AN INVESTIGATION OF MALE AND FEMALE COGNITIVE ABILITY ON THE WAIS-III

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ABSTRACT

This study, which formed part of a larger research project, investigated the effect of gender on test performance on the Wechsler Adult Intelligence Scale - Third Edition (WAIS-III). The WAIS-III was administered to a sample of 68 participants in the Eastern Cape following the initiative of the Human Sciences Research Council to standardise the WAIS-III for a South African population. The participants, aged 19 to 30, were stratified according to language of origin (African or English First Language), educational attainment (matriculant or graduate), quality of education (Department of Education and Training or private/"Model C" school) and gender. Analyses of variance and two sample t tests were used to compare male and female test performance. For the total sample, no significant difference between males and females on **Verbal, Performance** and **Full Scale IQ** were found. On the **factor indices**, females scored marginally higher than males on *Processing Speed* at a level which was approaching significance ($p = 0.105$), but no significant differences were found. On **subtest** performance, females significantly outperformed males on *Digit Symbol* ($p = 0.020$). Differences which were approaching significance were found on *Information* ($p = 0.133$) in favour of males, and on *Matrix Reasoning* ($p = 0.092$) in favour of females. For subgroups of the total sample, the most significant differences in test performance were found for the African First Language private/"Model C" school cohort in favour of females. Thus the overriding implication that emerged from this research was that on this relatively highly educated sample, no significant gender differences in cognitive ability were apparent.

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CHAPTER 1

INTRODUCTION

"We have more than a 'sneaking suspicion' that the female of the species is not only more deadly but also more intelligent than the male", (Wechsler, 1939, pp. 106 - 7).

David Wechsler, a man whose name is synonymous with intelligence testing, made this statement in the 1930's, a time when women were considered subservient to men, and largely believed to be intellectually inferior, a view shared by Francis Galton, the man who was responsible for the development of the first comprehensive test of intelligence (Huysamen, 1983; Kaufman & Lichtenberger, 1999; Mackintosh, 1996). Wechsler's comment, quoted above, was prompted by the small difference in overall scores in favour of women on both the original Stanford-Binet test, and on the Wechsler-Bellevue test (Mackintosh, 1996). Yet, it was not until the 1960's that women's movements demanding female equality both in the classroom and in the workplace, really took hold.

Many contemporary theorists believe that women have been disadvantaged on intelligence tests by a society that has favoured males both in terms of the different academic opportunities afforded them, as well as by the different academic expectations held of them. It has been widely shown that, on the whole, girls perform academically better than boys at school until they reach the middle of their high school careers, after which boys are able to match or better girls' academic performance (for example, Feingold, 1988, 1993; Lynn, R, 1994). The fact that girls mature earlier than boys has been used to explain this phenomenon, but Louw (in Louw & Edwards, 1997), suggests that social and cultural factors are responsible for this. Louw avers that many cultures actively encourage traits such as submissiveness in women, and inculcate a belief that to succeed academically or in the workplace is unfeminine. Many feminist writings, therefore, attempted to foster the belief that women could be academically astute, and successful in their careers without necessarily losing their femininity.

According to Ritzer (1988), feminist writings, aimed at enlightening society and empowering the women within it, had begun as early as the 1630's, and had continued sporadically until early in the twentieth century, when women in Britain and America earned the right to vote. Exhausted and seemingly satisfied by the victory they had achieved, the women's movement in America abated somewhat, and women seemed content to be relegated to the relative isolation of their homes while their menfolk went out to work. The feminist movement strengthened again in the 1960's, with the liberal feminists of the time equating the prevailing sexism as an ideology similar to racism. Ritzer (1988, p. 415) claims that sexism results in females "from childhood on, [being] limited and maimed, so that they can move into their adult roles and in those roles 'dwindle' from full humanness into the mindless, dependent, subconsciously depressed beings created by the constraints and requirements of their gender-specified roles." This was countered by Talcott Parsons' Structural Functionalsim theory, which posed a moral dilemma for women of the time. Parsons claimed that the traditional family was the backbone of society, the primary socialising agent for children and hence responsible for social stability. He said that "if men and women became too similar in family function and orientation, competition between them will disrupt family life, weakening the family's vital role in upholding social stability" (Parsons, 1954, in Ritzer, 1988, p. 409). How then could women justify their own need to be recognised as more than wife and mother if it jeopardised the very fabric of their children's lives?

However, great strides have been made over the last forty years with women achieving success in many walks of life, including the academic and business world, and the political arena. The issue of male and female cognitive capacity, however, remains contentious. Mackintosh (1996), when referring to attempts to ascribe specific intellectual characteristics to various groups in society, including gender groups, has said:

> *"Of all the controversial issues surrounding IQ tests, few have generated more heat and less light than the question whether different groups in our society differ in average IQ."* (Mackintosh, 1996, p. 559)

The aim of this research, therefore, is to add to the body of knowledge concerning male and female cognitive capacity. The latest version of the Wechsler Intelligence Scales, the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III), was released in the United States in 1997. The Human Sciences Research Council (HSRC) is in the process of standardising this test for a South African English speaking population, and running a concurrent experimental study regarding the test performance of the non-English speaking population in South Africa, a project which initiated the present research. While all of the Wechsler standardisation samples have been matched in terms of gender, they have never been normed separately for men and women. This research aims to investigate the effect of gender on test performance on the WAIS-III in a sample with a limited age range (19 - 30), and which has been stratified in terms of language of origin, educational attainment, quality of education and gender.

CHAPTER 2

LITERATURE REVIEW

It was stated in Chapter 1, that the aim of this research project was to investigate the effect of gender on WAIS-III test performance. However, before male and female cognitive ability is discussed, a brief review of the history and development of intelligence tests, including the development and use of intelligence tests in South Africa, will be provided.

2.1 THE HISTORY AND DEVELOPMENT OF INTELLIGENCE TESTS.

The first comprehensive test of intelligence was developed by Sir Francis Galton, an English biologist, in 1869 (Huysamen, 1983; Kaufman & Lichtenberger, 1999). His strict scientific background demanded a tool that permitted empirical measurement, and so he constructed a test battery that allowed accurate measurement, and which concentrated on sensory and motor tasks. However, the limitations of this test soon became apparent. In the early 1900's Alfred Binet, a Frenchman, realised that Galton's tests were not adequate to measure a concept as complex as intelligence and that separate tests for adults and children were necessary. In conjunction with Henri Simon, Binet devised a test for children, the Binet-Simon Scale, that was more language oriented than Galton's had been, and which focused on judgement, memory, comprehension, and reasoning (Kaufman & Lichtenberger, 1999). He revised this test until, in 1911, it included five ungraded adult tests.

Many Americans adapted Binet's test for use in the United States, but only Terman realised the importance of standardising the test for the American people. This he did with the development of the Stanford-Binet scale, standardised for American children and adolescents.

This test was used for nearly four decades. During this time, other tests, based on the Stanford-Binet, were devised. These tests included the Army Alpha group test with verbal content, the Army Beta group test consisting of non-verbal items, and the individually administered Army Performance Scale Examination. Many of the subtests included in these tests bore names of the subtests which are still used today: *Picture Completion, Picture Arrangement, Digit Symbol* and *Mazes.*

In the 1930's David Wechsler created an assessment battery for adults and children, with an age range of 7 - 69, and which granted equal weighting to verbal and non-verbal components. He defined intelligence as the "the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment" (Wechsler, 1958, p. 7). He regarded intelligence not only as a global entity, but also as an aggregate of specific abilities, because he considered that the elements or abilities which comprise this measure, while not independent, were qualitatively differentiable. He realised that the results of these tests had the potential to provide clinical information beyond pure psychometrics (Kaufman & Lichtenberger, 1999). The first adult intelligence scale he developed was the Wechsler-Bellevue Intelligence Scale (W-B) in 1939. This was followed in 1946 by Form II of the Wechsler-Bellevue, which introduced the concept of deviation IQs, as opposed to Terman's MA/CA (mental age divided by chronological age) computation. He continued to refine and develop this model with the publication in 1955 of the Wechsler Adult Intelligence Scale (WAIS), standardised for adults between 16 and 64 years of age, and in 1981, the Wechsler Adult Intelligence Scale - Revised (WAIS-R), widely used in both the United States and the United Kingdom, standardised for adults between 16 and 74 years of age. The most recent version, the Wechsler Adult Intelligence Scale - Third Edition (WAIS-III), standardised for a

16 to 89 age range, was published in 1997. At no stage, however, were these tests normed separately for men and women. According to Lezak (1983), although men and women have been shown to perform differently on some of the subtests of the WAIS batteries, the overlap between the scores that were obtained were, on the whole, too great to warrant separate norms.

2.2 INTELLIGENCE TESTING IN SOUTH AFRICA.

According to Huysamen (1983), individually applied intelligence tests for children in South Africa were first administered as early as 1915, when Martin used a modified version of the Stanford-Binet scale to test Zulu children between the ages of 4 and 18. In 1925, Dr Eybers of Grey University College in Bloemfontein published an adapted version of the Binet-Terman scale for use with white South African children, and in 1939, Dr M.L. Fick released the Individual Scale of General Intelligence, known as the Fick Scale, which he had based on Terman's revision of the Stanford-Binet Scale, and which was intended for children between the ages of 3 and 16. It was found that the scores achieved on these tests were grossly inflated, and so it was replaced, in 1964, by the New South African Individual Scale. In 1980, this scale was renamed the Senior South African Individual Scale (SSAIS), and was intended for children between the ages of 5 and 17.11 years. In 1979, the Junior South African Intelligence Scale (JSAIS) was published for children between the ages of 3 and 7.11 years. These tests were all normed for white, English or Afrikaans speaking children (Huysamen, 1983).

With the advent of World War I, group tests had been devised in America to enable large numbers of army recruits to be tested simultaneously (Kaufman & Lichtenberger, 1999). The perceived efficiency of the group test resulted in the first South African group test, the South African Group Test of Intelligence, for children between the ages of 6 and 16, to be published in 1930. This test was available only in Afrikaans and English. By 1950, it was realised that this test was too easy as the mean was 110 instead of 100, and so the original group test was revised with the publication in 1956 of the New South African Group Test (NSAGT). The junior, intermediate and senior versions of the NSAGT were all published by 1965. These revisions, however, were only available to, and standardised for, English and Afrikaans speaking children. In 1968, the HSRC developed a Group Test for Indian Pupils, and in 1974, a Group Test for Coloured pupils was released (Huysamen, 1983).

The only individually applied adult intelligence test which has been standardised for a South African population is the South African Wechsler Adult Intelligence Scale (SAWAIS). This test, which was based on the old Wechsler-Bellevue Intelligence Scale, and normed on a white, South African population nearly forty years ago, was marketed and sold by the Human Sciences Research Council (HSRC) until very recently (Nell, 1994). However, at the present time, although parts of the SAWAIS is still available on request, it is no longer being actively promoted in preparation for the South African standardisation of the WAIS-III (Claassen, personal communication). Much criticism was levelled at the continued use of the outdated SAWAIS in terms of its lack of applicability to a general South African population, the majority of whom did not speak English or Afrikaans as their first language, and who were not considered test-wise (Nell, 1994; Pieters & Louw, 1987). Test-wiseness is a characteristic inherent in a more westernised population and which, therefore, has advantaged the more privileged South African population in terms of IQ test performance. The concept of test-wiseness, widely considered to be one of the most powerful moderators of test performance, is characterised by fluent reading, automised knowledge of the alphabet, good pencil control and familiarity with copy tasks, and is gained through exposure to formal education (Nell, 1999). The use of a test which, considering South Africa's diverse and prejudiced educational background, appears so blatantly to disadvantage the majority of the population, was clearly inadvisable. Another criticism of the use of the SAWAIS was the fact that any research conducted using this test was questioned in international circles, and therefore reduced the credibility of South African academics (Pieters & Louw, 1987).

It is against this background that the HSRC has proposed to standardise the WAIS-III for a South African population (Nell, 1999). The standardisation will initially be conducted in English, using a sample of 900 participants who are stratified according to educational level, geographical region, and gender, and who

- declare that they speak English at home most of the time
- are drawn from a cross cultural population
- are between the ages of 16 and 69

A concomitant experimental study will be run on an additional 700 participants between the ages of 20 and 34, whose mother tongue is either an African language or Afrikaans, and who are variously proficient in English. The aim of this experiment is to analyse test items for bias, to determine differences in factor structures, and to determine profile structures for persons with limited English proficiency (Claassen, 1998). The distribution of this sample will be matched with the norming sample in terms of age, level of education and gender. However, the objective of the HSRC is to examine the effect of language proficiency on test results, but there is no intention to investigate the specific effects of crucial factors such as quality of education, socio-economic status or gender.

2.3 A DESCRIPTION OF THE WAIS-III.

The WAIS-III improves on the WAIS-R with the inclusion of three additional subtests: *Letter Number Sequencing*, a Verbal Scale subtest which measures working memory, attention, and sequencing ability; *Matrix Reasoning*, a Performance Scale subtest, which measures visual information processing, abstract and fluid reasoning skills, and simultaneous information processing; and *Symbol Search*, also a Performance Scale subtest, which measures visual processing speed, planning, and perceptual organisation (Kaufman & Lichtenberger, 1999). A clear advantage of this new test is that, built into the guidelines for its use are mechanisms which will enhance the opportunity of all people to do as well as possible, particularly the non-test-wise (Nell, 1999). These mechanisms include the concept of "guided learning" on subtests such as *Block Design*, in which the individual is "taught" how to assemble the blocks by watching the examiner copy the required design, and the reversal rule on 8 of the 14 subtests, which permits a period of extended practice for testees who are experiencing difficulty (Kaufman & Lichtenberger, 1999).

A major structural change to the WAIS-III is the addition of the four factor indices, similar to the Wechsler Intelligence Scale for Children - Third Edition (WISC-III). These are:

i. **Verbal Comprehension Index** made up of the *Vocabulary, Similarities* and *Information* subtests, and which taps crystallised intelligence and verbal ability.

ii. **Working Memory Index** made up of the *Arithmetic, Digit Span* and *Letter Number Sequencing* subtests, and which measures number ability and sequential processing, but requires a good non-distractible attention span for success.

iii. **Perceptual Organisation Index** made up of the *Picture Completion, Block Design* and *Matrix Reasoning* subtests, and which requires non-verbal thinking and visuo-motor co-ordination, a deductive reasoning process that is more dependent on fluid intelligence.

iv. **Processing Speed Index** made up of the *Digit Symbol* and *Symbol Search* subtests. *Symbol Search* taps mental speed and *Digit Symbol* measures psychomotor speed. This score may be adversely affected by factors such as poor fine motor co-ordination and lack of motivation on the part of the individual being tested.

The inclusion of these four factor indices permits the tester to be far more accurate in reading and interpreting the testee's profile.

Finally, the WAIS-III has extended the norms from a previous maximum age of 74 to include people up to the age of 89. This increases the test's usefulness in terms of clinical diagnosis of both retardation and traumatic or degenerative brain damage. In addition to this, the WAIS-III has decreased the reliance on timed performance, and enhanced the measurement of fluid reasoning ability (Claassen, 1998).

Despite the progressive improvement and refinement of intelligence tests over time, the concept of intelligence and the philosophy of intelligence testing itself has not been without debate.

2.4 CONTROVERSIAL ISSUES SURROUNDING THE MEASURE OF INTELLIGENCE.

Controversy regarding the concept of intelligence as a unitary, fixed and predetermined quality has abounded since the early 20th century when Alfred Binet's scale was first published, and continues unabated a century later (Howe, 1998; Lezak, 1995; Nell, 1999). Many contemporary, prominent authorities on intelligence, cited in Howe (1998), still regard an individual's IQ as a highly stable construct; for example, Rushton (1995) considers intelligence to be one of an individual's most enduring traits, and Murray (1996) claims that interventions aimed at raising an IQ score will meet with marginal and inconsistent success, and that the gains that are made will not endure over time. Howe (1998), however, challenges the assertion that IQ is largely unchangeable, and states that this notion has been contradicted by the empirical findings of a number of research studies, which have provided convincing evidence of large IQ gains taking place following positive environmental interventions. Among the research he cites, are adoption studies which have found that the average IQ of adopted children can be as much as twenty points higher than their biological parents (Capron & Duyme, 1989; Locurto, 1990; Schiff et al., 1982; Schiff & Lewontin, 1986); Head Start and other similar programmes which have shown evidence of large gains in measured IQ scores (Lazar & Darlington, 1982; Ramey et al., 1984; Snow & Yalow, 1982; Wasik et al., 1990; Zigler & Muenchow, 1992; Locurto, 1991); and studies of educational level, including entry and exit age, which have shown that intelligence test scores are highly changeable (Baltes & Reinert, 1969; Cahan & Cohen, 1989; Harnquist, 1968; Rutter & Madge, 1976; Ceci, 1990). The debate regarding the stability and malleability of the IQ score as a human characteristic, has included the question of gender and intellect. Many researchers consider that the male is characteristically intellectually superior to the female (for example Lynn, 1994), while others (for example Feingold, 1988) believe that there is no overall difference in male and female intellect, and that any differences that have been shown have been a function of environmental influences.

The usefulness of IQ testing has also been debated. While the usefulness of scientifically valid and appropriate intelligence tests, particularly in the industrial and educational fields, as well as that of clinical diagnosis has been widely acknowledged (for example Nell, 1999), the historical misuse of IQ tests in certain circles to justify various inhumane practices, has contributed to scepticism regarding the usefulness of cognitive testing (Kamin, 1973). The IQ score has been cited as a measure of intrinsic, genetic factors, as opposed to a score that could be influenced by extrinsic factors such as culture and environment. As such, the measured IQ score has been used to support and rationalise the notion of racial superiority, for example, in the immigration policies of the United States, the genocide perpetrated by Nazi Germany, and the racist policies of white South African governments (Nell, 1999). Further, the validity of intelligence tests must be questioned when they fail to take into account the effect of sexist or cultural bias in the test items, the administration of the test in a language which is different from the individual's mother tongue, his/her socio-economic status, the educational attainment of the individual, and the quality of education to which the individual has been exposed. The manner in which these factors are pertinent with regard to measured intellect and gender, is elaborated below. As the Wechsler family of intelligence tests are, internationally, the most widely used measure of intelligence, it is specifically these tests that will be referred to in the discussion of the reservations regarding the measure of intelligence.

With respect to **cultural bias**, it has been averred that the utility and objectivity of the Wechsler intelligence tests outside of the USA, the country in which they were developed, must be questioned (James & Dalton, 1993; Nell, 1999). Even when the test is administered in countries in which English is the *lingua franca*, for example in the UK and Australia, there are certain subtests, for example *Information*, which are still culturally loaded (James & Dalton,

1993) and which could adversely affect the score which is achieved by both male and female testees. According to Shuttleworth-Jordan (1995), both racial differences, i.e. ethnic factors, as well as socio-cultural differences, i.e. factors such as preschool socialisation experiences, primary and current language usage, educational level, socio-economic status and test sophistication, can account for significant variations in performance on cognitive tests. Nell (1997) questions the suitability of using the Wechsler family of intelligence tests as an instrument to measure intelligence in non-western cultures. In a study of the effects of race on test performance in the United States standardisation sample, Kaufman, McLean & Reynolds (1988) found significant main effects, in which whites consistently scored higher than blacks ($p < 0.001$) on all eleven subtests across all the age groups, with the exception of *Picture Arrangement* for the 16 - 19 year age group ($p < 0.01$). The largest differences in the performance of blacks and whites were found on the *Vocabulary* and *Block Design* subtests, two subtests which are often used together as a short form for clinical screening (Silverstein, 1982). Thus, the use of the *Vocabulary-Block Design* dyad or other similar screening methods could, quite clearly, penalise people of other cultures (Kaufman, McLean & Reynolds, 1988). Whilst much research has focused on the effect of cultural differences on performance on the Wechsler tests, a literature search did not reveal any reports which investigated gender effects in interaction with cultural effects on intelligence tests. That is, no research was found which had investigated the question of whether the performance of males and females were equally affected by the cultural bias identified with respect to intelligence tests.

With respect to **language of origin**, it is possible that however fluent an individual is in a language which is not his/her mother tongue, his/her measured verbal ability could be compromised by a potential inability to understand the nuances of a foreign language. It has been postulated that the emphasis that the Wechsler tests place on verbal ability, both in the presentation and in the response, may disadvantage testees who are not First Language English speakers, especially on the verbal scale (Kaufman & Lichtenberger, 1999). In itself, this is an underresearched area, and again, to the author's knowledge, no research has specifically examined the effect of language of origin in relation to gender on intelligence test performance.

With respect to **level of educational attainment**, it has been consistently shown that the number of years of schooling that have been successfully completed positively influences the score achieved on an intelligence test. Heaton, Grant and Matthews (1986), researchers cited by Puento and McCaffrey (1992), obtained statistically significant correlations between educational attainment and the scores achieved on all the WAIS-R subtests. Matarazzo & Herman (1984, p 631) cite a 0,70 correlation between measured IQ and grade completed, and state that:

> *"score upon score of studies revealed that the number of years of schooling an individual completes (academic attainment) correlates positively with that individual's measured intelligence as assessed by an Intelligence Quotient (IQ) or similar index."*

Again, this research was not concerned with specific gender effects. Speculatively, however, although Matarazzo and Herman cite a 0,70 correlation between IQ and grade completed, it is possible that should the same degree of correlation be found in studies which compare the cognitive ability of males and females in non-western cultures, by using one of the Wechsler Intelligence Scales, the validity of the measure could be questioned. It could be that a low measured IQ, seemingly commensurate with a low level of academic attainment, is not necessarily brought about by a limited cognitive capacity on the part of the individual, but rather that the low level of education which has adversely affected the measured score, was brought about by some other factor such as inadequate schooling, an inequality regarding academic input and expectations of males and females, or poor socio-economic circumstances. It is also possible that where poor socio-economic conditions prevail, the money that is available will be spent on advancing the level of educational attainment of the males in the family rather than the females.

With respect to quality of education, it is felt that the quality of education to which an individual has been exposed may also adversely affect his/her measured cognitive capacity. Schepers (1997), states that "the best genetic endowment can only come to fruition in a stimulating environment", and stresses the role that the quality of formal schooling plays in the development of linguistic and logical-mathematical intelligence. It is therefore possible that a child who is intellectually inferior, but who has been to a privileged school with plentiful resources and a small pupil/teacher ratio, will score better on an IQ test than a child who has been part of a deprived educational system in which the material, pastoral and emotional resources were limited. It is also in the area of quality of education that the male might be advantaged, in that in families with limited resources, it may well be the son who will be favoured by being sent to a better quality of school ahead of the daughter. According to Kaufman et al., (1988), the strongest relationship with education has been found on the Vocabulary and Information subtests. It is therefore postulated that a poor quality of education would particularly affect the development of these areas, and would be reflected in the measured Verbal IQ, particularly for the female if she has been disadvantaged in any of the ways described above.

With respect to **socio-economic status**, Shuttleworth-Jordan (1995), has stated that socio-economic status, one of the factors which contributes to socio-cultural differences, and frequently associated with racial differences, can influence significant variations in test performance on measures of cognitive ability. The limited financial resources implied by a poor socio-economic background will more than likely reduce the chances for both males and females of being exposed to both an extended education, and a high quality of education, factors which have both been shown to improve measured IQ (Lezak, 1995; Matarazzo & Herman, 1984; Schepers, 1997). In addition to this, it is unlikely that people from these limited home circumstances will have the opportunity to experience many of the learning situations from which many items on an intelligence test are driven. Poor measured intelligence, therefore, must be viewed in the light of these considerations.

Thus, while the Wechsler family of intelligence tests continues to be widely used as a measure of cognitive ability across diverse cultures and equally for males and females, the measurements that are obtained must take into account the considerations outlined above. In terms of gender differences in cognitive ability, opinions, based on research that has been done over time, are varied, and are discussed in the following section.

2.5 INTELLIGENCE AND GENDER.

Typically, as noted earlier (p. 6), separate standardisation for males and females on any of the adult Wechsler Intelligence Scales in the US, the UK and by the HSRC in SA has not been supplied. Research regarding the effect of gender on cognitive function over time has been equivocal. Some studies have shown that differences in Verbal, Performance and Full Scale IQs are not significantly related to gender (Reynolds, Chastain, Kaufman & McLean, 1987;

Brody, 1992, in Lynn 1998; Matarazzo, Bornstein, McDermott & Noonan, 1986; Matarazzo & Herman, 1984). However, other studies have shown a small superiority, with varying degrees of significance, of males over females on these scores (Arceneaux, Cheramie & Smith, 1996; Hattori & Lynn, 1997; Lynn, 1998; Lynn & Dai, 1993). Matarazzo et al., (1986, p. 972) suggest that "the respective unique psychometric properties of the W-B, WAIS and WAIS-R may operate to manifest different patterns of VIQ-PIQ scores between the two sex groups". Despite these differing opinions, it has been repeatedly and widely asserted that males and females have different but characteristic cognitive strengths (Hyde & Linn, 1988; Linn & Petersen, 1985; Matarazzo et al., 1986; Reynolds, 1987).

2.5.1 Male and Female Cognitive Strengths.

A number of studies have revealed that males perform better on tasks of a visuospatial nature, and that women perform better on tasks involving verbal ability, perceptual speed and precision motor control (Feingold, 1988; Coltheart, Hull & Slater, 1975, and Schaie, 1994 in Lezak, 1995; Lynn & Dai, 1993; Kumara, 1992). In a study of gender differences in WAIS-R age-corrected scaled scores on 230 subjects in the United States, Arceneaux et al. (1996) found that males performed better than women on subtests measuring general knowledge, numerical reasoning, and spatial visualisation, and thus reiterated the work of earlier researchers, such as Anastasi (1958) and Maccoby & Jacklin (1974). The consistency of these results over forty years prompted Arceneaux et al. to suggest that these differences be seen as true differences in cognitive processing, and that they should be investigated from a neuropsychological perspective. O'Boyle, Hoff and Gill (1995) studied the effect of mirror reversals on male and female performance on spatial tasks, and found that males were more effective than females when required to perform tasks presented in normal vision, but when a task required both spatial skills and refined motor manipulation in a mirror reversal situation, females reversed this advantage. Lezak (1995, p. 299) supports the finding that males fare better on many visuospatial tests, but cautions that "considerable overlap in the score distributions of the two sexes will be found on any given task in which there is a male advantage." Lynn and Dai (1993) point out that numerous research studies support the opinion that, on the whole, women obtain slightly higher means on verbal abilities and men slightly higher means on spatial abilities (Halpern, 1992; Hyde & Linn, 1988; Linn & Petersen, 1985; Maccoby & Jacklin, 1974), but state that when the two are averaged, there is no sex difference.

The claims regarding the varying cognitive strengths of males and females which are described above, have led to much debate regarding the dynamics of these cognitive differences. Many researchers are unsure whether these cognitive differences can be attributed to genetic factors, or to environmental influences (Wittig & Petersen, 1979). Lezak (1995) cites many researchers (Geary, 1989; Harris, 1978; Nash, 1979; Sherman, 1982), who claim that while differences in brain anatomy have been documented, so too have the effects of education and socialisation. This raises the nature-nurture issue: are the differences that have been documented above due to intrinsic, genetic factors, or are they the result of the different experiences and expectations of the environment in which males and females live?

2.5.1.1 Anatomical Differences

A number of researchers have attempted to show that the difference in male and female cognitive strengths is due to basic differences in the anatomical structure of the male and female brain. One explanation that has been proposed is that of lateral asymetry. Hattori

(1997), states that IQ test data support the notion that language is more bilaterally represented in women that men, and Lezak (1995) cites a number of researchers (for example Corballis, 1983; Levey & Heller, 1992) who have studied the functional characteristics of the two hemispheres of the brain, and who have found that lateral asymetry is not as pronounced in women as it is in men. However, they also state that since the overlap is considerable, these findings cannot provide any conclusive or convincing evidence to show why males should have superior spatial abilities and females should have superior verbal abilities.

Another explanation that has been posed is that of brain size. Many researchers have documented that males have larger brain sizes than females, even when this factor has been adjusted for body size (Ankney, 1992; Rushton, 1992; Witelson, 1991, in Lezak, 1995). A large number of studies have been conducted to show the positive correlation between brain size and intelligence, which has permitted the argument that the function of a larger brain is to confer greater intelligence (Lynn, 1994; 1998; Rushton 1992). Rushton (1992), has proposed that the widely held belief that there are no overall differences in male and female cognitive strengths is erroneous, and has used the results of WAIS-R standardisation samples which show that males have greater Full Scale IQs than females to support his argument regarding an anatomically based, inherently superior male intellect. Ankney (1992), however, has countered the argument for greater male intelligence, believing that the widely cited female verbal strengths and male spatial strengths balance to produce equal overall cognitive ability. He has suggested that the purpose of the larger male brain is to accommodate male spatial strengths, but this solution has not been generally supported. Thus, while anatomical differences in the structure of the male and female brain have been documented, it would seem that the implication of these anatomical differences remains speculative.

2.5.1.2 Socialisation and Education Effects

Wittig and Petersen (1979) believe that gender can be viewed as a variable which provides a stimulus for differential role assignment, ascribed status and treatment by others. They aver that puberty is the time at which sex-related differences in cognitive functioning reliably begin to appear, but that it is also likely to be a critical time for the intensification of socialisation effects, and that these gender differences are likely to increase with age as the socialisation effects accumulate. It has repeatedly been shown that educational attainment correlates positively with measured IQ (for example, Matarazzo & Herman, 1984), and so it follows that should a lesser education be expected of, or provided for females, their measured IQs would differ. Stankov conducted a study of student and non-student populations at the University of Sydney between 1978 and 1994 (reported in Saklofske & Zeidner, 1995), and found non-significant gender differences in performance on a battery of marker tests of fluid and crystallised intelligence. With reference to this study, Brody (1992), commented that the results "appear to implicate secular changes in our culture [which] .... might plausibly include a decline in sex-stereotyping of activities, interests and curricular choices among high school students" (Saklofske & Zeidner, 1995, p. 36). The implication of this statement is that prior to this time, measured intelligence was affected by socialisation processes which ascribed different expectations according to gender. Feingold (1988, p.102) states that:

> *The origins of sex differences have been attributed to childhood training and experience, to gender differences in attitudes (especially toward math), to parental and teacher expectations and behaviors, to different course taking, and also to biological differences between the sexes."*

The comparisons that are discussed below concern research that has been performed on cognitive gender differences using the WAIS-R standardisation samples from the United States

(Matarazzo et al., 1986, Hattori, 1997), China (Lynn & Dai, 1993), Japan (Hattori & Lynn, 1997), and Scotland (Lynn, 1998).

2.5.2 Gender Differences on VIQ, PIQ and FSIQ.

The research on gender differences, cited above, on Verbal IQ (VIQ), Performance IQ (PIQ) and Full Scale IQ (FSIQ) in multicultural studies of performance on standardisation samples of the WAIS-R, has consistently shown that males, on the whole, have slightly superior scores on VIQ, PIQ, and FSIQ, than females. See Table 2.1 below.

Table 2.1
VIQ, PIQ and FSIQ scores achieved by males and females in the WAIS -R standardisation samples of the United States, China, Japan and Scotland (Matarazzo et al., 1986; Lynn & Dai, 1993; Hattori & Lynn, 1997; Lynn, 1998).

	United States		*China*		*Japan*		*Scotland*	
	Males	*Females*	*Males*	*Females*	*Males*	*Females*	*Males*	*Females*
VIQ	*100.90*	*98.67*	*102.18*	*96.85*	*102.09*	*97.91*	*105.25*	*99.84*
(SD)	*15.07*	*14.68*	*14.55*	*15.01*	*15.60*	*14.13*	*12.87*	*12.24*
PIQ	*100.51*	*99.06*	*101.40*	*97.67*	*100.48*	*98.97*	*103.96*	*100.24*
(SD)	*15.19*	*15.07*	*14.76*	*15.09*	*15.13*	*14.94*	*14.65*	*11.90*
FSIQ	*100.92*	*98.70*	*102.00*	*97.02*	*101.54*	*98.23*	*105.09*	*100.00*
(SD)	*15.31*	*14.92*	*14.66*	*15.16*	*15.38*	*14.52*	*14.07*	*11.72*

The results cited above show a consistent male superiority across all of the measures discussed, VIQ, PIQ and FSIQ. In addition to this, Table 2.1 above reflects that males perform relatively better on VIQ than on PIQ, whereas the reverse is true for females, who score consistently better on PIQ than on VIQ. This finding seems to be contrary to the assertion that males score better on tasks of a visuospatial nature, tasks usually associated with PIQ, and females score better on tasks of verbal ability, tasks usually associated with VIQ. This finding, however, is best understood when the score scatter achieved by these standardisation samples on the individual subtests is examined in section 2.5.3 below.

Table 2.2 below, reflects the actual point superiority on VIQ, PIQ and FSIQ achieved by males in the multicultural standardisation samples of the WAIS-R.

Table 2.2.
Difference in overall IQ scores in favour of males on VIQ, PIQ, and FSIQ in the WAIS-R standardisation samples from the United States, China, Japan and Scotland (Matarazzo et al., 1986; Lynn & Dai, 1993; Hattori & Lynn, 1997; Lynn, 1998).

	United States		*China*		*Japan*		*Scotland*	
	d	*significance level*	*d*	*significance level*	*d*	*significance level*	*d*	*significance level*
VIQ	*2.23*	***	*5.33*	***	*4.18*	**	*5.41*	**
PIQ	*1.45*	*	*3.73*	***	*1.51*		*3.72*	*
FSIQ	*2.22*	**	*4.98*	***	*3.33*	**	*5.09*	**

Significance levels: * $p < .05$; ** $p < .01$; *** $p < .001$
d: difference in Verbal, Performance and Full Scale IQ points in favour of males.

Table 2.2 above reflects a significant male superiority on all of the overall IQ scores, across all of the WAIS-R standardisation samples cited here, with the exception of the PIQ score for the Japanese WAIS-R standardisation sample, which shows no significant difference between male and female PIQ scores. It must also be noted that male superiority on PIQ is, on the whole, less significant than the male superiority on VIQ and FSIQ.

While most of these standardisation samples are drawn from highly test-wise countries, a phenomenon which, it is felt, should advantage the females in these samples, it must be noted that the standardisations of these samples took place in the 1980's. As the age range of the participants in these samples was from 16 to 74, Feingold (1993), established that the average year of birth for the participants of the WAIS-R standardisation sample from the United States was 1941. This implies that the majority of the participants in this sample were schooled well before the advent of the women's movements in the United States in the early 1960's, which would mean that the females of this cohort would have been subject to the prejudices regarding female education and female role-stereotyping of the time. It is possible that this phenomenon could be generalised to the other WAIS-R standardisation samples cited here. Thus, while it is possible that the significant differences tabled here reflect an inherent male cognitive superiority, it is also possible that these differences were influenced by differential socialisation practices due to the sexist bias prevalent at the time.

2.5.3 Gender Differences on Individual Subtest Scores

Research findings reveal that males consistently and characteristically score better on the *Information, Arithmetic* and *Block Design* subtests, and that women consistently and characteristically score better on the *Digit Symbol* subtest (Arceneaux et al., 1996; Hattori & Lynn, 1997; Kaufman et al., 1988; Lynn, 1998; Lynn & Dai, 1993). Kaufman et al., (1988) collapsed the United States standardisation sample into four age groups (16 - 19, 20 - 34, 35 - 54 and 55 - 74) and found that the superiority of males on *Information, Arithmetic* and *Block Design* was significant at the 0.001 level for three of the four age groups, and that the superiority of females on *Digit Symbol* was significant at the 0.001 level across all four age groups. These researchers were of the opinion that as Wechsler systematically tried to eliminate items that seemed biased in favour of males or females, the results must accurately reflect a gender difference. They averred that this was especially true for tests such as *Block Design* and *Digit Symbol* which employ abstract stimuli, and which are not, therefore, considered to be as influenced by formal learning.

These subtest score differences influence overall IQ score differences. *Information* and *Arithmetic* are both subtests which contribute to the Verbal IQ scale. Since males have been found to score consistently and significantly better than females on these two subtests, it follows that their superior performance here will influence their superior performance on measures of VIQ. The apparently contradictory assertion that females score better than males on verbal tasks, has been attributed to the finding that females perform better than males on verbal tasks such as spelling and grammar (Feingold, 1992; Lezak, 1995), skills which are not tested in an IQ test, and which therefore do not contribute to a measure of VIQ. Females are said to perform better than males on tasks involving psychomotor and perceptual speed (Lezak, 1995), an assertion which is consistent with their superior performance on the *Digit Symbol* subtest, which involves both of the above-mentioned skills. Lynn and Dai (1993) have suggested that females score better on *Digit Symbol* because of characteristic skills related to memory, "freedom from distractibility", and perceptual speed. The superior performance of males on tasks involving spatial visualisation, mental rotation and mechanical aptitude, reported in studies of Differential Aptitude Tests, Preliminary Scholastic Aptitude Tests and on the Wechsler tests (Arceneaux et al., 1996; Feingold, 1992; Lezak, 1995; Linn & Petersen, 1985; Lynn & Dai, 1993) contributes to an understanding of why males perform better on the *Block Design* subtest. As *Block Design* and *Digit Symbol* are both subtests which contribute to a measure of PIQ, it would appear that males' superior performance on *Block Design,* and females' superior performance on *Digit Symbol,* serves to reduce the significance of the difference between male and female PIQ scores, but not to explain why males should consistently perform better on the latter measure across this series of studies.

A comparison of all 11 subtest scores across the four WAIS-R standardisation samples that are cited here, see Table 2.3 below, reveals that males outperform females on every subtest except *Digit Symbol,* with varying degrees of significance. The results that are cited here, at first glance, do seem to provide compelling support for a theory of general male cognitive superiority, and accordingly Lynn (1998) suggests that the similarity of these patterns across diverse cultures is indicative of genetic determination which transcends cultural differences. However, in this series of studies, the only subtests on which males consistently score better than females at a significance level of at least 0.01 are *Information* and *Arithmetic*, subtests which are considered to be highly academically influenced (Lezak, 1995).

Table 2.3
A comparison of the individual subtest scores achieved by males and females in the WAIS-R standardisation samples of the United States, China, Japan and Scotland (Hattori, 1999; Lynn & Dai, 1993; Hattori & Lynn, 1997; Lynn, 1998).

		United States		***China***		***Japan***		***Scotland***	
Subtest	***Gender***	***Score***	***p***	***Score***	***p***	***Score***	***p***	***Score***	***p***
Verbal Subtests									
Similarities	Male	9.01		10.10	***	10.32		10.10	
	Female	8.98		9.66		10.06		9.52	
Information	Male	9.82	***	10.96	***	10.43	**	11.04	***
	Female	8.98		9.31		9.58		9.19	
Comprehension	Male	9.60	*	10.55	***	10.39	**	10.64	*
	Female	9.33		9.83		9.73		9.71	
Arithmetic	Male	9.87	***	10.45	***	10.31	**	12.11	***
	Female	8.89		9.51		9.54		10.57	
Digit Span	Male	9.37		10.65		9.90		11.43	
	Female	9.44		10.44		9.64		11.31	
Vocabulary	Male	9.41		10.24	***	10.36	**	10.61	
	Female	9.25		9.73		9.29		10.17	
Performance Subtests									
Picture Comp	Male	9.15	***	10.35	***	10.03		10.43	
	Female	8.66		9.41		9.99		9.75	
Block Design	Male	8.95	*	9.85		10.13		11.60	***
	Female	8.65		9.60		9.53		10.34	
Picture Arrange	Male	8.97	**	10.11	**	10.48	**	11.06	
	Female	8.54		9.75		9.93		10.51	
Object Assembly	Male	9.16	***	10.19	***	10.28	**	10.00	*
	Female	8.42		9.69		10.00		9.20	
Digit Symbol	Male	8.08		9.79		9.81		10.14	
	Female	8.99	***	10.15	**	10.26	**	11.02	**

Significance levels: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$.

The *Information* subtest requires testees to answer questions of a general knowledge nature and therefore taps crystallised intelligence. Crystallised intelligence is defined as skills, abilities and knowledge that are enduring and made up of things that are over-learned, well-practised and familiar (Lezak, 1995). According to Kaufman and Lichtenberger (1999), performance on this subtest can be affected by considerations such as alertness to the environment; cultural opportunities at home; a foreign language background; intellectual curiosity and striving; interests; outside reading; richness of early environment; and school learning. The *Arithmetic* subtest requires the individual to provide answers for arithmetical problems posed verbally. It therefore taps working memory, verbal comprehension, and number and reasoning ability, all of which are aspects of fluid intelligence. According to Kaufman and Lichtenberger (1999), performance on this subtest can be affected by attention span, anxiety, concentration, distractibility, learning disabilities, ADHD, working under time pressure, and school learning. Clearly, as both *Information* and *Arithmetic* are subtests which are influenced by level of educational attainment, it is feasible to suggest that rather than males being genetically superior to females in terms of cognitive ability, it is possible that their superior performance on these two subtests could have been influenced by subtle differences in the educational orientation that the males have received, dictated by historical differences in societal expectations for boys.

The *Digit Symbol* subtest is largely considered a test of perceptual organisation, psychomotor speed and visual memory, in which the individual is required to match a number with a prescribed symbol. According to Kaufman and Lichtenberger (1999), good performance on this task is positively influenced by good fine hand-motor control, a facility with numbers and a learning ability, and negatively influenced by anxiety, distractibility, learning disabilities, ADHD, poor motivational level, obsessive concern with accuracy and detail, visual-perceptual problems and problems with working under time pressure. It is not a subtest that has been shown to be influenced by school learning as the *Arithmetic* and *Information* subtests are, and could therefore be seen as more indicative of inherent cognitive potential in this area, which is portrayed in women to a greater extent than in men.

2.6 CONCLUSION

The WAIS-R standardisation studies which have been cited here, have indicated overall male cognitive superiority. Researchers have differed in their opinions regarding the difference between male and female cognitive ability. Some have stated that the results which have been found on the WAIS-R standardisation samples must indicate inherent male cognitive superiority, while others have claimed that males and females are intellectually equal, but with different and characteristic cognitive strengths. The issue has been debated in terms of the nature/nurture controversy. Some researchers have claimed that different male and female cognitive strengths can be attributed to different anatomical structures in the male and female brain, while other researchers have stated that the difference in male and female measured scores are the result of different socialisation and educational practices for males and females. It has, however, been shown that measured IQ scores are affected by the influence of factors such as sexist and cultural bias, language of origin, educational attainment, quality of education and socio-economic status.

Research has shown that the difference in cognitive functioning between the sexes has declined greatly in recent years (Feingold, 1988, 1992; Lezak, 1995). The only exception to this finding is the continuing male superiority in high school mathematics at the upper levels of performance, which has remained constant from 1960 to 1983 (Feingold, 1988). Jordan

(1997), has proposed that the difference between male and female adult IQ scores, which has been documented to date, is likely to lessen over time. She attributes this to less differentiated educational and socialisation practices for boys and girls, and to a greater expectation for females to form an integral part of the work force in contemporary society. Thus it is possible that a culturally matched, contemporary sample which has been exposed to the same level and quality of education, will demonstrate little, if any, gender difference in cognitive functioning.

Given these contentious findings, it was therefore decided to conduct a study to investigate the effect of gender on WAIS-III test performance in a sample of South African participants, with a limited age range (19 - 30), who were stratified for language of origin, level of educational attainment, quality of education and gender, in such a manner that the contribution of these factors would facilitate the investigation of gender effects. In this way, it was anticipated that

i. the overall effect of gender on WAIS-III test performance could be examined in the South African context, and informally compared with the existing series of WAIS-R studies, and
ii. that for the first time, to the author's knowledge, the effect of gender in interaction with language of origin, level of educational attainment and quality of education on WAIS-III test performance could be investigated.

CHAPTER 3

METHODOLOGY

This study forms part of a larger research project being conducted at Rhodes University in Grahamstown, under the co-ordination of a clinical neuropsychologist. For the overall study, data have been collected to investigate WAIS-III test performance on a South African sample which has been stratified for age, language of origin, educational attainment, quality of education and gender. In the larger study, the following four areas related to the WAIS-III are being researched:

i. The development of a WAIS-III short form for use in South Africa.

ii. The effects of socio-economic status, level of education and quality of education on WAIS-III test performance.

iii. The effects of language of origin and English proficiency on WAIS-III test performance.

iv. The effect of gender on WAIS-III test performance in interaction with language of origin, educational attainment and quality of education.

This study addressed the last of these four research areas and investigated the effect of gender in interaction with language of origin, educational attainment and quality of education on WAIS-III test performance within a restricted age group.

3.1 Participants

There were a total of 68 participants, 34 males and 34 females, selected to comply with specific research requirements regarding age range, language of origin, level of educational attainment, and quality of education. Participants were between the ages of 19 and 30, and spoke either English or an African language as their first language. They were stratified in terms of two levels of educational attainment, either matriculant or graduate, and two levels of quality of education, having attended either a private or "Model C" school or a Department of Education and Training (DET) school in their high school years. The participant requirements in terms of age, language of origin, level of educational attainment and quality of education are delineated in more detail below.

3.1.1 Age

The participants were between the ages of 19 and 30 with an overall mean age of 24.06 years and a standard deviation (SD) of 2.95 years. The mean ages for males and females across groups were highly equivalent, ranging between 23.29 years and 24.88 years. Specifically, the mean age for males was 24.09 years, SD = 2.83 years; the mean age for male matriculants was 24.24 years, SD = 2.77 years, and the mean age for male graduates, 24.88 years, SD = 2.71 years. The mean age for females was 24.03 years, SD = 3.10 years; the mean age for female matriculants was 23.82 years, SD = 3.47 years, and the mean age for female graduates was 23.29 years, SD = 2.80 years.

This particular age range (19 - 30) was chosen because, in terms of South African politics prior to 1991, separate education was mandated for different population groups (Hartshorne, 1992). The implication of this was that before 1991, African First Language speakers, who could not afford a private school education, would have been forced to attend DET schools and would not, therefore, have been exposed to the same quality of education as English First Language speakers, who were able to attend both private and the equivalent of "Model C' schools, both of which were considered superior to DET schools. A cohort of this age range, therefore, permitted the researchers to select African First Language participants from either private or "Model C" schools who were old enough to have matriculated or have achieved a three year tertiary education, but who were nevertheless young enough to have been permitted a "Model C" school for their high school education. Furthermore, it was considered important to have a relatively restricted age range, the purpose of which was to control for the effect of age, and not to investigate age effects. Typically, the standardisation samples for the Wechsler intelligence tests from age twenty onwards, have been divided into age groups with ranges of five or ten years. This, in some measure, supports the assumption that there were not going to be significant age effects within a single decade.

3.1.2 Language of Origin

The participants were divided into two groups: those who declared that English was their home language and that they spoke English at home most of the time, and those whose mother tongue was an African Language. As the test was to be administered in English, only those African First Language speakers who declared themselves to be reasonably fluent in English, and who were working or studying in an environment in which English was the primary or "floor" language used, were included in the study. There were a total of 28 English First Language speakers, 14 males and 14 females, and a total of 40 African First Language speakers, 20 males and 20 females. A larger African First Language cohort was selected to enable the researchers to investigate the effect of the two levels of quality of education **within** the African First Language group. See Table 3.1 below.

Table 3.1
Number of male and female participants stratified according to two levels of language of origin and gender.

Gender	Language of Origin	
	English 1st Language (n=28)	**African 1st Language (n=40)**
Males (n=34)	14	20
Females (n=34)	14	20

3.1.3 Educational Attainment

For the purposes of this study, two levels of educational attainment were chosen: 34 participants had at least 12 years of education, but no three year degree or diploma, and are referred to as matriculants; and 34 participants had at least 15 years of education, including a three year degree or diploma, and are referred to as graduates. See Table 3.2 below.

Table 3.2
Number of male and female participants stratified according to two levels of educational attainment and gender.

Gender	Educational Attainment	
	Matriculant (n = 34)	**Graduate (n = 34)**
Males (n = 34)	17	17
Females (n = 34)	17	17

Years of education were calculated on the basis of the level of education a participant had attained. Thus, a matriculant would only be credited with a maximum of 12 years of education regardless of the number of years it had taken to achieve this level of education, and a graduate would only be credited with 15 years of education regardless of the number of years it had taken to reach this level of education.

For the matriculant group, no differentiation was made in terms of the quality of matriculation that was achieved, i.e. whether the matriculant had gained a university pass or not. In addition to this, some of the matriculants had either embarked on tertiary education and discontinued it, or had achieved a year's diploma course. Any single year successfully completed was credited to the participant's level of educational attainment. With respect to gender, the sample was well matched for education across the matriculation groups. The mean number of years of education of the total matriculant group was 12.47 years, SD = 0.56; the mean number of years for male matriculants 12.41 years, SD = 0.51, and for female matriculants 12.53 years, SD = 0.62.

For the graduate group, the minimum requirement was that the participants had to have successfully completed at least a three year degree or diploma course. A number of the graduates had obtained additional qualifications in the form of Honours or Masters degrees, or post-graduate diplomas. Any single post-graduate year successfully completed was credited to the participant's level of educational attainment. With respect to gender, the sample was well matched for education across the graduate groups. The mean number of years of education for the total graduate group was 16,53 years, SD = 1.35; the mean number of years of education for male graduates was 16.53 years, SD =1.50, and for female graduates was 16.53, SD = 1.23.

3.1.4 Quality of Education

Two levels of quality of education were investigated: (i) DET schooling, hereafter referred to as DET school, and (ii) private or "Model C" schooling, hereafter referred to as private/"Model C" school. DET schools were state-owned schools which were attended by black pupils only, and which received less funding per pupil than "Model C" schools (Bot, 1995). Private schools included schools affiliated to the Independent Examination Board, or similar schools which were not state-owned, typically commanding high fees for attendance. "Model C" schools comprise those schools which, under the previous political regime, were state-owned schools and were the sole preserve of the privileged white sector, receiving a larger state grant per pupil than the DET schools (Bot, 1995). Since 1991, limitations on admission to "Model C" schools, based on colour, has been lifted. The rationale behind making this distinction in the quality of education of the participants was to facilitate an analysis of the effect of the quality of education in interaction with gender. A DET education was considered inferior to that of a private/"Model C" school education. For the purposes of this research, there were 20 DET school participants, 10 males and 10 females, and 48 private/"Model C" school participants, 24 males and 24 females. Of the 48 private/"Model C" school participants, 35 were educated in a private school, and 13 were educated in a "Model C" school. The private/"Model C" school participants were stratified according to their language of origin: 20 participants, 10 males and 10 females, had an African language as their mother tongue, and 28 participants, 14 males and 14 females, had English as their first language. See Table 3.3 below.

Table 3.3
Number of male and female participants stratified according to quality of education, language of origin and gender.

	DET School	**Private/"Model C" School**	
Gender	**African 1st Language (n = 20)**	**African 1st Language (n = 20)**	**English 1st Language (n =28)**
Males (n = 34)	10	10	14
Females (n = 34)	10	10	14

This division enabled an analysis of the effect of gender in interaction with educational attainment within an African First Language group, and further, it enabled the investigation of the effect of gender in interaction with two levels of language of origin within the private/"Model C" school group.

3.2 Procedure

Once it was established that a particular person fulfilled the criteria in relation to age, language of origin, educational attainment, quality of education, and gender, see initial contact sheet (appendix 1), they were asked to participate in this study, providing that they had never been diagnosed with a learning difficulty, a neurological or psychiatric disorder, or a head injury.

The tests were administered by four intern clinical psychologists, whose research areas were stipulated at the beginning of this chapter. Each intern clinical psychologist was responsible for the administration of 17 tests, under the supervision of a clinical neuropsychologist. Each participant was required to sign a consent form (see appendix 2) in which he/she agreed to allow the results of the test to be used in the larger study. It was explained to the participant that all the information that was collected was confidential, and that the research would be written up in such a way that the information that was detailed in the various studies could not be traced back to the individual participants. Each participant was assigned a specific protocol number which was used to label his/her socio-economic questionnaire, language proficiency test and answer booklet to ensure confidentiality. Following this, the socio-economic questionnaire, the language proficiency test and the WAIS-III were administered in that order.

Testing mostly took place in private homes, but a number of participants were tested at the Rhodes Psychology Clinic. Quiet testing conditions with good lighting were ensured. Participants were tested at various times of the day, depending upon their commitments. Half way through the testing procedure, the participants were offered a fifteen minute break and some refreshment. In certain cases, particularly when testing took place in the evening, if it was judged that the participant was particularly fatigued, extra breaks were taken. On average, testing took about three hours to complete.

3.3 Measures

The testing was divided into three parts which were administered in the order stipulated below:

i. Socio-economic questionnaire

ii. Language proficiency test

iii. WAIS-III

3.3.1 Socio-Economic Questionnaire.

This questionnaire was devised specifically for the purposes of the second research area of the larger research project described above, and did not form part of the present study. Hence its construction will not be discussed in detail for the purposes of this thesis. Broadly, the socio-economic questionnaire comprised questions concerning the participant's present and formative socio-economic circumstances. The information that was required pertained to the participant's parents, grandparents or significant other's educational attainment, and the facilities that were available to him/her in his/her home currently and at various stages of his/her life (see appendix 3). The questionnaire was administered verbally by the researchers, and took, on average, ten minutes to complete.

3.3.2 Language Proficiency Test.

This test was devised by the HSRC to assess the English proficiency of the experimental group of the South African WAIS-III standardisation sample (see appendix 4). It was incorporated into this battery of tests for the purposes of the third research area of the larger research project described above, and did not form part of the present study. Briefly, it consisted of thirty multiple choice questions, from which the participant was required to choose either the correct or incorrect word or phrase from a selection of options. It was a pen and pencil test and took a testee approximately fifteen minutes to complete.

3.3.3 WAIS-III Administration.

Lastly, the WAIS-III was administered in the format stipulated by the manual, and the answers were entered into an answer booklet (see appendix 5). On three of the subtests, *Vocabulary, Information* and *Comprehension*, a number of additional items proposed by the HSRC were included. These additional questions were devised by the HSRC to establish whether they would form more culturally appropriate substitution items for the South African standardised version of the WAIS-III. For the purposes of this study, the substitution items were not used in the final scoring. However, they will be available for further comparative investigations should the final South African WAIS-III use any of these as replacement items.

3.4 Data Processing

Once all the testing had been completed, the protocols were marked and scored by the four intern clinical psychologists according to the norms standardised for an American population. The data were coded and entered into an Excel spreadsheet which was then given to a statistician for statistical analysis.

3.5 Data Analysis

For the purposes of this study, 2-way ANOVAS were used to compare the test performance of the males and females of the total sample on the individual subtests, the overall IQs, and the factor indices, in interaction with both levels of each of the following factors: language of origin and gender; educational attainment and gender; and quality of education and gender. When more individualised comparisons were required concerning subgroups of the total sample, the means and the standard deviations of two sample *t tests* were calculated to determine significant differences between male and female test performance on the individual subtests, the overall IQs, and the factor indices, for the factors language of origin, educational attainment and quality of education. For the subgroup comparisons, Bonferroni adjustments to the significance levels were made for the three comparisons that were used, language of origin, level of educational attainment, and quality of education.

The test performance on the individual subtests, the overall IQs and the four factor indices passed tests of normality, (Kolomogorov Smirnov $p > 0.02$), and tests for homogeneity of the variance (Levene test, $p > 0.10$).

CHAPTER 4

RESULTS

In this chapter, first the gender effects on WAIS-III test performance for the total sample are examined. Thereafter, the gender effects in relation to the factors language of origin, educational attainment and quality of education are examined. In each case, performance on the WAIS-III was compared in terms of:

i. the individual subtests
ii. the IQ scores: Verbal IQ (VIQ), Performance IQ (PIQ), and Full Scale IQ (FSIQ)
iii. the factor indices: Verbal Comprehension, Perceptual Organisation, Working Memory, and Processing Speed

The following subgroups of the total sample were compared:

i. African First Language males and females
ii. English First Language males and females
iii. male and female matriculants
iv. male and female graduates
v. private/"Model C" school males and females
vi. DET school males and females
vii. African First Language male and female matriculants
viii. African First Language male and female graduates
ix. English First Language male and female matriculants
x. English First Language male and female graduates
xi. African First Language DET school males and females
xii. African First Language private/"Model C" school males and females
xiii. English First Language private/"Model C" school males and females

For the total sample, 2-way ANOVAS were used to analyse the significance of the interactive effects of gender and each of the factors language of origin, educational attainment, and quality of education. Two sample *t tests* were used to compare male and female test performance for the total sample and for the various subgroups of the total sample which have been described above. Probability levels are denoted as follows: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Probability levels which fall between 0.05 and 0.15, denoted by the symbol "#", are discussed as differences which are approaching significance. This probability range is expressed by the term, $0.05 < p < 0.15$, a form which is commonly employed in statistical practice (Prof. Sarah Radloff, personal communication). To ensure that the overall level of significance did not exceed 0.05, Bonferroni adjustments were used (Miller, 1981). Thus after division for the number of comparisons that were made, i.e. language of origin, level of educational attainment and quality of education, the adjusted significance levels that were used were: * $p < 0.017$; ** $p < 0.003$; # $0.017 < p < 0.038$. For each of the WAIS-III categories under examination (subtest scores, the overall IQ scores, and the factor index scores), the results are discussed in the following order:

i. significant results

ii. results approaching significance

iii. non-significant trends

For each WAIS-III category that is examined, the data to which the text refers, are placed in a table situated as close to the relevant discussion as possible. Standard Deviations are referred to as "SD", and the number of subjects in each of the subgroup comparisons is denoted by "n".

4.1 THE OVERALL EFFECT OF GENDER ON TEST PERFORMANCE.

The overall effect of gender on test performance was examined by comparing the mean scores achieved by the total sample of males (n = 34) against the mean scores achieved by the total sample of females (n = 34) on the individual subtests, the overall IQs and the factor indices. See Table 4.1. below.

Table 4.1

A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs and the factor indices by the total sample of males and females.

Subtests, IQs and Factor Indices	Males (n = 34) M	Males (n = 34) SD	Females (n = 34) M	Females (n = 34) SD	*t test*	*p*
Verbal Subtests						
Vocabulary	10.47	4.16	10.62	4.31	- 0.14	0.887
Similarities	11.15	3.61	10.50	3.19	0.78	0.437
Arithmetic	10.12	3.29	11.00	3.04	- 1.15	0.255
Digit Span	10.00	3.10	11.09	3.60	- 1.34	0.186
Information	11.09	3.24	9.88	3.30	1.52	0.133 #
Comprehension	11.35	3.30	11.09	3.41	0.32	0.746
Let-Num Sequence	11.47	3.20	11.15	3.04	0.43	0.670
Performance Subtests						
Picture Completion	10.65	3.54	10.53	3.43	0.14	0.890
Digit Symbol	9.59	2.98	11.26	2.80	- 2.39	0.020 *
Block Design	9.68	3.36	9.35	2.90	0.43	0.672
Matrix Reasoning	10.68	3.47	12.15	3.61	- 1.71	0.092 #
Picture Arrange	9.38	3.85	9.00	3.31	0.44	0.662
Symbol Search	8.94	2.86	9.53	3.25	- 0.79	0.431
Object Assembly	7.91	2.97	8.00	3.30	- 0.12	0.908
Verbal IQ	104.50	18.39	104.24	17.70	0.06	0.952
Performance IQ	100.18	18.70	103.18	17.27	- 0.70	0.486
Full Scale IQ	102.88	18.66	104.18	18.53	- 0.29	0.775
Verbal Comprehension	105.24	19.38	101.56	18.23	0.81	0.423
Percep Organisation	102.09	18.33	103.91	16.74	- 0.43	0.670
Working Memory	102.88	16.69	106.59	17.12	- 0.77	0.441
Processing Speed	96.06	14.78	102.59	15.28	- 1.65	0.105 #

Significance levels: * $p < 0.05$; # $0.05 < p < 0.15$

With respect to the **individual subtest comparisons**, the only result that was statistically significant, was the difference in the scores achieved by males and females on *Digit Symbol.* Females scored 1.67 points higher than males on *Digit Symbol* ($p < 0.05$). In terms of results that were approaching significance, males scored 1.21 points higher than females on *Information* ($p = 0.133$); and females scored 1.47 points higher than males on *Matrix Reasoning* ($p = 0.092$). In terms of scaled score trends, of the remaining eleven subtests, males scored higher than females on six subtests (*Similarities, Comprehension, Picture Completion, Block Design, Picture Arrangement, Object Assembly*), and females scored higher than males on the other five subtests (*Vocabulary, Arithmetic, Digit Span, Letter Number Sequencing, Symbol Search).*

With respect to **overall IQ scores**, there were no differences between males and females that were significant or approaching significance. In terms of trends, males scored higher than females on VIQ, and females scored higher than males on PIQ and FSIQ. With respect to the **factor indices**, there were no significant differences between males and females. In terms of results that were approaching significance, females scored 6.53 points higher than males on *Processing Speed* ($p = 0.105$). In terms of trends, males scored higher than females on *Verbal Comprehension*, and females scored higher than males on *Perceptual Organisation* and *Working Memory.*

In sum, with respect to the total sample, see Table 4.1.1 below, the only significant gender difference was for the *Digit Symbol* subtest in favour of females. There were differences which were approaching significance in favour of males for the *Information* subtest, and in favour of females for the *Matrix Reasoning* subtest, and for the factor index, *Processing Speed.* A marginal female dominance was noted on FSIQ and on the factor index scores.

Table 4.1.1
A summary of the results of Table 4.1 reflecting both significant and trend superiority of males and females in terms of subtest, overall IQ and factor index performance.

	Significance Levels	**Male Superiority**	**Female Superiority**
Subtests	*		Digit Symbol
	#	Information	Matrix Reasoning
	Trends	Similarities Comprehension Letter Number Sequence Picture Completion Block Design Picture Arrangement	Vocabulary Arithmetic Digit Span Symbol Search Object Assembly
IQs	Trends	VIQ	PIQ, FSIQ
Factor Indices	#		Processing Speed
	Trends	Verbal Comprehension	Perceptual Organisation Working Memory

***Significance levels:* * $p < 0.05$; # $0.05 < p < 0.15$**
***Trends:* $p > 0.015$**

4.2 THE EFFECT OF LANGUAGE OF ORIGIN AND GENDER ON TEST PERFORMANCE.

With respect to gender, two levels of language of origin were investigated: African First Language and English First Language. First the interactive effect of language of origin and gender is investigated by means of a two-way ANOVA, thereafter, the mean scores achieved by males and females for each of the two levels of language of origin are compared by means of two sample *t tests.*

4.2.1 The Interactive effect of language of origin and gender.

A two-way ANOVA was performed to investigate the interaction between the two levels of language of origin, African First Language and English First Language, and gender. See Table 4.2. below. The main effect of language of origin, which is highly significant across all the modalities, is reported for completeness as part of the ANOVA table, but is not of direct relevance here, and is the focus of a different study (see Chapter 3, p. 29, study 3). The main effect of gender reflects the findings of the *t test* analysis reported in Table 4.1 and discussed above.

Table 4.2
Two way analysis of variance in which the effect of two levels of language of origin (African First Language and English First Language) and gender are compared.

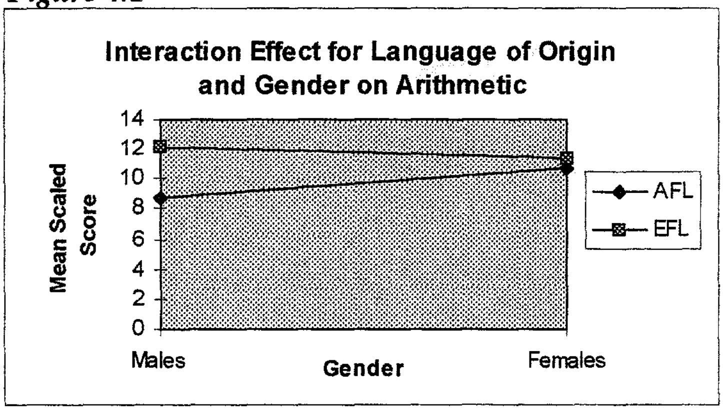
Subtests, IQ scores and Factor Indices	Language F Value	Gender F Value	Interaction F Value
Verbal Subtests			
Vocabulary	20.53 ***	0.02	0.02
Similarities	9.90 **	0.94	0.71
Arithmetic	7.71 **	0.75	3.78 #
Digit Span	7.93 **	1.91	0.00
Information	13.14 ***	2.97 #	0.34
Comprehension	4.35 *	0.21	0.60
Letter Number Sequencing	5.68 *	0.23	0.08
Performance Subtests			
Picture Completion	20.42 ***	0.03	0.01
Digit Symbol	17.08 ***	5.62 *	2.50 #
Block Design	22.93 ***	0.52	1.74
Matrix Reasoning	6.18 **	2.39 #	2.13 #
Picture Arrangement	14.37 ***	0.18	0.06
Symbol Search	18.17 ***	0.65	0.14
Object Assembly	21.91 ***	0.00	0.14
Verbal IQ	15.98 ***	0.05	0.75
Performance IQ	28.39 ***	0.40	1.15
Full Scale IQ	23.33 ***	0.02	0.97
Verbal Comprehension Index	17.83 ***	0.97	0.32
Perceptual Organisation Index	26.35 ***	0.08	1.48
Working Memory Index	10.22 **	0.44	0.74
Processing Speed Index	22.09 ***	2.80 #	1.15

Significance levels: ** $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; # $0.15 < p < 0.05$*

With respect to the **interaction effect of language of origin and gender**, there were no significant results. In terms of interaction effects that were approaching significance, there were interaction effects on the subtests *Arithmetic, Digit Symbol* and *Matrix Reasoning.*

Figure 4.1 below depicts the tendency for an interaction effect on *Arithmetic* ($p = 0.056$). The difference in performance was approaching significance in favour of females for the African First Language group, (see Table 4.3 on p. 48), but there was no significant difference between males and females for the English First Language group (see Table 4.4 on p. 50).

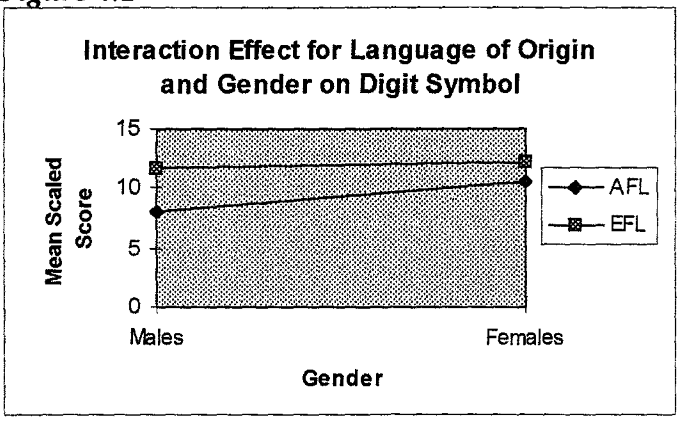
Figure 4.1



AFL: African First Language
EFL: English First Language

Figure 4.2 below depicts the tendency for an interaction effect on *Digit Symbol* ($p = 0.118$). The difference in performance was significant for the African First Language group in favour of females, (see Table 4.3 on p. 48), but there was no significant difference between males and females for the English First Language group (see Table 4.4 on p. 50).

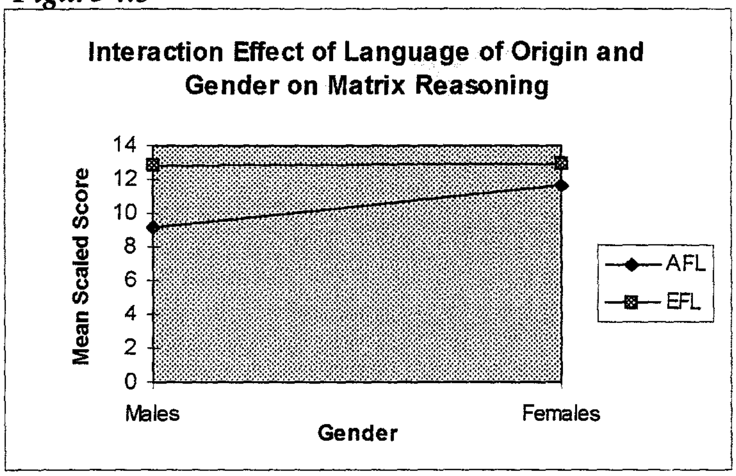
Figure 4.2



AFL: African First Language
EFL: English First Language

Figure 4.3 below depicts the tendency for an interaction effect on *Matrix Reasoning* (p = 0.149). The difference in performance was approaching significance for the African First Language group in favour of females, (see Table 4.3 on p. 48), but there was no significant difference between males and females for the English First Language group (see Table 4.4 on p. 50).

Figure 4.3



AFL: African First Language
EFL: English First Language

In sum, for the three subtests, *Arithmetic, Digit Symbol* and *Matrix Reasoning,* the tendency for interaction effects that have been described can be accounted for largely by the superior performance of the African First Language females over their male counterparts. No significant differences between male and female performance for the English First Language subgroup were noted. In order to elucidate the interaction effects described above, it is necessary to examine the effect of gender on test performance in relation to the factor language of origin for the two subgroups, African First Language and English First Language.

4.2.2 A comparison of male and female test performance in relation to African First Language.

A *t test* was used to compare the mean scores achieved by African First Language males (n = 20) and African First Language females (n = 20). See Table 4.3. below.

With respect to the **individual subtest** scores, in terms of significant results, females scored 2.5 points higher than males on *Digit Symbol* ($p < 0.017$) In terms of results that were approaching significance, females scored 2.05 points higher than males on *Arithmetic* ($p = 0.032$), and 2.45 points higher on *Matrix Reasoning* ($p = 0.034$). In terms of trends, of the remaining eleven subtests, males scored higher than females on five subtests (*Similarities, Information, Letter Number Sequencing, Picture Completion* and *Picture Arrangement*), and females scored higher than males on the other six (*Vocabulary, Digit Span, Comprehension, Block Design, Symbol Search* and *Object Assembly*).

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, females scored higher than males on all three IQ scores, VIQ, PIQ and FSIQ. With respect to the **factor indices**, there were no significant or approaching significance results. In terms of trends, males scored higher than females on

Table 4.3
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs, and the factor indices by African First Language males and females.

Subtests, IQs and Factor Indices	Males (n = 20) M	SD	Females (n = 20) M	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	8.70	3.80	8.95	3.99	-0.20	0.840
Similarities	9.85	3.47	9.75	3.40	0.09	0.927
Arithmetic	8.70	2.68	10.75	3.13	-2.23	0.032 #
Digit Span	9.10	2.59	10.15	3.60	-1.06	0.297
Information	9.80	3.17	8.95	3.46	0.81	0.423
Comprehension	10.40	3.50	10.65	3.83	-0.22	0.831
Let-Num Sequence	10.65	3.13	10.50	3.14	0.15	0.881
Performance Subtests						
Picture Completion	9.20	3.22	9.15	3.01	0.05	0.960
Digit Symbol	8.10	2.63	10.60	3.19	-2.70	0.010 *
Block Design	8.00	2.45	8.40	3.03	-0.46	0.649
Matrix Reasoning	9.15	2.91	11.60	4.06	-2.20	0.034 #
Picture Arrange	8.20	4.12	7.65	3.36	0.46	0.647
Symbol Search	7.65	2.41	8.45	3.12	-0.91	0.370
Object Assembly	6.50	2.21	6.80	3.07	-0.35	0.725
Verbal IQ	96.45	16.15	99.05	18.25	-0.48	0.636
Performance IQ	90.30	15.88	96.65	17.81	-1.19	0.241
Full Scale IQ	93.40	16.21	97.90	19.05	-0.80	0.426
Verbal Comprehension	97.05	18.25	95.30	18.39	0.30	0.764
Percep Organisation	92.50	14.71	98.00	16.98	-1.09	0.281
Working Memory	96.35	13.17	102.30	17.76	-1.20	0.236
Processing Speed	88.40	11.39	97.25	15.66	-2.04	0.048

Significance levels: * $p < 0.017$; # $0.017 < p < 0.038$ ***(Bonferroni adjustment to the p-values)***

Verbal Comprehension, and females scored higher than males on *Perceptual Organisation, Working Memory* and *Processing Speed.*

In sum, with respect to the African First Language subgroup, see Table 4.3.1 below, the only significant difference for gender, was for *Digit Symbol* in favour of females. There were differences which were approaching significance in favour of females for *Arithmetic* and *Matrix Reasoning*. A marginal female superiority was noted on the subtest, overall IQ and the factor index scores.

Table 4. 3.1
A summary of results of Table 4.3 reflecting both significant and trend superiority of African First Language males and females in terms of subtest, IQ and factor index performance.

	Significance Levels	Male Superiority	Female Superiority
Subtests	*		Digit Symbol
	#		Arithmetic Matrix Reasoning
	Trends	Similarities Information Letter Number Sequence Picture Completion Picture Arrangement	Vocabulary Digit Span Comprehension Block Design Symbol Search Object Assembly
IQs	Trends		VIQ, PIQ, FSIQ
Factor Indices	Trends	Verbal Comprehension	Processing Speed Perceptual Organisation Working Memory

Significance levels: * $p < 0.017$; # $0.017 < p < 0.038$
Trends: $p > 0.038$

4.2.3 A comparison of male and female test performance in relation to English First Language.

A *t test* was used to compare the mean scores achieved by English First Language males (n = 14) and English First Language females (n = 14). See Table 4.4 below.

With respect to the **individual subtest** scores, there were no results that were significant or approaching significance. In terms of trends, of the fourteen subtests, males scored higher than females on nine subtests (*Similarities, Arithmetic, Information, Comprehension, Letter Number Sequencing, Picture Completion, Block Design, Picture Arrangement,* and *Object*

Table 4.4
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs, and the factor indices by English First Language males and females.

Subtests, IQs and Factor Indices	Males (n = 14) M	Males (n = 14) SD	Females (n = 14) M	Females (n = 14) SD	*t test*	*p*
Verbal Subtests						
Vocabulary	13.00	3.33	13.00	3.66	0.00	1.000
Similarities	13.00	3.04	11.57	2.62	1.33	0.195
Arithmetic	12.14	3.08	11.36	2.98	0.69	0.499
Digit Span	11.29	3.41	12.43	3.25	-0.91	0.372
Information	12.93	2.40	11.21	2.64	1.80	0.084
Comprehension	12.71	2.52	11.71	2.73	1.01	0.324
Let-Num Sequence	12.64	3.03	12.07	2.73	0.52	0.605
Performance Subtests						
Picture Completion	12.71	2.97	12.50	3.08	0.19	0.853
Digit Symbol	11.71	2.02	12.21	1.85	-0.68	0.500
Block Design	12.07	3.05	10.71	2.13	1.37	0.184
Matrix Reasoning	12.86	3.08	12.93	2.81	-0.06	0.950
Picture Arrange	11.07	2.73	10.93	2.13	0.15	0.879
Symbol Search	10.79	2.46	11.07	2.87	-0.28	0.779
Object Assembly	9.93	2.79	9.71	2.92	0.20	0.844
Verbal IQ	116.00	15.33	111.64	14.42	0.77	0.446
Performance IQ	114.14	12.59	112.50	11.58	0.36	0.722
Full Scale IQ	116.43	12.82	113.14	13.93	0.65	0.522
Verbal Comprehension	116.93	14.72	110.50	14.20	1.18	0.250
Percep Organisation	115.79	13.90	112.36	12.62	0.68	0.500
Working Memory	112.21	17.14	111.43	15.16	0.13	0.899
Processing Speed	107.00	12.05	108.93	12.16	-0.42	0.677

Assembly), and females scored higher than males on four subtests (*Digit Span, Digit Symbol, Matrix Reasoning* and *Symbol Search.* Equal scores were obtained on the *Vocabulary* subtest, and will therefore not be reported in the summary table 4.4.1 below.

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on all three IQ scores, VIQ, PIQ, and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension, Perceptual Organisation* and *Working Memory.* Females scored higher than males on *Processing Speed.*

In sum, with respect to the English First Language subgroup, see Table 4.4.1 below, there were no differences that were significant or approaching significance in the performance of males and females in this subgroup. A marginal male superiority was noted on subtest, overall IQ and the factor index scores.

Table 4.4.1
A summary of results of Table 4.4 reflecting both significant and trend superiority of English First Language males and females in terms of subtest, IQ and factor index performance.

	Significance Levels	Male Superiority	Female Superiority
Subtests	Trends	Similarities Arithmetic Information Comprehension Letter Number Sequence Picture Completion Block Design Picture Arrangement Object Assembly	Digit Span Digit Symbol Matrix Reasoning Symbol Search
IQs	Trends	VIQ, PIQ, FSIQ	
Factor Indices	Trends	Verbal Comprehension Perceptual Organisation Working Memory	Processing Speed

Trends: $p > 0.038$

Since there were no significant differences in the performance of English First Language males and females, as opposed to the African First Language subgroup which showed a significant difference between male and female performance in favour of females on *Digit Symbol,* and differences that were approaching significance in favour of females on *Arithmetic* and *Matrix*

Reasoning, it must, therefore, be assumed that the superior performance of the African First Language female cohort influenced the interaction effects for language of origin and gender described under section 4.2.1.

4.3 THE EFFECT OF EDUCATIONAL ATTAINMENT AND GENDER ON TEST PERFORMANCE.

Two levels of educational attainment were investigated: matriculants and graduates. In this section, the interactive effect of educational attainment and gender is examined by means of a two-way ANOVA, and thereafter, the mean scores achieved by males and females for each of the two levels of educational attainment are compared by means of two sample *t tests.*

4.3.1 The interactive effect of educational attainment and gender.

A two-way ANOVA was performed to investigate the interaction between the two levels of educational attainment, matriculant and graduate, and gender. See Table 4.5 below.

The main effect of educational attainment, which is highly significant across all modalities, is reported for completeness as part of the ANOVA table, but is not of direct relevance here, and is the focus of a different study (see Chapter 3, p. 29, study 2). The main effect of gender reflects the findings of the *t test* analysis is reported in Table 4.1 and discussed in section 4.1 above. With respect to **the interaction effect of educational attainment and gender**, there were no results that were significant or approaching significance. A comparison of male and female test performance in relation to the two levels of educational attainment follows.

Table 4.5
A two-way analysis of variance in which the interactive effect of two levels of educational attainment, matriculant and graduate, and gender are compared.

Subtests, IQ scores and Factor Indices	Education F Value	Gender F Value	Interaction F Value
Verbal Subtests			
Vocabulary	31.84 ***	0.03	0.53
Similarities	16.05 ***	0.75	0.39
Arithmetic	11.26 **	1.51	0.06
Digit Span	6.26 *	1.91	0.40
Information	39.15 ***	3.61 #	0.02
Comprehension	24.86 ***	0.14	0.02
Letter Number Sequencing	7.87 **	0.20	0.37
Performance Subtests			
Picture Completion	2.59 #	0.02	0.24
Digit Symbol	2.71 #	5.79 *	0.04
Block Design	3.12 #	0.19	0.81
Matrix Reasoning	1.70	2.94 #	0.47
Picture Arrangement	5.43 *	0.20	0.44
Symbol Search	7.53 **	0.69	1.17
Object Assembly	1.07	0.01	0.12
Verbal IQ	32.30 ***	0.01	0.30
Performance IQ	4.35 *	0.51	0.03
Full Scale IQ	16.96 ***	0.10	0.04
Verbal Comprehension Index	35.21 ***	0.98	0.43
Perceptual Organisation Index	3.09 #	0.19	0.27
Working Memory Index	11.06 **	0.69	0.26
Processing Speed Index	5.39 **	2.86	0.28

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; # $0.15 < p < 0.05$

4.3.2 A comparison of the test performance of male and female matriculants.

A *t test* was used to compare the mean scores achieved by male matriculants (n = 17) and female matriculants (n = 17). See Table 4.6 below.

Table 4.6
A multiple comparison, using two sample t tests, of the mean scores on the individual subtests, the overall IQs and the factor indices of male and female matriculants

Subtests, IQs and Factor Indices	Males (n = 17)		Females (n = 17)		*t test*	*p*
	Score	SD	Score	SD		
Verbal Subtests						
Vocabulary	7.76	3.35	8.53	3.89	- 0.61	0.543
Similarities	9.41	3.30	9.24	3.47	0.15	0.880
Arithmetic	8.82	2.96	9.88	3.06	- 1.03	0.313
Digit Span	8.76	3.23	10.35	3.98	- 1.28	0.211
Information	9.06	2.68	7.94	2.95	1.16	0.256
Comprehension	9.65	3.28	9.29	3.20	0.32	0.753
Let Num Sequence	10.24	3.42	10.35	3.37	- 0.10	0.920
Performance Subtests						
Picture Completion	9.76	3.49	10.06	3.83	- 0.23	0.817
Digit Symbol	8.94	3.29	10.76	3.07	- 1.67	0.105
Block Design	9.35	3.87	8.35	2.76	0.87	0.392
Matrix Reasoning	10.41	3.62	11.29	3.90	- 0.68	0.499
Picture Arrange	8.12	3.31	8.29	3.48	- 0.15	0.881
Symbol Search	8.35	3.43	8.12	2.86	0.16	0.872
Object Assembly	7.65	3.72	7.47	3.37	0.14	0.886
Verbal IQ	93.24	14.87	94.94	16.86	- 0.31	0.756
Performance IQ	96.00	21.40	98.35	17.61	- 0.35	0.729
Full Scale IQ	94.12	18.36	96.18	17.89	- 0.33	0.743
Verbal Comprehension	93.00	15.16	91.76	17.50	0.22	0.827
Percep Organisation	99.47	21.76	99.12	16.19	0.05	0.958
Working Memory	95.53	17.66	100.65	18.40	- 0.83	0.414
Processing Speed	92.88	17.38	97.00	14.74	- 0.74	0.462

With respect to the **individual subtest scores**, there were no results that were significant or approaching significance. In terms of trends, males scored slightly higher than females on six subtests (*Similarities, Information, Comprehension, Block Design, Symbol Search, Object Assembly*) and females scored slightly higher on the other eight (*Vocabulary, Arithmetic, Digit*

Span, Letter Number Sequencing, Picture Completion, Digit Symbol, Matrix Reasoning, Picture Arrangement).

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, females scored higher than males on all three IQ scores, VIQ, PIQ and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension* and *Perceptual Organisation*, and females scored higher than males on *Working Memory* and *Processing Speed.*

In sum, Table 4.6.1 below shows that, for the matriculant subgroup, there were no differences in male and female performance that were significant or approaching significance. A marginal female superiority was noted on the subtest and the overall IQ scores.

Table 4.6.1
A summary of results of Table 4.6 reflecting both significant and trend superiority of male and female matriculants

	Significance Levels	**Male Superiority**	**Female Superiority**
Subtests	Trends	Similarities Information Comprehension Block Design Symbol Search Object Assembly	Vocabulary Arithmetic Digit Span Letter Number Sequence Picture Completion Digit Symbol Matrix Reasoning Picture Arrangement
IQs	Trends		VIQ, PIQ, FSIQ
Factor Indices	Trends	Verbal Comprehension Perceptual Organisation	Working Memory Processing Speed

Trends: $p > 0.038$

4.3.3 A comparison of the test performance of male and female graduates.

A *t test* was used to compare the mean scores achieved by male graduates (n = 17) and female graduates (n = 17). See Table 4.7 below.

Table 4.7
A multiple comparison, using two sample t tests, of the mean scores on the individual subtests, the overall IQs and the factor indices of male and female graduates

Subtests, IQs and Factor Indices	Males (n = 17) Score	SD	Females (n = 17) Score	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	13.18	2.98	12.71	3.72	0.41	0.687
Similarities	12.88	3.10	11.76	2.36	1.18	0.246
Arithmetic	11.41	3.16	12.12	2.64	- 0.71	0.483
Digit Span	11.24	2.45	11.82	3.11	- 0.61	0.547
Information	13.12	2.39	11.82	2.40	1.57	0.126
Comprehension	13.06	2.36	12.88	2.64	0.21	0.839
Let Num Sequence	12.71	2.49	11.94	2.51	0.89	0.380
Performance Subtests						
Picture Completion	11.53	3.45	11.00	3.02	0.47	0.638
Digit Symbol	10.24	2.56	11.76	2.49	- 1.77	0.087
Block Design	10.00	2.83	10.35	2.76	- 0.37	0.715
Matrix Reasoning	10.94	3.40	13.00	3.18	- 1.82	0.078
Picture Arrange	10.65	4.01	9.71	3.08	0.77	0.449
Symbol Search	9.53	2.10	10.88	3.12	- 1.48	0.148
Object Assembly	8.18	2.04	8.53	3.24	- 0.38	0.707
Verbal IQ	115.76	14.37	113.53	13.34	0.47	0.642
Performance IQ	104.24	15.07	108.00	15.98	- 0.71	0.485
Full Scale IQ	111.65	14.76	112.77	15.88	- 0.10	0.920
Verbal Comprehension	117.47	15.07	111.35	13.20	1.26	0.217
Percep Organisation	104.71	14.31	108.71	16.34	- 0.76	0.453
Working Memory	110.24	12.15	111.47	14.27	- 0.27	0.788
Processing Speed	99.24	11.26	107.12	14.49	- 1.77	0.086

With respect to the **individual subtest scores**, there were no results that were significant, or approaching significance. In terms of trends, males scored higher than females on seven subtests (*Vocabulary, Similarities, Information, Comprehension, Letter Number Sequencing, Picture Completion, Picture Arrangement)*, and females scored higher than males on the other seven (*Arithmetic, Digit Span, Digit Symbol, Block Design, Matrix Reasoning, Symbol Search, Object Assembly)*.

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on VIQ and females scored higher than males on PIQ and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension,* and females scored higher than males on *Perceptual Organisation, Working Memory* and *Processing Speed.*

Table 4.7.1
A summary of the results of Table 4.7 reflecting trend superiority of male and female graduates in terms subtest, IQ and factor index performance.

	Significance Level	Male Superiority	Female Superiority
Subtests	Trends	Vocabulary Similarities Information Comprehension Letter Number Sequence Picture Completion Picture Arrangement	Arithmetic Digit Span Block Design Digit Symbol Matrix Reasoning Symbol Search Object Assembly
IQs	Trends	VIQ	PIQ, FSIQ
Factor Indices	Trends	Verbal Comprehension	Perceptual Organisation Working Memory Processing Speed

Trends: $p > 0.038$

In sum, Table 4.7.1 above shows that there were no differences in male and female test performance for the graduate subgroup that were significant or approaching significance. A marginal female superiority was noted on FSIQ and on the factor index scores.

Overall, no interaction effect between educational attainment and gender was noted because the comparisons between male and female matriculants and graduates were equivalent in their failure to show differences that were significant or approaching significance. A marginal female superiority was noted for the matriculant group on the subtest and overall IQ scores (see Table 4.6.1), and for the graduate group on FSIQ and on the factor index scores (see Table 4.7.1), but these differences were not sufficient to prove significant.

4.4 THE EFFECT OF QUALITY OF EDUCATION AND GENDER ON TEST PERFORMANCE.

Two levels of quality of education were investigated: private/"Model C" school education and Department of Education and Training (DET) school education. In this section, the interactive effect of quality of education and gender is examined by means of a two-way ANOVA, and thereafter, the mean scores achieved by males and females for each of the two levels of quality of education are compared by means of two sample *t tests.* The analyses conducted by Hartman (2000), using the same data, revealed no significant differences for any of the subtests, IQ scores or factor indices with the exception of two subtests, namely *Block Design* and *Object Assembly,* and one factor index, namely *Perceptual Organisation.* Thus, with the exception of these, it was considered that language as a confounding variable was controlled. A finer analysis of the effect of language of origin was conducted by Hartman (2000) in his research described on page 29.

4.4.1 The interactive effect of quality of education and gender.

A two-way ANOVA was performed to investigate the interaction between the two levels of quality of education, private/"Model C" school education and DET school education, and gender. See Table 4.8 below. The main effect of quality of education, which is highly

Table 4.8
Two-way analysis of variance in which the interactive effect of the two levels of quality of education, private/"Model C" school education and DET school education, and gender are compared.

Subtests, IQ scores and Factor Indices	School F Value	Gender F Value	Interaction F Value
Verbal Subtests			
Vocabulary	31.68***	0.09	1.22
Similarities	21.83***	0.63	0.00
Arithmetic	16.01***	0.94	0.20
Digit Span	16.21***	0.98	0.75
Information	21.09***	2.71 #	0.03
Comprehension	22.67***	0.06	0.06
Letter Number Sequencing	12.25***	0.20	0.00
Performance Subtests			
Picture Completion	27.13***	0.30	0.95
Digit Symbol	44.65***	7.62**	0.01
Block Design	15.52***	0.14	0.01
Matrix Reasoning	26.24***	2.74 #	0.17
Picture Arrangement	59.50***	0.79	0.69
Symbol Search	28.36***	0.42	0.25
Object Assembly	20.63***	0.05	0.73
Verbal IQ	35.07***	0.07	0.21
Performance IQ	59.02***	0.39	0.36
Full Scale IQ	51.09***	0.01	0.37
Verbal Comprehension Index	30.54***	1.15	0.21
Perceptual Organisation Index	34.96***	0.07	0.28
Working Memory Index	21.53***	0.33	0.31
Processing Speed Index	44.31***	3.01 #	0.21

Significance levels: ** $p < 0.01$, *** $p < 0.001$; # $0.05 < p < 0.15$

significant across all modalities, is reported for completion as part of the ANOVA table, but is not of direct relevance here, and is the focus of a different study (see Chapter 3, p. 29, study 2). The main effect of gender largely reflects the findings of the *t test* analysis reported in Table 4.1 and discussed in section 4.1 above.

With respect to the **interaction effect of quality of education and gender**, there were no interaction effects that were significant or approaching significance. A comparison of male and female test performance in relation to the two levels of quality of education follows.

4.4.2 A comparison of male and female test performance in relation to a private/"Model C" school education.

A *t test* was used to compare the mean scores achieved by private/"Model C" school males (n = 24) and private/"Model C" school females (n = 24). See Table 4.9 below.

With respect to the **individual subtest scores**, there was only one significant result. Females scored 1.71 points (SD = 0.83) higher than males on *Digit Symbol* ($p < 0.017$). There were no results that were approaching significance. In terms of trends, of the remaining thirteen subtests, males scored higher than females on six subtests (*Similarities, Information, Comprehension, Letter Number Sequencing, Block Design, Picture Arrangement),* and females scored higher than males on the other seven *(Vocabulary, Arithmetic, Digit Span, Picture Completion, Matrix Reasoning, Symbol Search, Object Assembly).*

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, females scored higher than males on all three scores, VIQ, PIQ and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension,* and females scored higher than males on *Perceptual Organisation, Working Memory* and *Processing Speed.*

Table 4.9
A multiple comparison, using two sample t tests, of the mean scores obtained on the individual subtests, the overall IQs and the factor indices of private/"Model C" school education and gender.

Subtests, IQs and Factor Indices	Males (n = 24) Score	SD	Females (n = 24) Score	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	11.71	3.80	12.46	3.39	- 0.72	0.474
Similarities	12.25	3.38	11.58	2.36	0.79	0.432
Arithmetic	10.92	3.32	12.00	2.86	- 1.21	0.232
Digit Span	10.75	3.08	12.25	3.22	- 1.65	0.106
Information	12.08	2.98	10.96	2.74	1.36	0.180
Comprehension	12.50	2.70	12.13	2.97	0.46	0.649
Let Num Sequence	12.25	2.80	11.96	2.61	0.37	0.711
Performance Subtests						
Picture Completion	11.63	3.12	11.96	2.74	- 0.39	0.696
Digit Symbol	10.75	2.27	12.46	2.06	- 2.73	0.009 *
Block Design	10.58	3.17	10.21	2.36	0.46	0.645
Matrix Reasoning	11.79	3.22	13.46	2.69	- 1.95	0.058
Picture Arrange	10.79	3.49	10.75	1.85	0.05	0.959
Symbol Search	9.92	2.43	10.71	2.71	- 1.07	0.292
Object Assembly	8.71	3.03	9.17	2.96	- 0.53	0.598
Verbal IQ	110.79	16.71	111.58	13.08	- 0.18	0.856
Performance IQ	107.42	15.46	111.71	10.20	- 1.14	0.222
Full Scale IQ	110.08	15.42	112.71	12.21	- 0.65	0.517
Verbal Comprehension	111.46	17.65	108.92	13.19	0.57	0.575
Percep Organisation	108.13	16.13	111.13	11.46	- 0.74	0.461
Working Memory	107.63	15.93	112.08	14.22	- 1.02	0.312
Processing Speed	101.75	12.11	108.58	11.47	- 2.01	0.051

Significance levels: * $p < 0.017$ (Bonferroni adjustment to p-values)

In sum, Table 4.9.1 below shows that the only significant result for the comparison between private/"Model C" school males and females was for *Digit Symbol,* on which females significantly outperformed males. A marginal female superiority was noted on the subtest, overall IQ and factor index scores.

Table 4.9.1
A summary of results from Table 4.9 reflecting both significant and trend superiority of private/"Model C" school males and females in terms of subtest, IQ and factor index performance

	Significance Levels	**Male Superiority**	**Female Superiority**
Subtests	*		Digit Symbol
	Trends	Similarities Information Comprehension Letter Number Sequence Block Design Picture Arrangement	Vocabulary Arithmetic Digit Span Picture Completion Matrix Reasoning Symbol Search Object Assembly
IQs	Trends		VIQ, PIQ, FSIQ
Factor Indices	Trends	Verbal Comprehension	Perceptual Organisation Working Memory Processing Speed

*Significance levels: * $p < 0.017$*
Trends: $p > 0.038$

4.4.3 A comparison of male and female test performance in relation to a DET school education

A *t test* was used to compare the mean scores achieved by DET school males (n = 10) and DET school females (n = 10). See Table 4.10 below.

With respect to the **individual subtest scores**, there were no results that were significant or approaching significance. In terms of trends, of the fourteen subtests, males scored higher than females on eight subtests (*Vocabulary, Similarities, Information, Letter Number Sequencing, Picture Completion, Block Design, Picture Arrangement, Object Assembly*), and females scored higher than males on five subtests (*Arithmetic, Digit Span, Digit Symbol, Matrix Reasoning, Symbol Search*). Equal scores were achieved by males and females on the

Comprehension subtest, and will not, therefore, be reflected on the summary table 4.10.1 below.

Table 4.10
A multiple comparison using two sample t tests of the mean scores obtained on the individual subtests, the overall IQs and the factor indices of DET school education and gender

Subtest scores, IQ scores and Factor Indices	Males (n = 10)		Females (n = 10)		*t test*	p
	Score	SD	Score	SD		
Verbal Subtests						
Vocabulary	7.50	3.54	6.20	2.82	0.91	0.375
Similarities	8.50	2.76	7.90	3.54	0.42	0.678
Arithmetic	8.20	2.39	8.60	1.96	- 0.41	0.687
Digit Span	8.20	2.44	8.30	2.95	- 0.08	0.935
Information	8.70	2.63	7.30	3.20	1.07	0.299
Comprehension	8.60	3.06	8.60	3.24	0.00	1.000
Let Num Sequence	9.60	3.47	9.20	3.22	0.27	0.793
Performance Subtests						
Picture Completion	8.30	3.53	7.10	2.33	0.90	0.382
Digit Symbol	6.80	2.66	8.40	2.22	- 1.46	0.161
Block Design	7.50	2.84	7.30	3.16	0.15	0.883
Matrix Reasoning	8.00	2.54	9.00	3.71	- 0.70	0.491
Picture Arrange	6.00	2.26	4.80	1.93	1.28	0.218
Symbol Search	6.60	2.50	6.70	2.71	- 0.09	0.933
Object Assembly	6.00	1.76	5.20	2.30	0.87	0.394
Verbal IQ	89.40	12.93	86.60	14.88	0.45	0.659
Performance IQ	82.60	13.71	82.70	12.93	- 0.02	0.987
Full Scale IQ	85.60	14.11	83.70	14.74	0.29	0.772
Verbal Comprehension	90.30	15.17	83.90	16.77	0.90	0.383
Percep Organisation	87.60	15.40	86.60	14.83	0.15	0.884
Working Memory	91.50	12.99	91.60	15.12	- 0.02	0.986
Processing Speed	82.40	11.48	86.40	11.57	- 0.78	0.448

With respect to the **overall IQ scores** there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on VIQ and FSIQ, and females scored higher than males on PIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension* and *Perceptual Organisation,* and females scored higher than males on *Working Memory* and *Processing Speed.*

In sum, Table 4.10.1 below shows that there was no significant difference in test performance between males and females who attended a DET school. A marginal male superiority was noted on the subtest and FSIQ scores.

Table 4.10.1
A summary of results of Table 4.10 reflecting trend superiority of DET school males and females in terms of subtest, IQ and factor index performance

	Significance Levels	**Male Superiority**	**Female Superiority**
Subtests	Trends	Vocabulary Similarities Information Letter Number Sequence Picture Completion Block Design Picture Arrangement Object Assembly	Arithmetic Digit Span Digit Symbol Matrix Reasoning Symbol Search
IQs	Trends	VIQ, FSIQ	PIQ
Factor Indices	Trends	Verbal Comprehension Perceptual Organisation	Working Memory Processing Speed

Trends: $p > 0.038$

Overall, no interaction effect between quality of education and gender was noted, despite the significantly superior performance of private/"Model C" school females in comparison to private/"Model C" school males on the *Digit Symbol* subtest. There was a trend, however, for private/"Model C" school females, on the whole, to score marginally better than males on the subtests, the overall IQs and the factor indices, while the reverse was true for the DET school participants, where the trend was for males, on the whole, to score marginally better than females on the subtests and FSIQ, but these opposite trends were not sufficient to show any significant interaction effects.

4.5 THE EFFECT OF LANGUAGE OF ORIGIN, EDUCATIONAL ATTAINMENT AND GENDER ON TEST PERFORMANCE.

Two levels of language of origin, African First Language and English First Language, and two levels of educational attainment, matriculant and graduate, were investigated. In this section, gender performance in relation to the two levels of language of origin and the two levels of educational attainment is examined by means of two sample *t tests.*

4.5.1 A comparison of the test performance of male and female African First Language matriculants.

A *t test* was used to compare the mean scores achieved by African First Language male matriculants (n = 10) and African First Language female matriculants (n = 10). See Table 4.11 below.

With respect to the **individual subtest scores**, there were no significant results. In terms of results that were approaching significance, females scored 2.80 points higher than males on *Arithmetic* (p = 0.038). In terms of trends, of the remaining thirteen subtests, males scored higher than females on one subtest *(Information)*, and females scored higher than males on the other twelve subtests *(Vocabulary, Similarities, Digit Span, Comprehension, Letter Number Sequencing, Picture Completion, Digit Symbol, Block Design, Matrix Reasoning, Picture Arrangement, Symbol Search* and *Object Assembly).*

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, females scored higher than males on all three of the IQ scores, VIQ, PIQ, and FSIQ. With respect to the **factor indices**, there were no results

Table 4.11
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs and the factor indices by African First Language male and female matriculants.

Subtests, IQs, Factor Indices	Males (n = 10) Score	SD	Females (n = 10) Score	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	5.60	1.43	7.30	4.22	-1.21	0.243
Similarities	7.80	2.20	8.50	4.03	-0.48	0.636
Arithmetic	7.50	1.72	10.30	3.56	-2.24	0.038 #
Digit Span	7.40	1.71	9.90	4.38	-1.68	0.110
Information	7.60	2.17	6.90	2.92	0.61	0.551
Comprehension	8.60	3.60	8.90	3.84	-0.18	0.859
Let Num Sequence	9.10	2.77	10.30	4.27	-0.75	0.465
Performance Subtests						
Picture Completion	7.70	2.45	8.90	3.41	-0.90	0.379
Digit Symbol	7.20	2.62	10.20	3.88	-2.03	0.058
Block Design	6.80	2.10	7.70	3.20	-0.74	0.467
Matrix Reasoning	8.40	2.63	11.10	4.72	-1.58	0.132
Picture Arrange	6.40	2.50	6.70	3.53	-0.22	0.829
Symbol Search	6.60	2.37	7.40	3.20	-0.64	0.533
Object Assembly	5.30	1.64	6.70	3.86	-1.06	0.305
Verbal IQ	84.30	7.96	91.80	20.89	-1.06	0.303
Performance IQ	82.50	12.39	93.20	20.55	-1.41	0.176
Full Scale IQ	82.30	9.07	92.00	21.90	-1.29	0.212
Verbal Comprehension	83.50	9.19	86.20	19.31	-0.40	0.695
Percep Organisation	85.70	12.45	95.30	18.54	-1.36	0.191
Working Memory	87.60	9.90	100.50	22.92	-1.63	0.120
Processing Speed	83.40	11.49	93.40	17.72	-1.50	0.152

Significance levels: # 0.017 < p < 0.38 (Bonferroni adjustment to p-values)

that were significant or approaching significance. In terms of trends, females scored higher than males on all four factor indices (*Verbal Comprehension, Perceptual Organisation, Working Memory* and *Processing Speed).*

In sum, Table 4.11.1 below shows that there were no significant differences in the performance of African First Language matriculant males and females. Females performed slightly better than males on *Arithmetic* at a level which was approaching significance. A marginal female superiority was noted on the subtest, overall IQ and the factor index scores.

Table 4.11.1
A Summary of the results of Table 4.11 reflecting both significant and trend superiority of African First Language male and female matriculants in terms of subtest, IQ and factor index performance

	Significance Levels	Male Superiority	Female Superiority
Subtests	#		Arithmetic
	Trends	Information	Vocabulary Similarities Digit Span Comprehension Letter Number Sequence Picture Completion Digit Symbol Block Design Matrix Reasoning Picture Arrangement Symbol Search Object Assembly
IQs	Trends		VIQ, PIQ, FSIQ
Factor Indices	Trends		Verbal Comprehension Perceptual Organisation Working Memory Processing Speed

Significance levels: # $0.017 < p < 0.038$
Trends: $p > 0.038$

4.5.2 A comparison of the test performance of male and female African First Language graduates.

A *t test* was used to compare the mean scores achieved by African First Language male graduates (n = 10) and African First Language female graduates (n = 10). See Table 4.12 below.

Table 4.12
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs and the factor indices by African First Language male and female graduates

Subtests, IQs, Factor Indices	Males (n = 10)		Females (n = 10)		*t test*	*p*
	Score	SD	Score	SD		
Verbal Subtests						
Vocabulary	11.80	2.66	10.60	3.13	0.92	0.368
Similarities	11.90	3.35	11.00	2.16	0.71	0.484
Arithmetic	9.90	3.00	11.20	2.74	-1.01	0.325
Digit Span	10.80	2.20	10.40	2.84	0.35	0.729
Information	12.00	2.40	11.00	2.71	0.87	0.394
Comprehension	12.20	2.39	12.40	3.06	-0.16	0.873
Let Num Sequence	12.20	2.78	10.70	1.57	1.49	0.155
Performance Subtests						
Picture Completion	10.70	3.30	9.40	2.72	0.96	0.632
Digit Symbol	9.00	2.45	11.00	2.45	-1.83	0.085
Block Design	9.20	2.25	9.10	2.85	0.09	0.932
Matrix Reasoning	9.90	3.12	12.10	3.45	-1.50	0.151
Picture Arrange	10.00	4.74	8.60	3.06	0.78	0.443
Symbol Search	8.70	2.06	9.50	2.80	- 0.73	0.476
Object Assembly	7.70	2.11	6.90	2.23	0.82	0.421
Verbal IQ	108.60	12.61	106.30	12.23	0.41	0.684
Performance IQ	98.10	15.62	100.10	14.87	- 0.29	0.773
Full Scale IQ	104.50	14.10	103.80	14.45	0.11	0.914
Verbal Comprehension	110.60	14.51	104.40	12.54	1.02	0.320
Percep Organisation	99.30	14.11	100.70	15.77	- 0.21	0.837
Working Memory	105.10	9.90	104.10	11.57	0.21	0.838
Processing Speed	93.40	9.30	101.10	13.08	-1.52	0.147

With respect to the **individual subtest scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on nine subtests (*Vocabulary, Similarities, Digit Span, Information, Letter Number Sequencing, Picture Completion, Block Design, Picture Arrangement* and *Object Assembly),* and females scored higher than males on the remaining five subtests *(Arithmetic, Comprehension, Digit Symbol, Matrix Reasoning* and *Symbol Search).*

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on VIQ and FSIQ, and females scored higher than males on PIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension* and *Working Memory*, and females scored higher than males on *Perceptual Organisation* and *Processing Speed.*

In sum, Table 4.12.1 below shows that there were no differences in African First Language male and female graduate test performance that were significant or approaching significance. There was a trend for the African First Language graduate males to score marginally better than their female counterparts on the subtest scores, and on FSIQ.

Table 4.12.1
A summary of the results of Table 4.12 reflecting the trend superiority of African First Language male and female graduates in terms of subtest, IQ and factor index performance.

	Significance Levels	**Male Superiority**	**Female Superiority**
Subtests	Trends	Vocabulary Similarities Digit Span Information Letter Number Sequence Picture Completion Block Design Picture Arrangement Object Assembly	Arithmetic Comprehension Digit Symbol Matrix Reasoning Symbol Search
IQs	Trends	VIQ, FSIQ	PIQ
Factor Indices	Trends	Verbal Comprehension Working Memory	Perceptual Organisation Processing Speed

Trends: $p > 0.038$

4.5.3 A comparison of the test performance of male and female English First Language matriculants.

A *t test* was used to compare the mean scores achieved by English First Language male matriculants (n = 7) and English First Language female matriculants (n = 7). See Table 4.13 below.

Table 4.13
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs and the factor indices by English First Language male and female matriculants.

Subtests, IQs, Factor Indices	Males (n = 7)		Females (n = 7)		*t test*	*p*
	Score	SD	Score	SD		
Verbal Subtests						
Vocabulary	10.86	2.79	10.29	2.75	0.39	0.707
Similarities	11.71	3.35	10.29	2.36	0.92	0.375
Arithmetic	10.71	3.45	9.29	2.29	0.91	0.380
Digit Span	10.71	3.99	11.00	3.56	-0.14	0.890
Information	11.14	1.86	9.43	2.44	1.48	0.165
Comprehension	11.14	2.19	9.86	2.12	1.12	0.286
Let Num Sequence	11.86	3.80	10.43	1.72	0.91	0.383
Performance Subtests						
Picture Completion	12.71	2.50	11.71	4.03	0.56	0.587
Digit Symbol	11.43	2.51	11.57	1.13	-0.14	0.893
Block Design	13.00	2.65	9.29	1.80	3.07	0.010 *
Matrix Reasoning	13.29	2.87	11.57	2.64	1.16	0.267
Picture Arrange	10.57	2.82	10.57	1.81	0.00	1.000
Symbol Search	10.86	3.24	9.29	1.98	1.10	0.294
Object Assembly	11.00	3.27	8.57	2.37	1.59	0.137
Verbal IQ	106.00	13.09	99.43	7.98	1.13	0.279
Performance IQ	115.29	15.90	105.71	9.29	1.38	0.194
Full Scale IQ	111.00	14.51	102.14	7.95	1.42	0.182
Verbal Comprehension	106.57	10.98	99.71	11.47	1.14	0.276
Percep Organisation	119.14	16.22	104.57	11.13	1.96	0.074
Working Memory	106.86	20.74	100.86	10.73	0.68	0.510
Processing Speed	106.43	15.61	102.14	7.49	0.65	0.525

Significance levels: * p < 0.017 (Bonferroni adjustment to p-values)

With respect to the **individual subtest scores**, there was only one significant result. Males scored 3.71 points higher than females on *Block Design* ($p < 0.017$). There were no results that were approaching significance. In terms of trends, of the remaining thirteen subtests, males scored higher than females on ten subtests *(Vocabulary, Similarities, Arithmetic, Information, Comprehension, Letter Number Sequencing, Picture Completion, Matrix Reasoning, Symbol Search* and *Object Assembly)*, and females scored higher than males on two subtests *(Digit Span* and *Digit Symbol)*. Equal scores were obtained on the *Picture Arrangement* subtest, and will not, therefore, be reported on the summary table 4.13.1 below.

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on all three IQ scores, VIQ, PIQ and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on all four factor indices *(Verbal Comprehension, Working Memory, Perceptual Organisation* and *Processing Speed)*.

In sum, Table 4.13.1 below shows that English First Language male matriculants significantly outperformed their female counterparts on the *Block Design* subtest. There were no results that were approaching significance. There was a trend for the males in this subgroup to perform marginally better than females on the subtest, overall IQ and factor index scores.

Table 4.13.1
A summary of results of Table 4.13 reflecting both significant and trend superiority of English First Language male and female matriculants in terms of subtest, IQ and factor index performance

	Significance Levels	Male Superiority	Female Superiority
Subtests	*	Block Design	
	Trends	Vocabulary Similarities Arithmetic Information Comprehension Letter Number Sequence Picture Completion Matrix Reasoning Symbol Search Object Assembly	Digit Span Digit Symbol
IQs	Trends	VIQ, PIQ, FSIQ	
Factor Indices	Trends	Perceptual Organisation Verbal Comprehension Working Memory Processing Speed	

Significance levels: * $p < 0.017$
Trends: $p > 0.038$

4.5.4 A comparison of the test performance of male and female English First Language graduates.

A *t test* was used to compare the mean scores achieved by English First Language male graduates (n = 7) and English First Language female graduates (n = 7). See Table 4.14 below.

With respect to the **individual subtest scores**, there were no significant results. In terms of results that were approaching significance, males scored 1.71 points higher than females on *Information* (p = 0.027). In terms of trends, of the remaining thirteen subtests, males scored higher than females on four subtests *(Similarities, Arithmetic, Comprehension* and *Picture Arrangement),* and females scored higher than males on the other nine subtests *(Vocabulary, Digit Span, Letter Number Sequencing, Picture Completion, Digit Symbol, Block Design, Matrix Reasoning, Symbol Search* and *Object Assembly).*

Table 4.14
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs and the Factor Indices by English First Language male and female graduates

Subtests, IQs, Factor Indices	Males (n = 7)		Females (n = 7)		*t test*	*p*
	Score	**SD**	**Score**	**SD**		
Verbal Subtests						
Vocabulary	15.14	2.34	15.71	2.06	-0.49	0.636
Similarities	14.29	2.21	12.86	2.34	1.17	0.264
Arithmetic	13.57	1.99	13.43	1.99	0.13	0.895
Digit Span	11.86	2.91	13.86	2.34	-1.42	0.182
Information	14.71	1.25	13.00	1.29	2.52	0.027 #
Comprehension	14.29	1.80	13.57	1.90	0.72	0.484
Let Num Sequence	13.43	1.99	13.71	2.63	-0.23	0.822
Performance Subtests						
Picture Completion	12.71	3.59	13.29	1.70	-0.38	0.710
Digit Symbol	12.00	1.53	12.86	2.27	-0.83	0.423
Block Design	11.14	3.34	12.14	1.35	-0.74	0.484
Matrix Reasoning	12.43	3.46	14.29	2.43	-1.16	0.268
Picture Arrange	11.57	2.76	11.29	2.50	0.20	0.843
Symbol Search	10.71	1.60	12.86	2.54	-1.88	0.084
Object Assembly	8.86	1.86	10.86	3.13	-1.45	0.172
Verbal IQ	126.00	10.21	123.86	6.23	0.47	0.644
Performance IQ	113.00	9.35	119.29	9.84	-1.23	0.244
Full Scale IQ	121.86	8.75	124.14	8.65	-0.49	0.632
Verbal Comprehension	127.29	9.93	121.29	5.79	1.38	0.193
Percep Organisation	112.43	11.37	120.14	8.91	-1.41	0.183
Working Memory	117.57	11.82	122.00	11.05	-0.72	0.483
Processing Speed	107.57	8.38	115.71	12.51	-1.43	0.178

Significance levels: # 0.017 < P < 0.038 (Bonferroni adjustment to p-values)

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on VIQ, and females scored higher than males on PIQ and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension*, and females scored higher than males on *Perceptual Organisation, Working Memory* and *Processing Speed.*

In sum, Table 4.14.1 below shows that there were no significant differences in the performance of English first Language male and female graduates. The males in this subgroup performed slightly better than females on the *Information* subtest at a level which was approaching significance. There was a trend for females in this subgroup to perform marginally better than males on FSIQ, and on the subtest and factor index scores.

Table 4.14.1
A summary of results of Table 4.14 reflecting both significant and trend superiority of English First Language male and female graduates in terms of subtest, IQ and factor index performance.

	Significance Levels	Male Superiority	Female Superiority
Subtests	#	Information	
	Trends	Similarities Arithmetic Comprehension Picture Arrangement Symbol Search	Vocabulary Digit Span Letter Number Sequence Picture Completion Digit Symbol Block Design Matrix Reasoning Symbol Search Object Assembly
IQs	Trends	VIQ	PIQ, FSIQ
Factor Indices	Trends	Verbal Comprehension	Perceptual Organisation Working Memory Processing Speed

Significance levels: # 0.017 < p < 0.038
Trends: p > 0.038

Overall, for the African First Language subgroup, there were no significant differences in matriculant or graduate test performance. African First Language female matriculants scored slightly higher than their male counterparts on the *Arithmetic* subtest at a level which was approaching significance. For the African First Language matriculant group, see Table 4.11.1, there was a trend for females to perform marginally better than males on the subtest, overall IQ and factor index scores, whereas for the graduate group, see Table 4.12.1, there was a trend for the males to perform marginally better than the females on the subtest, overall IQ and factor index scores. For the English First Language group, English First Language male matriculants scored significantly better than their female counterparts on the *Block Design* subtest, see Table 4.13. English First Language male graduates performed slightly better than their female counterparts on the *Information* subtest at a level that was approaching significance, see Table 4.14. On the whole, there was a trend for English First Language matriculant males to perform marginally better than the females of this subgroup on the subtest, overall IQ and factor index scores, see Table 4.13.1, whereas for the graduate group, the trend was for the females to score marginally better than the males on the subtests, FSIQ and the factor index scores, see Table 4.14.1. This is the reverse of what was shown for the African First Language subgroup.

4.6 THE EFFECT OF LANGUAGE OF ORIGIN, QUALITY OF EDUCATION AND GENDER ON TEST PERFORMANCE.

Two levels of language of origin, African First Language and English First Language, and two levels of quality of education, private/"Model C" school education and DET school education, were investigated. In this section, the mean scores achieved by males and females for each of the two levels of language of origin and the two levels of quality of education are compared by means of two sample *t tests*.

4.6.1 A comparison of test performance for African First Language DET school males and females.

A *t test* was used to compare the mean scores achieved by African First Language DET school males (n = 10) and African First Language DET school females (n = 10). See Table 4.15 below.

Table 4.15
A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs and the factor indices of African First Language, DET school education and gender

Subtests, IQs, Factor Indices	Males (n = 10) Score	SD	Females (n = 10) Score	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	7.50	3.54	6.20	2.82	0.91	0.375
Similarities	8.50	2.76	7.90	3.54	0.42	0.678
Arithmetic	8.20	2.39	8.60	1.96	- 0.41	0.687
Digit Span	8.20	2.44	8.30	2.95	- 0.08	0.935
Information	8.70	2.63	7.30	3.20	1.07	0.299
Comprehension	8.60	3.06	8.60	3.24	0.00	1.000
Let Num Sequence	9.60	3.47	9.20	3.22	0.27	0.793
Performance Subtests						
Picture Completion	8.30	3.53	7.10	2.33	0.90	0.382
Digit Symbol	6.80	2.66	8.40	2.22	- 1.46	0.161
Block Design	7.50	2.84	7.30	3.16	0.15	0.883
Matrix Reasoning	8.00	2.54	9.00	3.71	- 0.70	0.491
Picture Arrange	6.00	2.26	4.80	1.93	1.28	0.218
Symbol Search	6.60	2.50	6.70	2.71	- 0.09	0.933
Object Assembly	6.00	1.76	5.20	2.30	0.87	0.394
Verbal IQ	89.40	12.93	86.60	14.88	0.45	0.659
Performance IQ	82.60	13.71	82.70	12.93	- 0.02	0.987
Full Scale IQ	85.60	14.11	83.70	14.74	0.29	0.772
Verbal Comprehension	90.30	15.17	83.90	16.77	0.90	0.383
Percep Organisation	87.60	15.40	86.60	14.83	0.15	0.884
Working Memory	91.50	12.99	91.60	15.12	- 0.02	0.988
Processing Speed	82.40	11.48	86.40	11.57	- 0.78	0.448

With respect to the **individual subtest scores**, there were no results that were significant or approaching significance. In terms of trends, of the fourteen subtests, males scored higher than females on eight subtests *(Vocabulary, Similarities, Information, Letter Number Sequencing, Picture Completion, Block Design, Picture Arrangement* and *Object Assembly),* and females scored higher than males on five subtests *(Arithmetic, Digit Span, Digit Symbol, Matrix Reasoning* and *Symbol Search).* Equal scores were achieved on the *Comprehension* subtest, and will not, therefore, be reported on the summary table 4.15.1 below.

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on VIQ and FSIQ and females scored higher than males on PIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension* and *Perceptual Organisation,* and females scored higher than males on *Working Memory and Processing Speed.*

Table 4.15.1
A summary of results of Table 4.15 reflecting the trend superiority of African First Language, DET school males and females in terms of subtest, IQ and factor index performance

	Significance Level	**Male Superiority**	**Female Superiority**
Subtests	Trends	Vocabulary Similarities Information Letter Number Sequence Picture Completion Block Design Picture Arrangement Object Assembly	Arithmetic Digit Span Digit Symbol Matrix Reasoning Symbol Search
IQs	Trends	VIQ, FSIQ	PIQ
Factor Indices	Trends	Verbal Comprehension Perceptual Organisation	Working Memory Processing speed

Trends: $p > 0.038$

In sum, Table 4.15.1 above shows that there were no significant differences in the performance of African First Language DET school males and females. There was a trend for the males in this subgroup to perform marginally better than their female counterparts on the subtest scores and on FSIQ.

4.6.2 A comparison of test performance for African First Language private/"Model C" school males and females.

A *t test* was used to compare the mean scores achieved by African First Language private/"Model C" school males (n = 10) and African First Language private/"Model C" school females (n = 10). See Table 4.16 below.

With respect to the **individual subtest scores**, there were three significant results, all in favour of females. Females performed 3.40 points higher than males on *Digit Symbol* (p = 0.003); 3.70 points higher than males on *Arithmetic* (p = 0.008); and 3.90 points higher than males on *Matrix Reasoning* (p = 0.005). There were no results that were approaching significance. In terms of trends, of the remaining eleven subtests, males scored higher than females on one subtest *(Information)*, and females scored higher than males on ten subtests *(Vocabulary, Similarities, Digit Span, Comprehension, Letter Number Sequencing, Picture Completion, Block Design, Picture Arrangement, Symbol Search* and *Object Assembly)*.

With respect to the **overall IQ scores**, there were no significant results. In terms of results that were approaching significance, females scored 12.60 points higher than males on PIQ (p = 0.029) In terms of trends, females scored higher than males on VIQ and FSIQ. With respect to the **factor indices**, there was only one significant result. Females scored 13.70 points higher than males on *Processing Speed* (p = 0.005). In terms of results that were approaching

Table 4.16
A multiple comparison using two sample t tests of the mean scores achieved on the individual subtests, the overall IQs, and the factor indices of African First Language, private/"Model C" school education and gender.

Subtests, IQs, Factor Indices	Males (n = 10) Score	SD	Females (n = 10) Score	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	9.90	3.84	11.70	2.98	- 1.17	0.257
Similarities	11.20	3.71	11.60	2.07	- 0.30	0.769
Arithmetic	9.20	2.97	12.90	2.56	- 2.98	0.008*
Digit Span	10.00	2.54	12.00	3.33	- 1.51	0.149
Information	10.90	3.41	10.60	2.99	0.21	0.837
Comprehension	12.20	3.05	12.70	3.34	- 0.35	0.730
Let Num Sequence	11.70	2.50	11.80	2.57	- 0.09	0.931
Performance Subtests						
Picture Completion	10.10	2.77	11.20	2.10	- 1.00	0.330
Digit Symbol	9.40	1.96	12.80	2.39	- 3.48	0.003**
Block Design	8.50	2.01	9.50	2.59	- 0.96	0.348
Matrix Reasoning	10.30	2.91	14.20	2.44	- 3.25	0.005*
Picture Arrange	10.40	4.48	10.50	1.43	- 0.07	0.947
Symbol Search	8.70	1.89	10.20	2.53	- 1.50	0.150
Object Assembly	7.00	2.58	8.40	2.99	- 1.12	0.277
Verbal IQ	103.50	16.51	111.50	11.70	- 1.25	0.227
Performance IQ	98.00	14.59	110.60	8.37	- 2.37	0.029 #
Full Scale IQ	101.20	14.85	112.10	10.02	- 1.92	0.070
Verbal Comprehension	103.80	19.28	106.70	12.01	- 0.40	0.691
Percep Organisation	97.40	12.89	109.40	10.00	- 2.33	0.032 #
Working Memory	101.20	12.05	113.00	13.54	- 2.06	0.054
Processing Speed	94.40	7.89	108.10	11.07	- 3.19	0.005 *

Significance levels: * $p < 0.017$, ** $p < 0.003$; # $0.017 < p < 0.038$
(Bonferroni adjustment to p-values)

significance, females scored 12.00 points higher than males on *Perceptual Organisation* (p = 0.032). In terms of trends, females scored higher than males on *Verbal Comprehension* and *Working Memory*.

In sum, Table 4.16.1 below shows that females scored significantly better than males on *Digit Symbol, Arithmetic, Matrix Reasoning,* and *Processing Speed.* There was a difference which was approaching significance in favour of females on PIQ and *Perceptual Organisation.* On the whole, for the African First Language private/"Model C" school subgroup, there was a trend for females to perform better than males on the subtest, overall IQ and factor index scores.

Table 4.16.1
A summary of results of Table 4.16 reflecting both the significant and trend superiority of African First Language, private/"Model C" school males and females in terms of subtest, IQ and factor index performance

	Significance Level	Male Superiority	Female Superiority
Subtests	**		Digit Symbol
	*		Arithmetic Matrix Reasoning
	Trends	Information	Vocabulary Similarities Digit Span Comprehension Letter Number Sequence Picture Completion Block Design Picture Arrangement Symbol Search Object Assembly
IQs	#		PIQ
	Trends		VIQ, FSIQ
Factor Indices	*		Processing Speed
	#		Perceptual Organisation
	Trends		Verbal Comprehension Working Memory

Significance levels: ** $p < 0.017$, ** $p < 0.003$; # $0.017 < p < 0.038$*
Trends: *$p > 0.038$*

4.6.3 A comparison of test performance for English First Language private/"ModelC" school males and females.

A *t test* was used to compare the mean scores of English First Language private/"Model C" school males (n = 14) and English First Language private/"Model C" school females (n = 14). See Table 4.17 below.

Table 4.17

A multiple comparison, using two sample t tests, of the mean scores achieved on the individual subtests, the overall IQs, and the factor indices of English first language, private/"Model C" school education and gender

Subtests, IQs, Factor Indices	Males (n = 14) Score	SD	Females (n = 14) Score	SD	*t test*	*p*
Verbal Subtests						
Vocabulary	13.00	3.33	13.00	3.66	0.00	1.000
Similarities	13.00	3.04	11.57	2.62	1.33	0.732
Arithmetic	12.14	3.08	11.36	2.98	0.69	0.499
Digit Span	11.29	3.41	12.43	3.25	- 0.91	0.372
Information	12.93	2.40	11.21	2.64	1.80	0.084
Comprehension	12.71	2.52	11.71	2.73	1.01	0.324
Let Num Sequence	12.64	3.03	12.07	2.73	0.52	0.605
Performance Subtests						
Picture Completion	12.71	2.97	12.50	3.08	0.19	0.853
Digit Symbol	11.71	2.02	12.21	1.85	- 0.68	0.500
Block Design	12.07	3.05	10.71	2.13	1.37	0.184
Matrix Reasoning	12.86	3.08	12.93	2.81	- 0.06	0.950
Picture Arrange	11.07	2.73	10.93	2.13	0.15	0.879
Symbol Search	10.79	2.46	11.07	2.87	- 0.28	0.779
Object Assembly	9.93	2.79	9.71	2.92	0.20	0.844
Verbal IQ	116.00	15.33	111.64	14.42	0.77	0.446
Performance IQ	114.14	12.59	112.50	11.58	0.36	0.722
Full Scale IQ	116.43	12.82	113.14	13.93	0.65	0.522
Verbal Comprehension	116.93	14.72	110.50	14.20	1.18	0.250
Percep Organisation	115.79	13.90	112.36	12.62	0.68	0.500
Working Memory	112.21	17.14	111.43	15.16	0.13	0.899
Processing Speed	107.00	12.05	108.93	12.16	- 0.42	0.677

With respect to the **individual subtest scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on nine subtests *(Similarities, Arithmetic, Information, Comprehension, Letter Number Sequencing, Picture Completion, Block Design, Picture Arrangement,* and *Object Assembly),* and females scored higher than males on four subtests *(Digit Span, Digit Symbol, Matrix Reasoning,* and *Symbol*

Search). Equal scores were achieved on the *Vocabulary* subtest, and will not, therefore, be reported on the summary table 4.17.1 below.

With respect to the **overall IQ scores**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on all three IQ scores, VIQ, PIQ and FSIQ. With respect to the **factor indices**, there were no results that were significant or approaching significance. In terms of trends, males scored higher than females on *Verbal Comprehension, Perceptual Organisation* and *Working Memory.* Females scored higher than males on *Processing Speed.*

Table 4.17.1
A summary of results of Table 4.17 reflecting the trend superiority of English First Language, private/"Model C" school males and females in terms of subtest, IQ and factor index performance

	Significance Level	**Male Superiority**	**Female Superiority**
Subtests	Trends	Similarities Arithmetic Information Comprehension Letter Number Sequence Picture Completion Block Design Picture Arrangement Object Assembly	Digit Span Digit Symbol Matrix Reasoning Symbol Search
IQs	Trends	VIQ, PIQ, FSIQ	
Factor Indices	Trends	Verbal Comprehension Perceptual Organisation Working Memory	Processing Speed

Trends: $p > 0.038$

In sum, Table 4.17.1 above shows that there were no results that were significant or approaching significance. For the English First language private/"Model C" school subgroup, there was a trend for males to score marginally better than females on the subtest, overall IQ and factor index scores.

Overall. in terms of gender test performance in relation to the combined factors of language of origin and quality of education, there were no significant differences in test performance between African First Language DET school males and females or English First Language private/"Model C" school males and females. There was a trend for the males in both of these subgroups to perform marginally better than their female counterparts, see Tables 4.15.1 and 4.17.1. However, this was not true for the African First Language private/"Model C" school subgroup, which showed female superiority across all the comparisons that were made. See Table 4.16.1. Females in this subgroup scored significantly better than their male counterparts on the subtests *Digit Symbol, Arithmetic* and *Matrix Reasoning,* and for the factor index *Processing Speed.* They performed better than the males at a level which was approaching significance on PIQ and *Perceptual Organisation,* and showed a trend to perform marginally better than males on all the other comparisons except for the *Information* subtest, on which there was a trend for males to score marginally better than females.

4.7 CONCLUSION

For the total sample, a *t test* revealed that the only significant difference in male and female test performance on the WAIS-III across all the subtest, overall IQ, and factor index comparisons that were made, was found on the subtest *Digit Symbol* in favour of females. There were differences that were approaching significance on the *Information* subtest in favour of males, and on the *Matrix Reasoning* subtest and *Processing Speed* factor index in favour of females. Analyses of variance for gender and each of the factors, language of origin, educational attainment and quality of education, revealed three interaction effects for gender and language of origin on *Arithmetic, Digit Symbol* and *Matrix Reasoning* at a level which was approaching significance, but no interaction effects for gender and either educational attainment or quality of education. All of the interaction effects that were found for gender and language of origin were shown to be influenced by the superior test performance African First Language females over their male counterparts.

Gender comparisons by means of two sample *t tests* for all of the subgroups, described on pp. 39 and 40, revealed that males consistently performed better than females on the *Information* subtest for every comparison, and females consistently performed better than males on the *Digit Symbol* subtest for every comparison. In addition to this, the two sample *t test* comparisons for all the subgroups showed that there was a strong trend for males to perform better than females on the *Similarities* subtest, and on the *Verbal Comprehension* factor index; and for females to perform better than males on the *Matrix Reasoning* and *Digit Span* subtests, and on the *Processing Speed* factor index.

With respect to the performance of males and females in relation to the factors for which the sample was stratified, it was shown that, for language of origin, there was a trend for African First Language females to perform marginally better than their male counterparts, and English First Language males to perform marginally better than their female counterparts. For educational attainment, there appeared to be little difference in the overall performance of male and female matriculants or graduates. For quality of education, private/"Model C" school females performed marginally better than private/"Model C" school males, and DET school males performed marginally better than DET school females. In terms of gender performance in relation to the combined factors of language of origin and educational attainment, it was shown that for the African First Language cohort, female matriculants performed marginally better than their male counterparts, whereas male graduates performed marginally better than their female counterparts; for the English First Language cohort, male matriculants performed marginally better than their female counterparts, whereas female graduates performed marginally better than their male counterparts. In terms of gender performance and the combined factors of language of origin and quality of education, for the African First Language DET school cohort, and the English First Language private/"Model C" school cohort, there was a trend for the males to perform marginally better than their female counterparts. However, for the African First Language private/"Model C" school cohort, females performed significantly better than their male counterparts.

CHAPTER 5

DISCUSSION

5.1 INTRODUCTION

This study investigated the effect of gender on test performance on the WAIS-III of a South African sample of participants with a restricted age range (19-30), and stratified in terms of language of origin, educational attainment, quality of education and gender. As the WAIS-III was only released in 1997, there has not been any published research regarding the differences in male and female performance on this test, although much research regarding gender performance on the WAIS-R standardisation samples has been conducted. Although the age range and level of educational attainment of the present study and the WAIS-R standardisation samples differ, it will be useful to compare the results obtained in the present study with those obtained by the WAIS-R standardisation samples in terms of gender trends, particularly as the WAIS-R has been shown by researchers such as Crawford, Gray and Allan (1995), to have robust psychometric properties.

Much of the literature that was consulted, indicated that there was no significant difference in the overall cognitive capacity of males and females (for example, Lynn, 1994). However, different male and female cognitive strengths were well documented, in that males appeared to score better than females on tasks of a quantitative and spatial nature, and females appeared to score better than males on tasks of a verbal nature (Feingold, 1988, 1992; Linn & Petersen, 1985; Hyde & Linn, 1988). The reason for these different cognitive strengths was debated in terms of the nature-nurture issue, with various conclusions being reached regarding different anatomical structures in the male and female brain, and the effects of different socialisation and educational practices and educational expectations of males and females.

Evidence from the WAIS-R standardisation samples for the United States, China, Japan and Scotland (see Tables 2.1, p. 21; 2.2, p. .22; and 2.3, p. 25), however, produced contradictory findings. A perusal of these tables showed a consistent trend for males to outperform females on ten of the eleven subtests, with a substantial proportion of these differences being highly significant. The only exception was for the *Digit Symbol* subtest, on which females consistently and significantly outperformed males across all the WAIS-R standardisation samples that have been cited. The most consistent significant differences across all the WAIS-R standardisation samples appeared on the *Information, Comprehension, Arithmetic* and *Object Assembly* subtests in favour of males, and on the *Digit Symbol* subtest in favour of females. See Table 2.3, p. 25.

As a result of the consistently superior performance of the males in the WAIS-R standardisation samples cited in this study on the subtest scores, males consistently and significantly outperform females on all three of the IQ scores (VIQ, PIQ and FSIQ), across all of the standardisation samples (see Tables 2.1, p. 21; and 2.2, p. 22). The only exception to this finding, is shown for the Japanese WAIS-R standardisation sample, where males score significantly higher than females on FSIQ and VIQ, but there is no significant difference between males and females on PIQ. No comparison can be made in terms of performance on the factor indices, as this is a new addition to the adult, individually applied, Wechsler Intelligence Scales. For the purposes of clarity, only the results that proved significant, or approaching significance for the total sample of the present study will be discussed in detail.

5.2 A COMPARISON OF THE SIGNIFICANT RESULTS ACHIEVED BY MALES AND FEMALES ON THE INDIVIDUAL SUBTESTS.

With respect to the mean scores achieved on the individual subtests by the males and females of the total sample, there was only one subtest on which there was a significant difference in male and female performance, and two subtests on which the difference between male and female performance was approaching significance. In terms of significant differences, females outperformed males on *Digit Symbol.* In terms of differences that were approaching significance, males performed better than females on *Information,* and females performed better than males on *Matrix Reasoning.* These results strongly suggest that, for the majority of the subtests, the males and females in this study perform equally well on the WAIS-III. A detailed discussion of the implications of the difference in male and female test performance on *Digit Symbol, Information* and *Matrix Reasoning* follows. For all of the results that are discussed, it has been shown that the factors, language of origin, educational attainment and quality of education, have a highly significant effect (see Tables 4.2 on p. 44; 4.5 on p. 53; and 4.8 on p. 59). However, the significance of these factors on their own, does not form part of this study and form the research areas for additional theses as described on page 29 in Chapter 3.

5.2.1 Digit Symbol

For the total sample, there was a significant difference in favour of females on *Digit Symbol* (p = 0.02), see Table 4.1 on p. 41. With respect to the effect of **educational attainment and gender** on performance on *Digit Symbol,* an analysis of variance, see Table 4.5 on p. 53, revealed a significant main effect for gender in favour of females ($p < 0.05$), but no interaction effect. A comparison of the performance of male and female matriculants and graduates revealed no significant differences, and so it must be concluded that the gender effect in favour of females that was shown here for *Digit Symbol* was influenced by some factor other than level of educational attainment, or that the superior female performance on this subtest reflects an inherent female cognitive ability in this area.

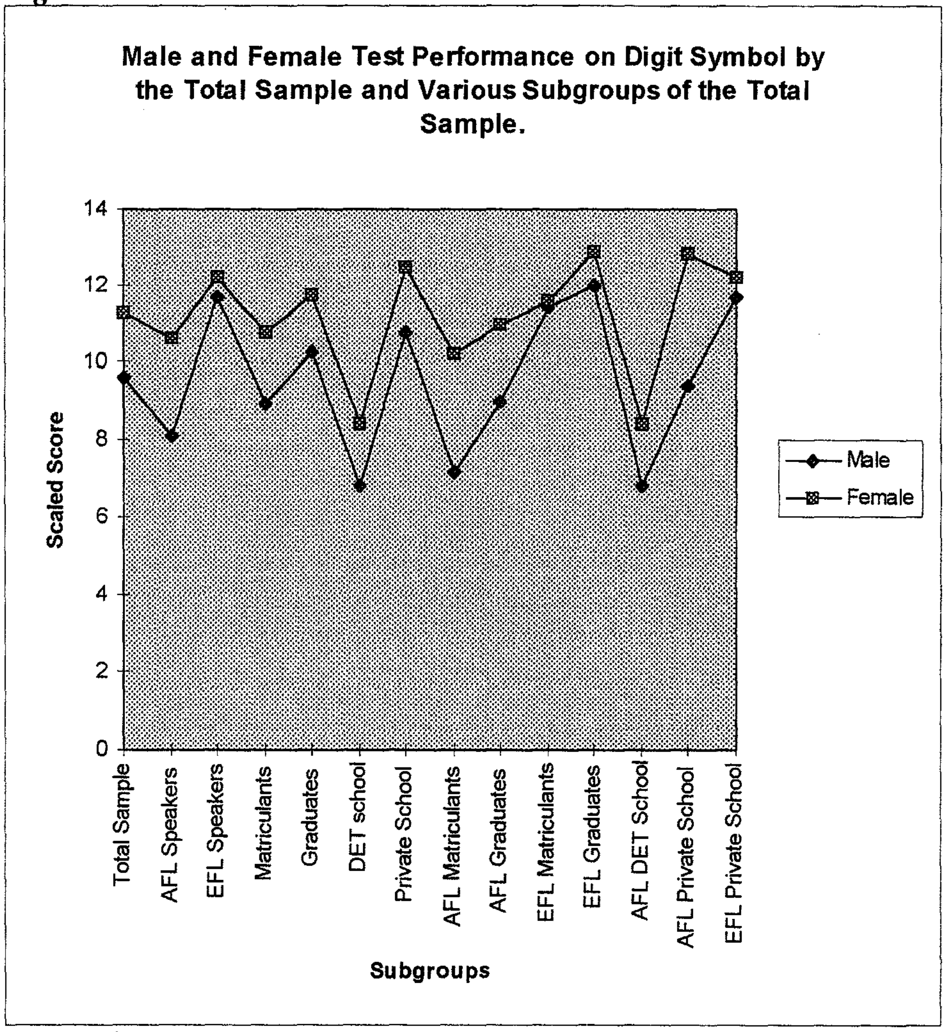
However, an analysis of variance which investigated the interaction between **language of origin and gender** on performance on *Digit Symbol*, see Table 4.2 on p. 44, revealed both a significant main effect for gender ($p < 0.05$), as well as an interaction effect that was approaching significance. A comparison of the performance of males and females on *Digit Symbol* for the two language groups showed that African First Language females significantly outperformed African First Language males ($p = 0.01$), see Table 4.3 on p. 48, but that there was no significant difference in the performance of English First Language males and females, see Table 4.4 on p. 50. It must therefore be concluded that the superior performance of the African First Language private/"Model C" school female cohort significantly influenced both the gender effect, and the interaction effect in this analysis, in addition to the gender effect that was described for educational attainment and gender.

An analysis of variance which investigated the interaction between **quality of education and gender** on performance on *Digit Symbol,* see Table 4.8 on p. 59, revealed a highly significant main effect for gender ($p < 0.01$), but no interaction effect. A comparison of the two levels of quality of education shows that private/"Model C" school females significantly outperformed private/"Model C" school males ($p = 0.009$), see Table 4.9 on p. 61, but that there was no difference in the performance of DET school males and females, see Table 4.10 on p. 63. It must be concluded, therefore, that the gender effect shown on Table 4.8 was influenced by the performance of private/"Model C" school females.

In sum, therefore, it can be seen that the effect of the factors African First Language, and a private/"Model C" school education have significantly influenced the superior performance of the females in this sample on *Digit Symbol.* When these two factors are combined, and the performance of males and females within the African First Language, private/"Model C" school cohort are compared by means of a two sample *t test,* see Table 4.16 on p. 79, it is shown that the difference is highly significant ($p < 0.003$), but that there was no significant difference in the performance of African First Language DET school males and females, see Table 4.15 on p. 76, or English First Language private/"Model C" school males and females, see Table 4.17 on p. 81.

Thus, while there was a consistent trend for the females within all the subgroups to perform marginally better than males on *Digit Symbol,* See Figure 5.1 below, and a significant difference in favour of females for the total sample was shown, it has become clear that the difference in male and female performance for the total sample was significantly influenced by the superior performance of the African First Language private/"Model C" school female cohort, and that for the majority of the sample, there was no significant difference in the performance of males and females on *Digit Symbol.* Thus, while the findings for the total sample of this study seem to echo the findings of the cited WAIS-R standardisation samples, in that there was a significant difference between male and female performance on *Digit Symbol,* this does not appear to be strictly true when analysed in terms of differential educational and language factors.

Figure 5.1



AFL: African First Language
EFL: English First Language

In terms of the stratification qualities of the present sample and the WAIS-R standardisation samples, the main differences are found in the age range and the level of educational attainment. For the present sample, the ages of the participants ranged from 19 to 30, whereas for the WAIS-R standardisation samples the ages of the participants ranged from 16 to 74, with the average year of birth for the present sample being 1976, and the average year of birth for the WAIS-R standardisation sample from the United States being 1941 (Feingold 1993), and the other three WAIS-R standardisation samples being slightly younger. The level of educational attainment for the present sample ranged from 12 to 15+ years whereas the level of educational attainment for the standardisation samples ranged from 0-7 to 16+ years, thus reflecting a much higher mean level of educational attainment for the present sample. The implications of these two factors is that, on average, the participants in the present sample would have been exposed to more years of education than the standardisation samples which have been cited, as well as having been educated in an environment which reflects the practice of a more equitable education for males and females in contemporary society.

The *Digit Symbol* subtest has been described as a test of psychomotor performance which is relatively unaffected by intellectual prowess, memory or learning (Erber et al., 1981; Glosser, Butters, and Kaplan, 1977; Murstein and Leipold, 1961, in Lezak, 1995), an assertion, therefore, that does not seem to be supported by the finding of the present study, which shows a trend for the graduates to perform better than the matriculants on *Digit Symbol,* see Figure 5.1 above. In addition to this, it appears that the relatively high level of educational attainment, as well as the more equitable educational practices for males and female in contemporary times, has served to level the scores between males and females for the majority of the participants in the total sample. According to Kaufman and Lichtenberger (1999), success on *Digit Symbol* is enhanced by motor persistence, sustained attention, response speed and visuomotor co-ordination, all qualities which could be enhanced by an extended education, but which are not dependent upon an extended education for development. It has been proposed that females are superior to males on this test because of an ability to encode the symbols verbally (Estes, 1974; A. Smith, 1967a; W.G. Snow and Weinstock, 1990, in Lezak, 1995), a factor which may be synonymous with the documented superior female verbal skills, but this has not been conclusively established. However, according to Lezak (1995), people who are unused to handling pencils or doing fine handwork under time pressure are disadvantaged on tests such as *Digit Symbol*, as half the total score value is contributed by copying speed (Storandt, 1976, and Le Fever, 1985, in Lezak, 1995). This could, in some measure, account for the better performance of private/"Model C" school participants in comparison with DET school participants, as a superior quality of education might well have permitted a greater exposure to both timed performance in terms of tests and examinations, as well as complexity of pen and pencil tasks. While none of the literature that was consulted has documented any possible reasons for the better performance of African First Language private/"Model C" school females over African First Language private/"Model C" school males in comparison with their English First Language private/"Model C" school counterparts who have shown no significant difference in performance, it is possible that exposure to a superior education has enhanced the development of inherent female strengths, but this argument is somewhat negated by the almost equal performance of English First Language males and females.

It could be argued, however, that as English First Language private/"Model C" school males have always been exposed to timed, fine-motor work, unlike their African First Language private/"Model C" school male counterparts, many of whom, as has been documented, have only been permitted to attend private/"Model C" schools since 1991 (Hartshorne, 1992), and who, therefore, have had less time and practice to develop and to narrow the difference between male and female performance. However, it could also be argued that the particularly superior performance of African First Language private/"Model C" school females could be understood from a cultural perspective.

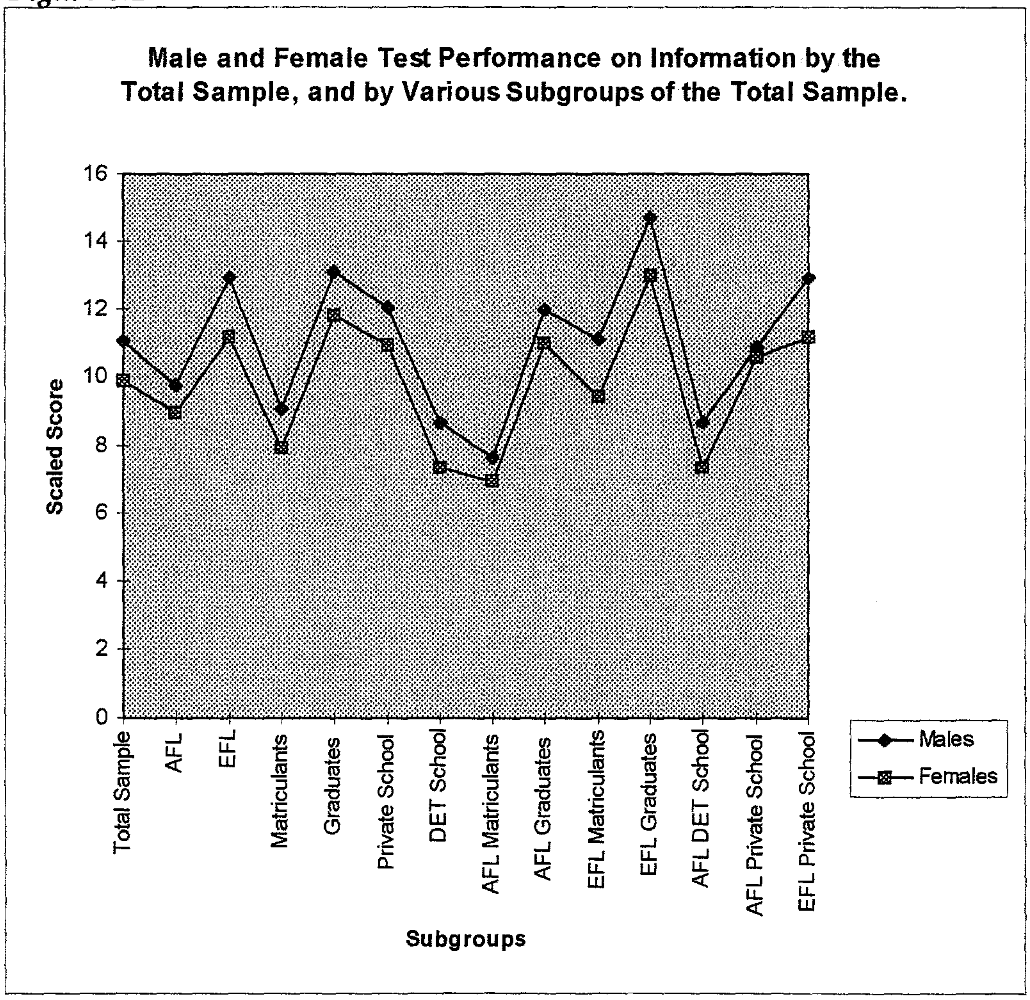
Traditionally, African First Language females have always been subservient to their menfolk. It is possible that having been given a better chance to succeed academically, by attending a private/"Model C" school, the superior performance of the African First Language female reflects their determination to work hard for something that has not always been their right - to be an equal. This is, in some measure, borne out by the performance of the DET school participants, all of whom speak an African language as their mother tongue, but whose performance has not been significantly different. While the performance of the DET school cohort reflects the trend of all the females in this sample, that is to score marginally better than their male counterparts on the *Digit Symbol* subtest, the fact that the African First Language DET school female has not had the same opportunity as their private/"Model C" school counterparts, has tended to perpetuate the status quo, which is that their performance has not improved significantly over time.

While it must be clearly stated that the superior female performance on this subtest was positively influenced by the significantly superior performance of the African First Language private/"Model C" school female, it is possible that these results also reflect a superior female cognitive strength in terms of visuomotor perception and co-ordination, mental speed, and attention span. However, the size of the sample that was used in this study was relatively small, and while it has been stated that the Wechsler Intelligence Scales are noted for their robust psychometric properties, the possible effect of the small sample size must not be excluded. In addition to this, the results of this study show that the significance of the superior female strength in this area appears to be diminishing over time, a finding that could possibly be attributed to a societal sanctioning of males being involved in tasks that have previously been considered feminine.

5.2.2 Information.

For the total sample, males performed slightly better than females on the *Information* subtest at a level that was approaching significance ($p = 0.133$), see Table 4.1 on p. 41. An analysis of variance for gender and each of the factors, **language of origin,** see Table 4.2 on p. 44; **educational attainment**, see Table 4.5 on p. 53; and **quality of education**, see Table 4.8 on p. 59, revealed, in each analysis, a main effect for gender in favour of males that was approaching significance, but no interaction effect. However, a comparison of the performance on *Information* of the males and females in the various subgroups, revealed only

Figure 5.2



AFL: African First Language
EFL: English First language

one difference and which was only approaching significance. Table 4.14. on p. 73 shows that English First Language male graduates scored slightly higher than their female counterparts at a level which was approaching significance ($p = 0.027$). Figure 5.2 above depicts the trend for males to perform slightly better than females across all the subgroup comparisons that were made, and possibly reflects the gender effect in favour of males described above. The results of the present study are similar to those of the WAIS-R standardisation samples cited in the literature review above, in that it echoes the trend for males to perform better than females on the *Information* subtest, but the significance of the differences for the present study is only marginal (approaching significance), whereas for the WAIS-R standardisation samples the differences were all highly significant ($p < 0.01$ or $p < 0.001$).

It is possible that the difference between the results obtained in the present study and the results obtained on the WAIS-R standardisation samples is a function of the higher mean educational level of the participants of the present study (see earlier discussion on page 92). It has been shown that *Information* is a subtest which is highly academically influenced (Lezak, 1995), an assertion which is supported by the superior performance of graduate participants in this study over their non-graduate counterparts, see Figure 5.2 above. In the present study, however, it is possible that the high level of educational attainment of both males and females, in addition to the fact that the majority of the participants in this study were exposed to a good quality of education, has served to reduce the significance of the difference in male and female performance. Thus, while the marginal gender effect in favour of males on *Information*, which is revealed in this study, may reflect an inherent male quality which is different from females, it is also possible that the significant difference which was shown on the WAIS-R standardisation samples is also a function of the inequitable educational practises of the time.

However, the finding that if males and females are equally educated, the significance of the difference between male and female performance on the *Information* subtest reduces, seems to contradict the finding that the only significant difference between male and female performance on this subtest is for the English First Language private/"Model C" school subgroup. This subgroup encompasses the qualities which, supposedly, affords the bearer the greatest advantage on this test: a superior level of educational attainment, a superior quality of education, and an intimate understanding of the language which the WAIS-III uses.

The *Information* subtest has been described as a measure of crystallised intelligence (Kaufman & Lichtenberger, 1999), in that it taps among other things, the extent of remote memory stored in verbal form (Lezak, 1995). However, in order for something to be remembered, prior exposure to that particular learning situation is necessary. The cultural bias which, according to James and Dalton (1993), is particularly prevalent on the *Information* subtest, may well have limited the exposure of African First Language speakers to situations that English First Language speakers may have more readily encountered. As English is a language that is internationally used, and the language in which the Wechsler family of intelligence tests were devised, it follows that English First Language speakers, even those who live in different countries, would be advantaged on a test which was designed within the framework of their language and within a western culture. However, this does not explain why males should consistently do better than females on this subtest. As stated above, it has been widely asserted that *Information* is a subtest that is highly academically influenced. According to Lezak (1995), education accounts for as much as 37% to 38% of the variance in people over the age of 35. It follows, therefore, that the higher the level of educational attainment an individual has reached, the more successful he/she will be on this subtest. This, then, accounts for the superior performance of graduates over matriculants, but still not why English First Language graduate males should do better than their female counterparts.

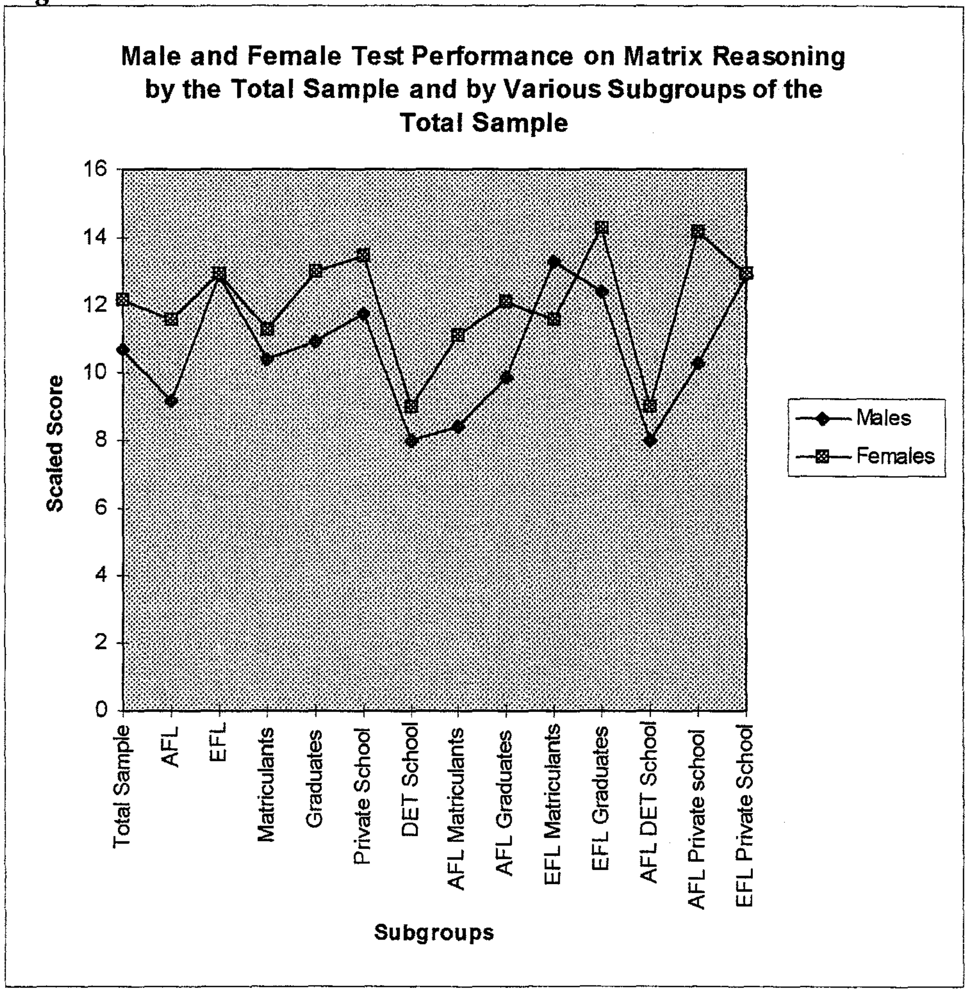
In conclusion, a consistent finding of this particular study has been the marginally significant effect of gender in favour of males on successful performance on the *Information* subtest. It follows therefore, that, as this subtest is largely a measure of crystallised intelligence, which includes remote memory, the results that have been documented in this study, and supported by the findings of the WAIS-R standardisation samples quoted in the literature review above, are indicative of an inherent superior ability for males to tap stored information, and possibly a greater crystallised intelligence. This would then account for all three of the factors mentioned here: English as the mother tongue, a high level of educational attainment, and male gender.

5.2.3 Matrix Reasoning

For the total sample, females performed slightly better than males on the *Matrix Reasoning* subtest at a level which was approaching significance ($p = 0.092$), see Table 4.1 on p. 41. An analysis of variance for gender and each of the factors **educational attainment**, see Table 4.5 on p. 53, and **quality of education**, see Table 4.8 on p. 59, showed main effects for gender that were approaching significance, but no interaction effects. However, an analysis of variance for **language of origin and gender**, showed both a significant main effect for gender ($p < 0.05$), and an interaction effect that was approaching significance. A comparison of the two language groups revealed that African First Language females performed slightly better than African First Language males at a level approaching significance ($p = 0.034$), but that there was no significant difference in the performance of English First Language males and females. It must therefore be assumed that both the gender effect and the interaction effect on

Matrix Reasoning described here, were influenced by the superior performance of the African First Language females. A comparison of the performance on *Matrix Reasoning* of the males and females for all of the other subgroups, however, revealed only one other significant result. It was found that African First Language private/"Model C" school females significantly outperformed African First Language private/"Model C" school males (p = 0.005). Thus, throughout these comparisons, a consistent gender effect in favour of females has been revealed, but it was also shown that this gender effect was influenced by the superior performance of the African First Language female cohort, and significantly influenced by the private/"Model C" school African First Language females.

Figure 5.3



AFL: African First language
EFL: English First Language

Figure 5.3 above depicts the performance of males and females on *Matrix Reasoning* for the total sample and for subgroups of the total sample. It can be clearly seen that for most of the comparisons, there was a trend for females to perform slightly better than males on this test. The only exception that was depicted here, was for the English First Language matriculant group, in which the males scored slightly better than the females.

As *Matrix Reasoning* is a new addition to the Wechsler series of adult intelligence scales, there was no other research available to compare the performance of males and females on this subtest. According to Kaufman and Lichtenberger (1999), *Matrix Reasoning* is a test of fluid intelligence in which the individual is required to use abstract, non-verbal reasoning skills and spatial visualisation to succeed. It is said to be a more suitable measure of cognitive ability for the non-testwise participant (Nell, 1999). As a test of cognitive ability, *Matrix Reasoning* is highly commensurate with the Raven's Progressive Matrices and the Raven's Coloured Progressive Matrices, which require similar kinds of skills for success. Like *Matrix Reasoning,* the Ravens' tests are said to be tests which are relatively culture fair, as they require neither language nor academic skills to complete (Lezak, 1995). However, Lezak (1995), cites researchers (H.R. Burke, 1985; Colonna and Faglioni, 1966; P. E. Vernon, 1979) who have found that education does influence performance on the Ravens' to a small degree. Should the same small education effect apply to *Matrix Reasoning,* it would have been obviated in this study, as all of the participants were relatively well educated with the minimum educational level being twelve years. This was confirmed by the results mentioned above, which did not reflect an education effect in a comparison of male and female performance for the matriculant and graduate subgroups.

What is pertinent, however, is the fact that this test seemed to favour African First Language females in comparison to African First Language males but not English First Language females in comparison to English First Language males. However, the most significant result reported on *Matrix Reasoning* in this study was for the subgroup African First Language private/"Model C" school females who significantly outperformed their male counterparts (p = 0.005), see Table 4.16 on p. 79. As the effect of language of origin, described above, proved only marginally significant, it must be assumed that it was the addition of the factor, quality of education, that increased the significance of this result. A superior quality of education has been shown to facilitate the development of natural cognitive potential, particularly in the areas of linguistic and logical-mathematical skills (Schepers, 1997). It follows, therefore, that for the African First Language private/"Model C" school cohort, the enhancement of these skills should have been equally developed for both males and females. This has not, however, been reflected in this particular study. It is possible, therefore, that, as with the superior performance of African First Language private/"Model C" school females on *Digit Symbol*, exposure to a superior quality of education has either facilitated the expression of inherent female characteristics, or the same reasoning which was used to understand this cohort's better performance on *Digit Symbol* applies here, namely that African First Language females who have been given the opportunity to change their historical cultural subservience, have applied themselves more diligently to the task of self-improvement than the males of this cohort who have never really had to work too hard to achieve recognition within their cultural milieu.

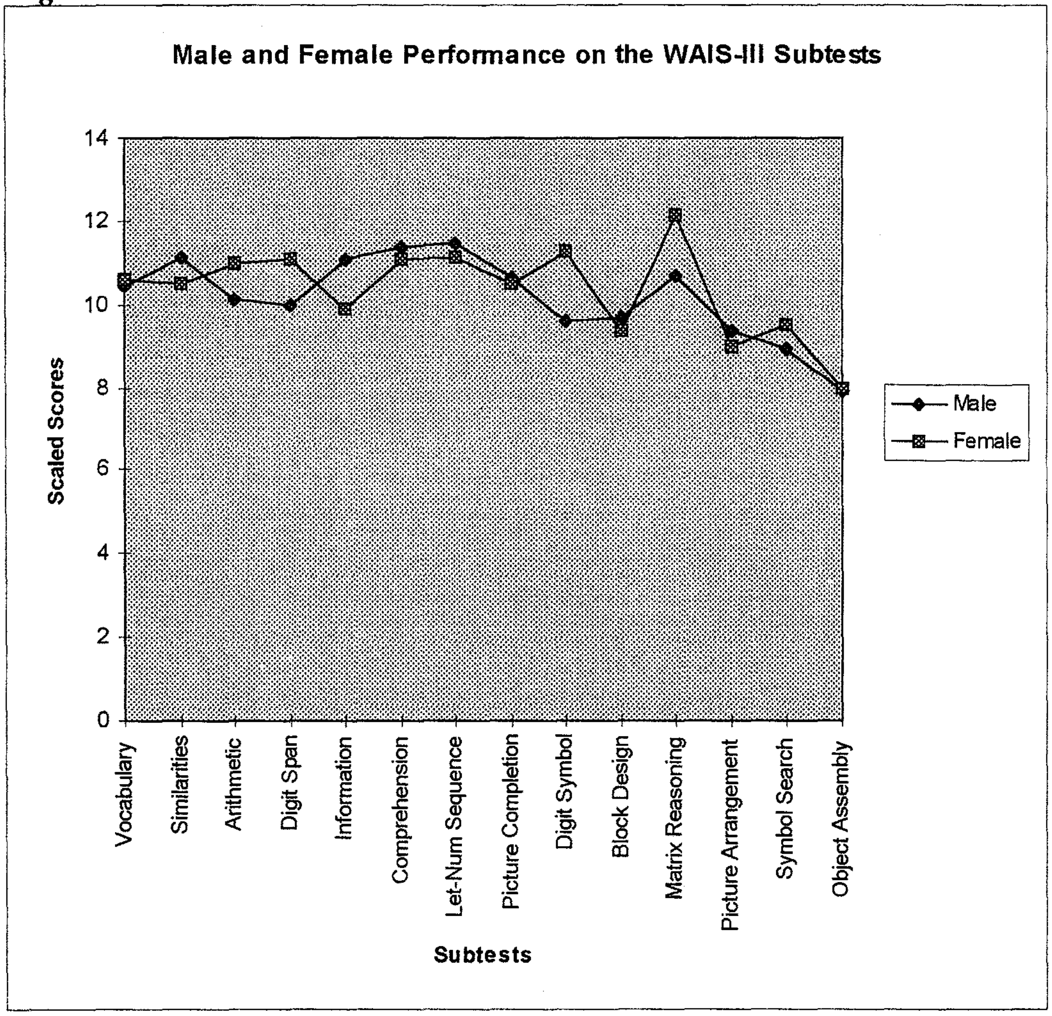
Lezak (1995) quotes researchers (Llabre, 1984; Persaud, 1987) who claim that gender differences on the Raven's Progressive matrices do not appear to be significant. While a direct comparison between the results on *Matrix Reasoning* in this study, and the findings on the

Ravens' tests cannot be made as they are two different tests, the apparent inconsistency between the two tests which employ comparable faculties must be noted. The gender effect in favour of females on test performance of the total sample on *Matrix Reasoning,* was consistently reported at a level which was approaching significance throughout all the subgroup comparisons that were made. However, as Figure 5.3 depicts, the difference in the performance of English First Language females over English First Language males was very small, and even reversed for the English First Language matriculant group, it must be assumed that this reported gender effect for the present sample is a reflection of the significantly superior performance of the African First Language female cohort, and not necessarily a reflection of generalised inherent female strengths, and commensurate with global observations on the Ravens'.

5.2.4 Summary of Significant Subtest Results.

At the beginning of this chapter, it was stated that, for the WAIS-R standardisation samples, on the whole, males outperformed females with varying degrees of significance on all of the subtests of the WAIS-R, with the exception of *Digit Symbol.* The subtests which showed the greatest significant differences across all the standardisation samples in favour of males, were *Arithmetic, Information, Comprehension* and *Object Assembly.* Figure 5.4 below shows that this superior male performance has been maintained for the participants in this sample on *Information* and *Comprehension,* but reversed for the other two subtests, *Arithmetic* and *Object Assembly.* Whereas all these differences in favour of males were highly significant for the WAIS-R standardisation samples, the only significant difference in favour of males for this study was on *Information,* which was at a level that was approaching significance.

Figure 5.4



It was suggested that this difference persisted in this study possibly because of an inherent superior male ability in terms of crystallised intelligence, but it was also suggested that the superior level of education of the total sample had the effect of narrowing the difference in performance between males and females, thus reducing the significance of this difference to a level which was only approaching significance. While it is possible that the changes described here reflect the effect of a relatively high level of education for the total sample in this study, it is also possible that the results in this study reflect changes in female performance which are due to other factors, such as a levelling of both socialisation practices in terms of sex-role stereotyping, and academic expectations for males and females in contemporary society. This is especially pertinent, as the sample that was tested was a particularly young cohort, with an age range of between 19 and 30, in comparison with the WAIS-R standardisation samples whose ages ranged from 16 to 74, many of whom were born before the advent of women's movements in the 1960's, and who would, therefore, reflect the inequitable socialisation practices of their time. This lends strong support to the observation of Feingold (1988, p 61), that "sex differences among adolescents have decreased markedly over the past generation", particularly as the generation to which he was referring, would have been the contemporaries of the present sample, and the prediction of Jordan (1997), detailed earlier, that the difference between male and female IQ scores is likely to lessen over time.

It was shown that the females in this study significantly outperformed the males on the *Digit Symbol* subtest, and performed slightly better than the males at a level which was approaching significance on the *Matrix Reasoning* subtest. Although it appeared that the performance of females in this study on *Digit Symbol* reflected the general trend depicted by the WAIS-R standardisation samples, it was shown that the significance of this result was highly influenced by the significantly superior performance of the African First Language private/"Model C" school female cohort over their male counterparts, and that for the other two subgroups, English First Language private/"Model C" school males and females and DET school males and females, there was no significant difference in performance. As *Matrix Reasoning* is a new addition to the adult, individually applied Wechsler Intelligence Scales, it was not possible to compare the performance of the participants in this study with previous studies. However, like *Digit Symbol,* it was shown that the superior performance of the females in this study on the *Matrix Reasoning* subtest, was also significantly influenced by the superior performance of the African First Language private/"Model C" school female cohort, and that there was no significant difference in the performance of the males and females of the DET school cohort or the English First Language private/"Model C" school cohort.

Given these findings, it is felt that the results of this study reflect the effect of an equal and extended education for both males and females, which has facilitated a levelling of male and female cognitive ability especially in the areas of fluid intelligence, and visuomotor perception and co-ordination. While it was suggested that the superior performance of the African First Language private/"Model C" school female cohort on *Digit Symbol* and *Matrix Reasoning* could have been influenced by the superior education they had received, it was also postulated that their superior performance on these subtests was influenced by a deep-seated desire to better themselves and to use the opportunity provided by a better education to shake the shackles of a previously culturally determined subservient role. However, it is possible that for this particular study, the significantly superior performance of the African First Language private/"Model C" school female cohort has been skewed because of a sample effect.

5.3 A COMPARISON OF THE OVERALL IQ SCORES ACHIEVED BY MALES AND FEMALES IN THE PRESENT STUDY.

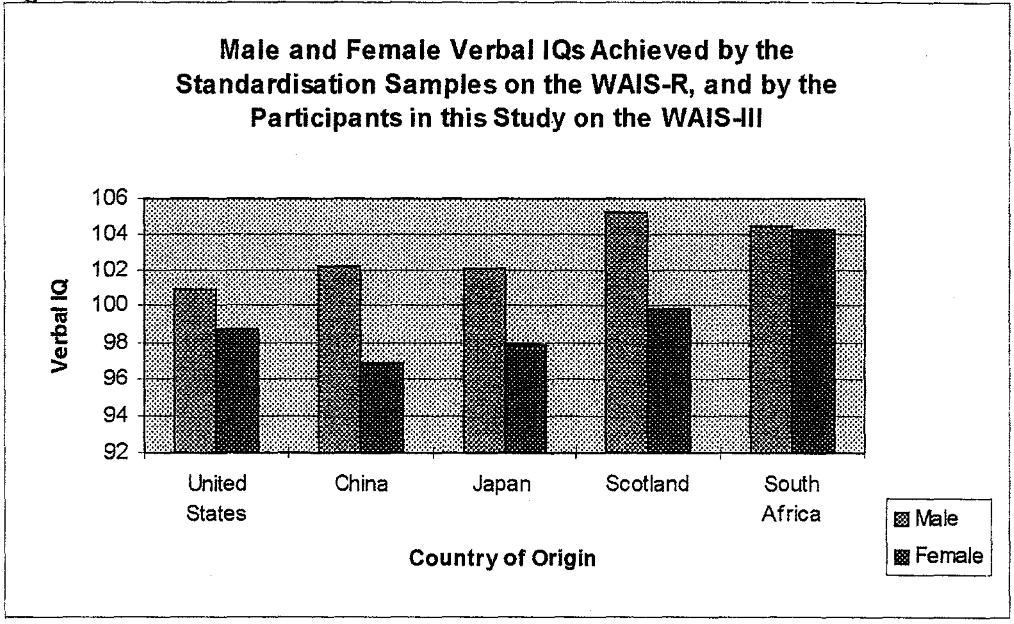
With respect to the overall IQ scores achieved by the male and female participants in this study, no significant differences between male and female performance were found for any of the IQ scores. While the sample in this study differs from the WAIS-R standardisation samples in terms of a higher mean level of educational attainment and the limited age range of the participants in the present study, a comparison will be made in terms of the difference in the trends that are noted.

The present study revealed almost identical male and female Verbal IQs (VIQ) and a trend for females to score slightly higher, although not significantly higher, than males on Performance IQ (PIQ) and Full Scale IQ (FSIQ). This was different from the WAIS-R standardisation samples which showed that on the whole, males scored significantly higher on all three IQ scores, VIQ, PIQ, and FSIQ, than females. The only exception was the WAIS-R standardisation sample from Japan which showed no significant difference between male and female performance on PIQ, although the trend was still for males to score significantly higher than females on FSIQ, and VIQ, see Table 2.2 on p. 22. The difference in these trends on IQ scores for the present study can be understood in terms of the individual subtest scores which are discussed in detail below. Briefly, however, the WAIS-R standardisation samples showed a trend for males to score higher than females on ten of the eleven subtests, whereas in this study, there was a more equal distribution of subtest scores in that males scored higher than females on seven of the fourteen subtests, and females scored higher than males on the other seven. See Figure 5.4 on p. 102.

5.3.1 Verbal IQ

Figure 5.5 below clearly depicts the levelling of male and female performance on VIQ for the participants of this study, and equally clearly, shows that this is very different from the significantly superior performance of the males in the WAIS-R standardisation samples. While the relatively higher VIQs of the present sample in comparison to the VIQs of the WAIS-R standardisation samples must reflect the higher mean educational level of the participants in the present study, the question that must be posed is whether the higher educational level of the females in this sample can make such a difference to the comparison of male and female VIQs.

Figure 5.5



Across all the comparisons of the various subgroups that were made, there were no differences in male and female VIQs that were significant or approaching significance. It has been previously stated that it was only in the 1960's that women's movements demanding female equality both in the classroom and in workplace really took hold. Contemporary society in the western world reflects the changes that have taken place as a result of this movement with many women being found in very senior positions in the academic, business and political arenas. The participants of this study were the children of the seventies, children who would have been treated very differently from the children of previous generations. As Feingold (1993) points out, the average year of birth for the WAIS-R standardisation sample was 1941, the majority of whom, therefore, would have been raised in homes and educated in schools which would have subscribed to very different principles regarding the female role and status in comparison to today's schools and homes. Given these considerations, it is highly probable that the levelling of male and female VIQs reflects the different educational and socialisation practices of modern times, and hence is a more accurate representation of male and female cognitive ability in this area. These findings, therefore, must question the frequently documented assertion that females have superior verbal skills to males (for example Feingold, 1988), both from the perspective that quite the reverse has been shown by the WAIS-R standardisation samples, and from the results of the present study which indicate that males and females have equal verbal skills. However, it must be noted, that the superior female verbal skills that have been referred to are described by Feingold (1992) as strengths in terms of language usage, i.e. spelling and grammar, as opposed to verbal reasoning skills. It is possible that correct language usage was considered a good female attribute, and an aspect of female education that was encouraged, which is why females performed so much better on tests of these skills than males did.

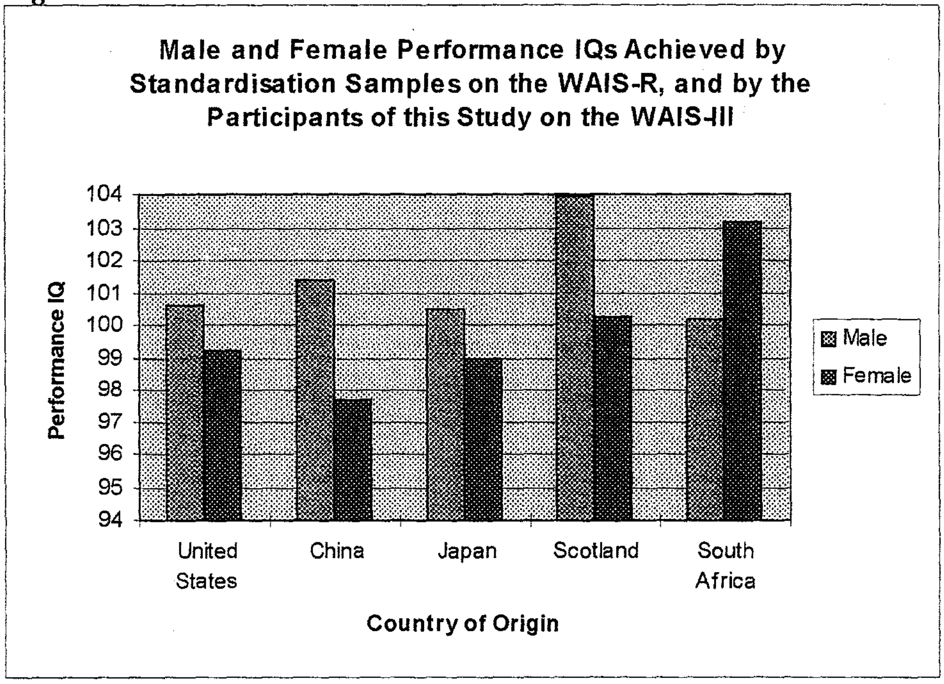
An examination of the performance of males and females on the verbal subtests on both the WAIS-R and the WAIS-III, explains statistically why the difference in overall measured male and female VIQ occurs. It has been shown that for the WAIS-R standardisation samples males scored significantly higher than females on *Information, Comprehension* and *Arithmetic*, and there was a trend for males to score higher than females on the remaining three subtests. See Table 2.3 on p. 25. Since these subtests made up a measure of VIQ on the WAIS-R, they must necessarily reflect a higher VIQ for the males of the WAIS-R standardisation samples. However, as Table 4.1 on p. 41 shows, for the present study, there was only one significant difference in favour of males which was on the *Information* subtest, and this was only at a level which was approaching significance ($p = 0.133$). On the remaining six subtests, the trend was for males to score better than females on three subtests and females to score better than males on the remaining three. This then explains the levelling of male and female VIQs for this particular study.

It must be reiterated that according to Lezak (1995), the subtests *Information* and *Arithmetic* are highly academically influenced. Thus, assuming that the WAIS-R standardisation samples reflect the prejudices of their time regarding an equal education for boys and girls as described above, it follows that the superior male performance on these two subtests, is a function of the different expectations of male academic performance. Given the changes that have occurred with respect to female education and career prospects in the last forty years, it is possible that the scores that have been obtained in this study, particularly as this was a relatively highly educated sample, must be indicative of equal male and female cognitive skills in this area, skills that were previously masked by a lack of opportunity for females.

5.3.2 Performance IQ

While the difference between male and female PIQ in this study is not significant, Figure 5.6 below shows that females in the present study have not only negated the significance of the difference between males and females in favour of males which was shown on the WAIS-R standardisation samples, but they have also reversed the direction of the scores, in that for this study, females have shown a trend to score higher than males on measures of PIQ. The only comparison between male and female PIQ which was significant in the present study, was for African First Language private/"Model C" school females who outperformed their male counterparts at a level that was approaching significance ($p = 0.029$). It is postulated that this subgroup's significantly superior performance on the two subtests *Digit Symbol* and *Matrix Reasoning,* described under sections 5.2.1 and 5.2.3 above have influenced the significance of this comparison.

Figure 5.6



An interesting phenomenon reflected by this Figure is that, despite the superior educational level of the participants in this study, the South African males displayed a lower average PIQ than the males for all the WAIS-R standardisation samples. However, the same was not true for the equivalent female comparison, in that the PIQ of the females in this study was higher than the females for the standardisation samples. It must be assumed that either the level of educational attainment does not affect PIQ scores, and that the trend described here reflects the enhancement of an innate female skills in this area, or that this too reflects more accurately the potential of a more equally educated female. It was shown in the literature review that, for the WAIS-R standardisation samples, the difference between male and female PIQ was smaller than the difference between male and female VIQ or FSIQ. This phenomenon could be understood in terms of the widely-reported consistent significant female superiority on *Digit Symbol,* a subtest which contributes to a measure of PIQ. For the present study, the significant female advantage on *Digit Symbol* persists, in addition to the female superiority on *Matrix*

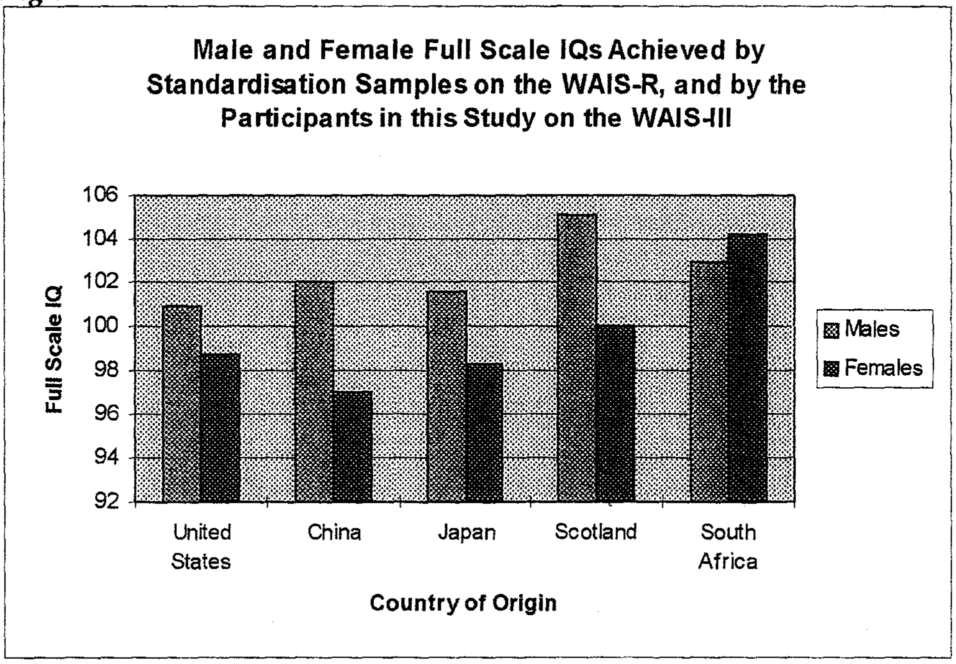
Reasoning, although the difference on this subtest was only approaching significance. Table 4.1 on p. 41 shows that for the remaining five subtests which make up a measure of PIQ, females scored slightly higher than males on two and males scored slightly higher than females on the other three. This then contributes to an understanding of the reversal in the trend established on the WAIS-R standardisation samples, see Table 2.3 on p. 25, which showed a male advantage on four of the five subtests which measured PIQ.

This finding seems contrary to the documented literature which has claimed that males are superior to females in terms of spatial ability, mechanical reasoning, and mental rotations (Feingold, 1992; Linn and Petersen, 1985; Mackintosh, 1996), all skills which are associated with a measure of PIQ. However, these skills form only a part of the measure of PIQ. The documented female skills on psychomotor tasks such as fine motor co-ordination and perceptual speed, indicated by the superior female performance on *Digit Symbol,* and which remain evident in this study, also contribute to a measure of PIQ, as do the abstract, non-verbal reasoning skills and spatial visualisation skills inherent in a measure of *Matrix Reasoning,* also a subtest on which females performed better than males. While it has been shown that, for this study, the female scores on these two subtests were significantly influenced by a particular subgroup, the African First Language private/"Model C" school female cohort, it is considered that, for this study, the levelling of male and female scores represents a more accurate reflection of male and female cognitive ability given equal educational opportunities.

5.3.3 Full Scale IQ.

While the difference between male and female FSIQ in this study is not significant, Figure 5.7 below shows that the trend, which was evident on all of the WAIS-R standardisation samples cited, for males to score significantly higher than females on FSIQ, has not only been negated, but also the direction of the scores has been reversed. In this study, the trend was for females to score higher than males on a measure of FSIQ.

Figure 5 7



Statistically, the change in the trend set by WAIS-R standardisation samples which indicated a significantly superior male FSIQ, can be understood in terms of the fact that FSIQ is an aggregate of VIQ and PIQ. In this study, as females almost levelled the male scores for VIQ (Males = 104.50, Females = 104.24) and outperformed males on PIQ (Males = 100.18, Females = 103.18), it follows that the female FSIQ would show a trend to be slightly higher than the male FSIQ. As was discussed under sections 5.3.1 and 5.3.2 above, it is proposed that, the levelling of male and female FSIQs is due to the more uniform educational opportunities and expectations of males and females, which has permitted a more accurate reflection of female cognitive ability to emerge.

5.3.4 Summary of Overall IQ Results

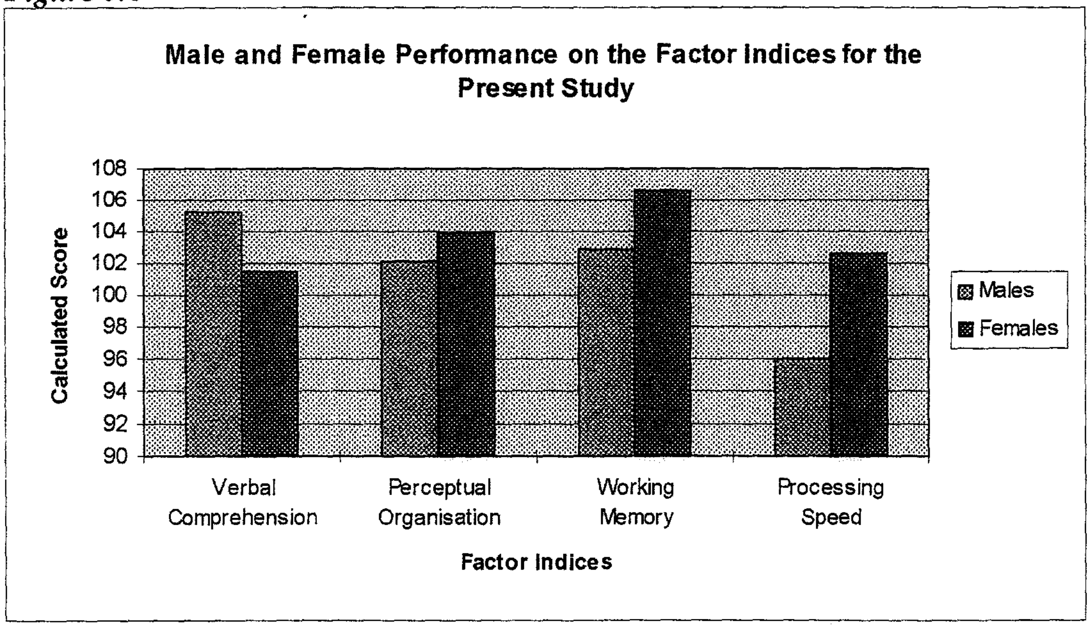
A review of the scores achieved on the WAIS-R by males and females of the standardisation samples of the United States, China, Japan and Scotland indicated that on the whole, males significantly outperformed females on all three IQ scores, but that the difference between male and female performance on PIQ was smaller and less significant than on VIQ and FSIQ, see Table 2.2 on page 22. For the participants in this study, it was found that, unlike the WAIS-R standardisation samples, the differences in the scores between males and females on all three IQ measures were not significant. It was found that males and females performed equally well on a measure of VIQ, and that on measures of PIQ and FSIQ, there had been a directional change, in that there was a trend for females to score marginally better than males. The levelling of male and female VIQ scores was seen as a function of the better performance by females on the verbal subtests, which was different from the WAIS-R standardisation samples which showed that males outperformed females on each of the six verbal subtests. The change in the tendency for males to score better on a measure of PIQ was understood in terms of an improved overall performance of females on the performance subtests, as well as the significantly superior female performance on the *Digit Symbol* and *Matrix Reasoning* subtests. As FSIQ is an aggregate of the VIQ and PIQ measures, the improved overall female performance described above, has led to a change in the tendency for males to achieve higher FSIQs, than shown by the WAIS-R standardisation samples.

The changes reflected by this study, in comparison to the WAIS-R standardisation samples, were understood in terms of overall higher mean educational level of this sample, which therefore did not accommodate the influence of less educated males and females, as well as the different socialisation and educational practices of contemporary women, which, it is suggested, permitted a more accurate reflection of female cognitive ability to emerge.

5.4 A COMPARISON OF THE SIGNIFICANT FINDINGS ACHIEVED BY MALES AND FEMALES ON THE FACTOR INDICES.

The addition of the four factor indices, described in the literature review above, is new to the individually applied, adult Wechsler Intelligence Scales, and therefore no comparative data is available. In the present study, there were no significant differences between male and female performance on any of the factor indices. On *Processing Speed,* however, females outperformed males at a level which was approaching significance. On the other three factor indices, Figure 5.8 below depicts a trend for males to score slightly higher than females on *Verbal Comprehension,* and for females to score slightly higher than males on *Perceptual Organisation* and *Working Memory.*

Figure 5.8

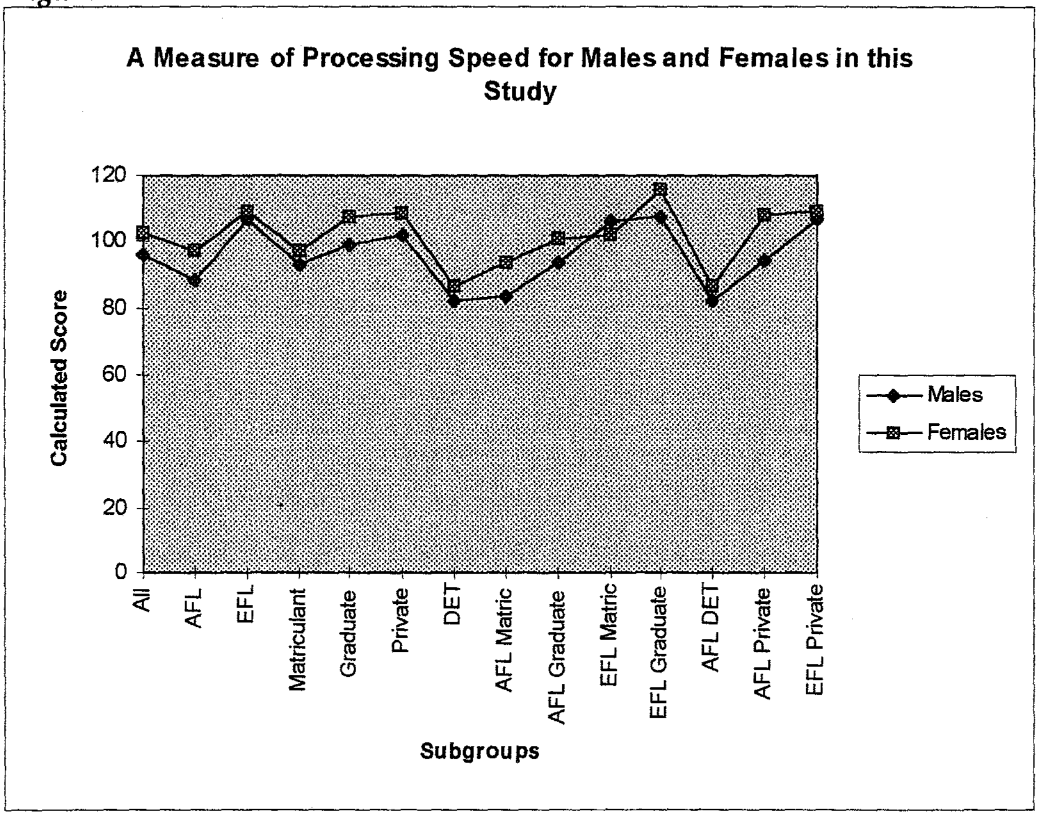


The slightly superior performance of males on *Verbal Comprehension* is due to the better performance of males than females on two of the three subtests which make up this measure: *Similarities* and *Information.* As *Verbal Comprehension* is considered a measure of crystallised intelligence (Kaufman and Lichtenberger, 1999), the trend reflected here supports the assertion that males are superior to females in terms of crystallised intelligence. However, it has been shown that, for this sample which reflects a more highly educated population than the WAIS-R standardisation samples, the difference between male and female test performance has reduced in comparison to the WAIS-R standardisation samples. Thus, while these scores may reflect an inherent male cognitive superiority in this area, it may be that, as the differences are no longer significant, in time, these differences will disappear altogether. The slight female advantage on the factor indices *Working Memory* and *Perceptual Organisation* may suggest an inherent female advantage on measures of number ability, sequential processing, attention span and fluid intelligence (Kaufman and Lichtenberger, 1999), but the fact that these differences are not significant, limits any conclusions that can be drawn in this regard. It is possible, however, that the levelling of male and female scores in these areas suggest that a more equitable education and less stereotyped social expectations for males and females in contemporary society has permitted males to develop skills that were previously deemed too feminine for them to learn in earlier times.

5.4.1 Processing Speed.

For the total sample, females performed slightly better than males on *Processing Speed* at a level which was approaching significance (p = 0.105). Analyses of variance for gender and each of the factors **language of origin** and **quality of education** showed a gender effect at a level that was approaching significance. However, as Figure 5.9 below indicates, while there was a trend for females to perform better than males on this measure for most of the comparisons that were made, the only significant difference between male and female performance was for the African First Language private/"Model C" school subgroup. For this subgroup, females significantly outperformed males on *Processing Speed* (p = 0.005), and reflects this particular cohort's significantly superior performance on the subtest *Digit Symbol* relative to their male counterparts. This, therefore, suggests that the gender effect described above, was significantly influenced by the performance of the females of this particular cohort.

Figure 5.9



AFL: African First Language
EFL: English First Language

According to Kaufman and Lichtenberger (1999), *Processing Speed* is seen as a measure of mental and psychomotor speed, qualities which have already been attributed to females in earlier discussions. Females' consistently significant superior performance on *Digit Symbol* and marginally better performance on *Symbol Search,* the subtests which comprise a measure of *Processing Speed,* account for their higher score on this factor index. The superior performance of African First Language private/"Model C" school females in comparison with their male counterparts, was largely discussed under section 5.2.1. It was suggested that while the consistently superior performance of African First Language private/"Model C" school females might indicate an inherent female cognitive strength on tasks involving fine motor handwork as well as a good attention span and visual perception his area, the differences could be more culturally based, and reflect the determination of the females in this cohort to achieve a more equal standing with their male counterparts. The fact that the difference in performance between English First Language private/"Model C" school males and females and African First Language DET school males and females was negligible, supports the latter theory, rather than the theory of innate female superiority. Again, however, as it was earlier suggested, the results that have been obtained in this study could reflect an idiosyncratic sampling effect, and would need verification in further studies with larger numbers and a similarly differentiated group.

5.4.2 Summary of significant factor index results.

For the total sample females performed better than males on *Processing Speed,* at a level that was approaching significance. A gender effect in favour of females on *Processing Speed,* at a level which was approaching significance, was also found on analyses of variance for gender and each of the factors, language of origin and quality of education. It was felt that the significantly superior female performance shown here was influenced by the performance of the African First Language private/"Model C" school female cohort who significantly outperformed their male counterparts on this measure. It was suggested that while the exposure of this cohort to a superior quality of education permitted the females in this subgroup to develop their natural, innate talents more rapidly than their male counterparts, their superior performance might reflect an attempt to overcome a culturally determined subservience to the males in their culture. It was also suggested that the results that were obtained here may have been influenced by the qualities inherent in the participants of this particular subgroup, and that further studies would have to be performed to verify whether this indeed is an accurate reflection of the traits within this particular subgroup, or the result of an idiosyncratic sampling effect.

Although not significant, there was a trend for males to perform slightly better than females on *Verbal Comprehension*, and a trend for females to perform slightly better than males on *Perceptual Organisation* and *Working Memory.* It was suggested that the higher mean level of education for the total sample, as well as the more uniform academic and socialisation practices for contemporary males and females, contributed to the levelling of measured male and female cognitive ability on these measures.

5.5 CONCLUSION

Contrary to the findings of the cited WAIS-R standardisation samples which indicated that males were intellectually superior to females, the results obtained in this study clearly indicate that for this relatively highly educated sample, there is no difference in the overall cognitive capacity of males and females. Two demoFigureic variables, characteristic of the participants in this study, could have influenced the change in trends that have been noted in this research:

i. the relatively young mean age of the participants in this study, which has facilitated a reflection of the more uniform and less stereotypical societal and educational attitudes and practices with regard to males and females in contemporary society.

ii. a relatively high mean level of educational attainment for both the male and female participants in this study which, as it has been shown above, correlates positively with measured IQ.

Given the fact that both males and females in contemporary society are, on the whole, being provided with far more equitable opportunities in terms of education and employment, in addition to experiencing a less prejudiced upbringing in terms of sex-role stereotyping, it is possible that both the quality of education that males and females receive, and the level of educational attainment to which both males and females are aspiring, have facilitated a more accurate measure of the relatively equal male and female intellectual capacity, which has been shown in this study. Thus males have been allowed to develop "feminine" strengths, and conversely females have been allowed to develop "masculine" strengths.

The significant difference in favour of females which was shown on the *Digit Symbol* subtest, as well as the differences which were approaching significance in favour of females which were shown on the *Matrix Reasoning* subtest and the *Processing Speed* factor index, were shown to be significantly influenced by the superior performance of the African First Language private/"Model C" school female cohort in comparison to their male counterparts, as there were no significant differences in male and female performance on the WAIS-III for the remaining two subgroups of this sample, DET school males and females, and English First Language private/"Model C" school males and females, who together form 71% of the total sample. Providing that these results were not due to a sample effect, it was speculatively suggested that factors other than innate intellectual ability had influenced the superior performance of this particular female cohort. Traditionally, the females of this subgroup have always been subservient to the males. Thus, having been exposed to and provided with a different and superior education, and the beliefs and opportunities implicit in that system, it is possible that the females of this subgroup have applied themselves more assiduously to the task of improving themselves, unlike the DET school females who have not really experienced any of these changes, or the English First Language private/"Model C" school females who have been exposed to this system for a much longer period of time.

Although males performed slightly better than females on the *Information* subtest, the significance of the difference was marginal, and in reality, largely represented a levelling of male and female abilities on this subtest. Again, as it was shown that *Information* is a subtest which is highly academically influenced, the levelling of scores were attributed to the equitable education the males and females are receiving in contemporary society.

Thus, in conclusion, it is felt that, in time, the words of David Wechsler, quoted at the beginning of this thesis, will be proved erroneous. It will be shown that the female of the species is neither more deadly nor more intelligent than the male, but simply equally deadly and intelligent.

5.6 EVALUATION OF THIS RESEARCH

The methodological strengths of this study include:

1. This sample was very carefully stratified in terms of gender and the three factors language of origin, educational attainment and quality of education, which facilitated a more accurate differentiated comparison of male and female intelligence test performance than has been previously achieved.

2. This particular age range (19 - 30), facilitated the comparison of gender performance of contemporary males and females, who have been exposed to a more equitable education, with the males and females of the WAIS-R standardisation samples whose education, it is felt, was influenced by the prejudices and sex-role stereotyping of the time.
3. The relatively high mean educational level of the present sample facilitated a discussion of the effect of education on male and female test performance in comparison with the WAIS-R standardisation samples whose mean educational level was lower than that of the present study.
4. The exclusion of participants who had previously suffered from learning difficulties, neurological disorders, psychiatric disorders or head injuries, reduced the possibility that the results that were obtained were negatively influenced by factors other than those for which the sample was stratified.
5. The tests were all administered by trained intern clinical psychologists according to the method described in Chapter 3. This reduced the chances of the results being affected by different administration techniques.

The methodological weaknesses of this study include:

1. The results obtained in this study are limited in terms of generalisability because of the size of the sample, the age range, and the high mean educational level of the participants in this sample.

    1.1 The relatively small sample size in this study, while still large enough to show statistically significant results for the comparisons that were made, limited the comparative opportunities for certain subgroups. A larger sample size would therefore permit a more robust investigation of the difference of various subgroups and would be less subject to sample effects which, for example, may have contaminated the findings of female significance for the African First Language, private/"Model C" school subgroup.

1.2 The limited age range, while necessary to achieve the comparisons set out in the aim of this study, inhibit the generalisation of the results beyond this age group, and exclude the effect of age and experience which are not factored into this comparison.

1.3 The relatively high mean educational level of this sample restricts the generalisability of the results obtained here to the general South African population, and limits the ability to make more direct comparisons of the results obtained here with the results of the WAIS-R standardisation samples, which are representative of the general population.

2. It has been widely claimed that the effect of cultural bias largely invalidates the results of tests which employ culturally inappropriate testing methods This, obviously, lends some doubt to the appropriateness of using the WAIS-III as a tool to measure the cognitive ability of the African First Language cohort. However, while these reservations are noted, the gender comparisons in this sample gain validity because the male and female groups were all carefully matched for cultural factors such as language of origin, educational attainment and quality of education.
3. The limitations of this study did not permit the results that were obtained to be explored in terms of variability. It has been shown that male scores on certain cognitive tests, for example quantitative reasoning, spatial visualisation, spelling and general knowledge, are more variable than female scores (Ankney, 1992; Feingold, 1992). An examination of the results that were obtained in this study in terms of variability would, therefore have enriched the comparative findings that were discussed.

5.7 RECOMMENDATIONS FOR FUTURE RESEARCH

In a review of the WAIS-R, Kaufman (1983, p. 313),states that it "is *the* criterion of adult intelligence, and no other instrument even comes close", but in the same review, he suggests that insufficient reference is made to the appropriateness of the use of this test with minorities, or the influence of educational level on measured scores. While the intelligence test that Kaufman was referring to was the WAIS-R, similar concerns apply to the use of the WAIS-III, particularly as the cultural and educational concerns mentioned above apply to this study. According to Bardos, Naglieri and Prewett (1992, p. 303), current intelligence tests do not measure certain cognitive skills, and thus an expanded view of cognitive functioning is needed to promote "a greater understanding of cognitive function in general and gender differences and similarities in particular." It would therefore seem that in order to assess the cognitive capacity of diverse cultures in general, and particularly the difference in male and female cognitive ability, a more appropriate means of assessment is needed.

An important component of intelligence is memory, both in terms of working memory and long term memory. The results of this study indicated that males were marginally superior to females in terms of crystallised intelligence, which includes the ability to retrieve stored information, and therefore more a measure of long term memory, and that females were marginally superior to males in terms of working memory, the ability to manipulate material mentally, therefore more a measure of short term memory. It would be useful to employ other more probing methods to test whether the results of this test reflect a real difference in male and female cognitive ability, or whether the differences reflected here are a function of the test that was employed.

It was seen in this study, that the differences in male and female test performance that were so apparent in the African First Language private/"Model C" school cohort, were not shown for both the English First Language private/"Model C" school cohort and the African First Language DET school cohort. It is therefore suggested, that in order to examine the richness of this finding, more subjects in this category should be examined for gender effects. Further, a similar cohort should be tested at a later date, when the males and females who comprise this group have had time to be schooled in a private or similar such school from the beginning of their education, in order to evaluate whether the differences that are reflected here truly represent the male and female cognitive differences of this particular cohort.

The limited age range and relatively high educational level of this particular study, while necessary for the purposes of this research, are not representative of the males and females in this society, and therefore, any results that are generated here cannot be generalised to a South African population. It is therefore recommended that research concerning male and female test performance be conducted on the WAIS-III, using a more fully representative South African sample.

Finally, it is suggested that a more complete comparative analysis of the differences in male and female cognitive ability on the WAIS-III should include a comparison of the variabilities in their measured scores.

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APPENDIX 1

Initial Contact Sheet

WAIS-III Master's Research

Initial Contact Sheet

Surname: ______________________ First Name: ______________________

Contact Address: ____

Contact Telephone Number(s): ______________________________________

Gender: [Male] [Female]

Age: [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Home Language: [English] [Xhosa] [Other African Language:]

Language at place of study or work: [English]

Schooling: [Private School] [DET]

Check that the 5 high school years were completed in the same category of school. [ ]

Name of School and Town: ______________________________________

Educational Level: [Matric Only] [Graduate]

If Matric only, check that they do not intend to, nor have tried to study further. [ ]

Ever been diagnosed with or had one of the following:

Learning Difficulty	Yes	No
Neurological Disorder	Yes	No
Psychiatric Disorder	Yes	No
Head Injury	Yes	No

If Yes to any of the above - give details: ______________________________________

____

____

Arranged Date of Testing: ____________________ Time: ____________________

Tester: ______________________ Venue: ______________________

Further Contacts? ____

Protocol Number: [ ]

APPENDIX 2

Informed Consent Form

WAIS-III Master's Research

Response Booklet

Protocol Number: [ ]

INFORMED CONSENT

In South Africa we have had various tests to measure IQ - you may have completed one at school or when applying for a job. These tests have been found to be outdated and problematic in various ways, especially in terms of their applicability to previously disadvantaged groups. In America and Britain they have now developed a new test: the Wechsler Adult Intelligence Scale-III (WAIS-III), which is hoped to be more fair and less culturally biased towards certain groups. We are conducting this research on the WAIS-III to see how specific variables in the South African context affect performance on this test. This will allow us to see if the use of this test in South Africa and for various population groups will be fair and acceptable in terms of the new labour legislation.

We are doing this research as part of our Masters in Clinical Psychology at Rhodes University, Grahamstown and would thus appreciate your co-operation in completing the tests and supplying us with certain demographic information. The information provided will be treated as confidential. The results will not be linked to specific participants and specific test performance will not be available to anyone besides the researchers. Results of this research may be used for presentation at conferences and for publication in professional journals.

I________________________ have read the above and give my consent for the information given and test performance results to be used for the above mentioned research.

_____________________ Signed

_____________________ Date

APPENDIX 3

Socio-Economic Questionnaire

SOCIO-ECONOMIC QUESTIONNAIRE:

CAREGIVERS

Who were your primary caregivers at various stages of schooling ?

	Pre-School	Primary School	High School	Post School
Mother	☐	☐	☐	☐
Father	☐	☐	☐	☐
Other 1:_______________	☐	☐	☐	☐
Other 2:_______________	☐	☐	☐	☐
Other 3:_______________	☐	☐	☐	☐

What was/is the educational level of your parents/caregivers?

	Father	Mother	Other 1	Other 2	Other 3
None	☐	☐	☐	☐	☐
Less than Std 6	☐	☐	☐	☐	☐
Std 6 – 7	☐	☐	☐	☐	☐
Std 8 – 9	☐	☐	☐	☐	☐
Std 10/Matric	☐	☐	☐	☐	☐
Degree/Diploma +	☐	☐	☐	☐	☐

What kind of work did your parents/caregivers do?

	Father	Mother	Other 1	Other 2	Other 3
Unemployed	☐	☐	☐	☐	☐
Unskilled	☐	☐	☐	☐	☐
Semi-skilled	☐	☐	☐	☐	☐
Skilled	☐	☐	☐	☐	☐
Professional	☐	☐	☐	☐	☐

What were the other forms of income in the participant's home?

	Father	Mother	Other 1	Other 2	Other 3
Old Age Pension	☐	☐	☐	☐	☐
Disability Grant	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

TYPE AND QUALITY OF HOME

What kind of home did the participants live in across the various stages of their schooling?

	Pre-School	Primary School	High School	Post School
Informal dwelling/shack	☐	☐	☐	☐
Flat/cluster home/town house	☐	☐	☐	☐
Brick house	☐	☐	☐	☐
A traditional dwelling	☐	☐	☐	☐
Room in backyard of property	☐	☐	☐	☐
Other:________________	☐	☐	☐	☐

Across the various stages of schooling, was the participant's home:

	Pre-School	Primary School	High School	Post School
Owned	☐	☐	☐	☐
Rented	☐	☐	☐	☐
Other:________________	☐	☐	☐	☐

BASIC FACILITIES IN THE HOME

Across the various stages of schooling did the participant's home have:

	Pre-School	Primary School	High School	Post School
Running Water:	☐	☐	☐	☐
Electricity:	☐	☐	☐	☐
Flush Toilet:	☐	☐	☐	☐

EDUCATIONAL FACILITIES IN THE HOME

Across the various stages of the participants schooling did they have access to:

	Pre-School	Primary School	High School	Post School
Radio	☐	☐	☐	☐
Television	☐	☐	☐	☐
Books	☐	☐	☐	☐
Magazines/ Newspapers	☐	☐	☐	☐
Children's Books	☐	☐	☐	☐
Access to Libraries	☐	☐	☐	☐
Did your parents read to you	☐	☐	☐	☐
Pens and Pencils	☐	☐	☐	☐
Computer	☐	☐	☐	☐

APPENDIX 4

Language Proficiency Test

Sentence Completion

Section A

Read the following paragraphs and then circle the most appropriate word which can be used to complete each sentence:

Example: The principal at Lebohang High School urged his pupils to come to school AT / ON / TO / BY time.

Paragraph 1:

The police said that the escaped convict was still IN / AT / BY / TO large but that they hoped to get the whole gang TO / AFTER / BEHIND / IN bars before the end of the week. They warned however that the convict was dangerous and would go FOR / IN / OVER / TO any length to avoid being caught. Apparently the prisoner got out by stretching himself out TO / IN / FROM / AT full length and thus reaching the top of the wall, was then able to hoist himself ACROSS / OVER / FROM / BEFORE the wall. The other prisoners were IN / OUT / WITH / BY on all his plans and held AT / OFF / WITH / IN the guards until he was well ON / OFF / UNDER / BEYOND his way. The officer AT / ON / IN / WITH charge promised to look AT / ABOUT / INTO / FOR the matter.

Paragraph 2:

The old man wanted to set BY / DOWN / ASIDE / FOR an amount of money for a rainy day or perhaps put it TOWARDS / FOR / AT / ABOUT a new car. He and his wife were TO / OUT / IN / OF one mind about this but then they were led BY / THROUGH / WITH / ALONG their noses by an unscrupulous salesman who talked them INTO / OVER / FROM / TO buying a car which was much more expensive than they could afford. When they realised what they had let themselves AT / OUT OF / ABOUT / IN FOR they confronted the salesman but he was immediately UPON / UP IN / OUT OF / AT arms and told them that they had already entered UNDER / WITH / BY / INTO a contract and must abide THROUGH / WITH / BY / IN its stipulations. The couple decided to take the salesman TO / AT / IN / ON court.

Section B

Which word/phrase correctly completes the sentence?
Please circle the number next to the most appropriate word/phrase.

Anne . . . . . there since morning. She refuses to go out.
1. has been sitting
2. was sitting
3. had sat
4. is sitting

The boat . . . . . soon after it had sprung a leak.
1. is sunk
2. had sunk
3. sinks
4. sank

They will be surprised to know that it is . . . . . informed the police.
1. me that
2. she whom
3. I who
4. him what

Which underlined word/phrase is used wrongly in each group of sentences?
1. The farmer raises chickens and then sells it.
2. Catch that dog and lock it in the garage.
3. Peel the potatoes and boil them in the salt water.
4. The police pursued the suspicious-looking men and eventually arrested them.

1. It is he who helped us.
2. Whose is this? Is it yours?
3. Which do you prefer, these or those?
4. The children have dressed themself.

1. Would you mind my opening the window?
2. I don't approve of she reading my letters.
3. Did you give it back without his asking you?
4. The weather won't stop your playing the match.

Which underlined word/phrase is used wrongly in each paragraph?

Tourism is fast becoming a major industry. The slogan "Sunny South Africa" is often used to attract tourists. The beaches, holiday farms and the Kruger National Park is visited by thousands of tourists every year. South Africa has much to offer and the world is slowly coming to realise this.

The Sahara is a land exposed to soil erosion. The source of its problems are the soil itself. The lack of tress means there is no shade to prevent the sun from burning off the surface water. The earth dries up and the plant life dies.

That cities are growing at a startling rate is apparent to anyone watching the spreading rings of shanties and squatters' huts that surrounds virtually every major Third World city. Yet some cities manage to cope.

This grandfather clock is said to have belonged to an Austrian emperor. It has chimes for the last fifty years and will possibly continue to chime for the next fifty. It will be auctioned tomorrow after being cleaned.

APPENDIX 5

WAIS-III Answer Booklet and Test Instructions

WAIS-III Master's Research

Answer Booklet

Protocol Number: [ ]

Gender: [Male] [Female]

Age: [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Home Language: [English] [Xhosa] [Other African Language:]

Language at place of study or work: [English]

Schooling: [Private School] [DET]

Check that the 5 high school years were completed in the same category of school. [ ]

Where all 12 years of schooling completed in the same type of school: [Yes] [No]

If NO, give brief history of changes: ____________________

____

____

Educational Level: [Matric Only] [Graduate]

If Matric only, check that they do not intend to, nor have tried to study further. [ ]

Matric Symbol: [A] [B] [C] [D] [E] [F]

Matric Exemption: [Yes] [No]

Ever failed a year at school [Yes] [No]

If "Yes" when and why: ____________________

What have you done since leaving school (year by year): ____________________

____

____

____

____

____

____

1. Picture Completion

TIME LIMIT
20 seconds each item

REVERSE RULE
Score of 0 on Item 6 or 7, administer Items 1–5 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE
5 consecutive scores of 0

Item	Response	Score (0 or 1)
1.	Comb	
2.	Table	
3.	Face	
4.	Briefcase	
5.	Train	
START 6.	Door	
7.	Glasses	
8.	Pitcher	
9.	Pliers	

Item	Response	Score (0 or 1)
10.	Leaf	
11.	Pie	
12.	Jogging	
13.	Fireplace	
14.	Mirror	
15.	Chair	
16.	Roses	
17.	Knife	
18.	Boat	

Item	Response	Score (0 or 1)
19.	Basket	
20.	Clothing	
21.	Lockers	
22.	Cow	
23.	Tennis Shoes	
24.	Woman	
25.	Barn	
	Total Raw Score (Maximum = 25)	

2. Vocabulary

REVERSE RULE
Score of 0 or 1 on Item 4 or 5, administer Items 1–3 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE
6 consecutive scores of 0
DO ADDITIONAL ITEMS

SCORING RULE
All Items: 0,1, or 2 pts.

Item		Response	Score (0, 1, or 2)
1.	Bed		
2.	Ship		
3.	Penny		
START 4.	Winter		
5.	Breakfast		
6.	Repair		
7.	Assemble		

2. Vocabulary *(continued)*

Item	Response	Score (0, 1, or 2)
8. Yesterday		
9. Terminate		
10. Consume		
11. Sentence		
12. Confide		
13. Remorse		
14. Ponder		
15. Compassion		
16. Tranquil		
17. Sanctuary		
18. Designate		
19. Reluctant		
20. Colony		
21. Generate		
22. Ballad		
23. Pout		
24. Plagiarize		
25. Diverse		
26. Evolve		
27. Tangible		
28. Fortitude		
29. Epic		
30. Audacious		
31. Ominous		
32. Encumber		
33. Tirade		

Total Raw Score
(Maximum = 66)
(Include credit for items on previous page.)

Additional Items

34.	Negotiation		
35.	Marathon		
36.	Complicated		
37.	Financial		
38.	Virus		
39.	Illustrate		
40.	Vandalism		
41.	Superficial		
42.	Autobiography		
43.	Pandemonium		

3. Digit Symbol—
Coding
(previous page)

DISCONTINUE RULE
120 seconds
(or 4 rows)

Time Limit	120"
Completion Time	
Total Raw Score	Maximum=133

Digit Symbol—
Incidental Learning (Optional)
(Response Booklet)

DISCONTINUE RULE
Administer both rows

	Total Score
Pairing	Maximum=18
Free Recall	Maximum=9

Digit Symbol—
Copy (Optional)
(Response Booklet)

DISCONTINUE RULE
90 seconds

Time Limit	90"
Completion Time	
Total Raw Score	Maximum=133

4. Similarities

REVERSE RULE Score of 0 or 1 on item 6 or 7, administer items 1–5 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE [illegible] consecutive scores of 0

SCORING RULE Items 1–5: 0 or 1 point for each response. Items 6–19: 0, 1, or 2 points for each response. [illegible]

Item	Response	Score (0 or 1)
1. Fork–Spoon		
2. Socks–Shoes		
3. Yellow–Green		
4. Dog–Lion		
5. Coat–Suit		
START 6. Piano–Drum		(0, 1, or 2)
7. Orange–Banana		
8. Eye–Ear		
9. Boat–Automobile		
10. Table–Chair		
11. Work–Play		
12. Steam–Fog		
13. Egg–Seed		
14. Democracy–Monarchy		
15. Poem–Statue		
16. Praise–Punishment		
17. Fly–Tree		
18. Hibernation–Migration		
19. Enemy–Friend		

Total Raw Score (Maximum = 33)

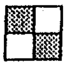
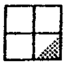
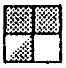
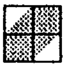
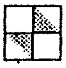
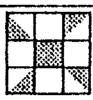
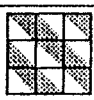
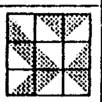
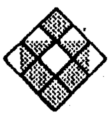
5. Block Design

REVERSE RULE
Score of 0 or 1 on Item 5 or 6, administer Items 1-4 in reverse sequence until two consecutive prefect scores are obtained

DISCONTINUE RULE
3 consecutive scores of 0

SCORING RULE
Items 1-6: 2 pts. for each correct design in Trial 1
1 pt. for each correct design in Trial 2
0 pts. for each incorrect design in Trials 1 & 2
Items 7-14: Circle the appropriate score up to a maximum of 7 pts.

EXAMINEE (Leave this column blank)

Design		Time Limit	Incorrect Design	Time in Seconds	Correct Design	Score (Circle the appropriate score for each design)				
1.		30"	Trial 1 Trial 2		Y N	0	Trial 2 1	Trial 1 2		
2.		30"	Trial 1 Trial 2		Y N	0	Trial 2 1	Trial 1 2		
3.		30"	Trial 1 Trial 2		Y N	0	Trial 2 1	Trial 1 2		
4.		30"	Trial 1 Trial 2		Y N	0	Trial 2 1	Trial 1 2		
START 5.		60"	Trial 1 Trial 2		Y N	0	Trial 2 1	Trial 1 2		
6.		60"	Trial 1 Trial 2		Y N	0	Trial 2 1	Trial 1 2		
7.		60"			Y N	0	16"-60" 4	11"-15" 5	6"-10" 6	1"-5" 7
8.		60"			Y N	0	16"-60" 4	11"-15" 5	6"-10" 6	1"-5" 7
9.		60"			Y N	0	21"-60" 4	16"-20" 5	11"-15" 6	1"-10" 7
10.		120"			Y N	0	36"-120" 4	26"-35" 5	21"-25" 6	1"-20" 7
11.		120"			Y N	0	66"-120" 4	46"-65" 5	31"-45" 6	1"-30" 7
12.		120"			Y N	0	76"-120" 4	56"-75" 5	41"-55" 6	1"-40" 7
13.		120"			Y N	0	76"-120" 4	56"-75" 5	41"-55" 6	1"-40" 7
14.		120"			Y N	0	66"-120" 4	46"-65" 5	36"-45" 6	1"-35" 7

EXAMINER

6. Arithmetic

REVERSE RULE
Score of 0 on item 5 or 6, administer items 1–4 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE
4 consecutive scores of 0

SCORING RULE
Items 1–18: 0 or 1 pt. for each response
Items 19–20: 0, 1, or 2 pts.

Problem	Time Limit	Completion Time in Seconds	Correct Response	Response	Score (0 or 1)	Problem	Time Limit	Completion Time in Seconds	Correct Response	Response	Score (0 or 1)
1.	15"		3			11.	30"		$10.50		
2.	15"		7			12.	60"		30¢		
3.	15"		5			13.	60"		$186.00		
4.	15"		2			14.	60"		10		
START 5.	15"		$9.00			15.	60"		$600.00		
6.	15"		$4.00			16.	60"		43		
7.	30"		5			17.	60"		$51.00		
8.	30"		$1.50			18.	60"		$49.50		
9.	30"		8			19.	60"		1 of 4 or 5 of 20		(0, 1, or 2) 0; 11"–60" 1; 1"–10" 2
10.	30"		$3.60			20.	120"		96		0; 11"–120" 1; 1"–10" 2

Total Raw Score (Maximum = 22)

7. Matrix Reasoning

REVERSE RULE
Score of 0 on item 4 or 5, administer items 1–3 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE
4 consecutive scores of 0 or 4 scores of 0 on 5 consecutive items

SCORING RULE
All items: 0 or 1 pt. for each response. Do not score Sample Items A–C.

Note. Correct response appears in ***bold italic.*** Administer Sample Items A–C to all examinees.

Item	Response Options (Circle one)						Score (0 or 1)
A.	1	***2***	3	4	5	DK	
B.	1	2	3	4	***5***	DK	
C.	1	2	3	***4***	5	DK	
1.	1	2	***3***	4	5	DK	
2.	1	2	***3***	4	5	DK	
3.	1	***2***	3	4	5	DK	
START 4.	1	***2***	3	4	5	DK	
5.	1	2	***3***	4	5	DK	
6.	***1***	2	3	4	5	DK	
7.	1	2	3	4	***5***	DK	
8.	***1***	2	3	4	5	DK	
9.	1	***2***	3	4	5	DK	
10.	1	2	3	***4***	5	DK	
11.	1	2	3	4	***5***	DK	
12.	***1***	2	3	4	5	DK	

Item	Response Options (Circle one)						Score (0 or 1)
13.	1	2	3	***4***	5	DK	
14.	1	2	***3***	4	5	DK	
15.	1	***2***	3	4	5	DK	
16.	1	***2***	3	4	5	DK	
17.	***1***	2	3	4	5	DK	
18.	1	2	3	4	***5***	DK	
19.	1	2	***3***	4	5	DK	
20.	1	2	3	***4***	5	DK	
21.	1	2	***3***	4	5	DK	
22.	1	2	***3***	4	5	DK	
23.	1	***2***	3	4	5	DK	
24.	***1***	2	3	4	5	DK	
25.	1	***2***	3	4	5	DK	
26.	1	2	3	4	***5***	DK	

Total Raw Score (Maximum = 26)

8. Digit Span

DISCONTINUE RULE
Digits Forward & Backward:
Score of 0 on both trials of any item.
For both Digits Forward & Backward, administer both trials of each item even if Trial 1 is passed. Administer Digits Backward even if examinee scores 0 on Digits Forward.

SCORING RULE
Each Trial: 0 or 1 pt. for each response
Item score = Trial 1 + Trial 2

Digits Forward Item	Trial	Item/Response	Trial Score	Item Score (0, 1, or 2)
START 1.	1	1-7		
	2	6-3		
2.	1	5-8-2		
	2	6-9-4		
3.	1	6-4-3-9		
	2	7-2-8-6		
4.	1	4-2-7-3-1		
	2	7-5-8-3-6		
5.	1	6-1-9-4-7-3		
	2	3-9-2-4-8-7		
6.	1	5-9-1-7-4-2-8		
	2	4-1-7-9-3-8-6		
7.	1	5-8-1-9-2-6-4-7		
	2	3-8-2-9-5-1-7-4		
8.	1	2-7-5-8-6-2-5-8-4		
	2	7-1-3-9-4-2-5-6-8		

Digits Forward Total Score (Maximum = 16)

Digits Backward Item	Trial	Item/Response	Trial Score	Item Score (0, 1, or 2)
1.	1	2-4		
	2	5-7		
2.	1	6-2-9		
	2	4-1-5		
3.	1	3-2-7-9		
	2	4-9-6-8		
4.	1	1-5-2-8-6		
	2	6-1-8-4-3		
5.	1	5-3-9-4-1-8		
	2	7-2-4-8-5-6		
6.	1	8-1-2-9-3-6-5		
	2	4-7-3-9-1-2-8		
7.	1	9-4-3-7-6-2-5-8		
	2	7-2-8-1-9-6-5-3		

Digits Backward Total Score (Maximum = 14)

Forward + Backward = (Maximum = 30)

9. Information

REVERSE RULE
Score of 0 on Item 5 or 6: administer Items 1-4 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE
6 consecutive scores of 0
DO ADDITIONAL ITEMS

SCORING RULE
All Items: 0 or 1 pt. for each response

Item	Response	Score (0 or 1)
1.	Saturday	
2.	Age	
3.	Ball	
4.	Months	
START 5.	Thermometer	
6.	Sunrise	
7.	Weeks	
8.	Hamlet	
9.	Brazil	
10.	MLK, Jr.	
11.	Civil War President	
12.	Cleopatra	
13.	Italy	
14.	Relativity	

9. Information *(continued)*

Item	Response	Score (0 or 1)	Item	Response	Score (0 or 1)
15. Olympics			22. Vessels		
16. Sahara Desert			23. Catherine		
17. Genesis			24. Continents		
18. Sistine Chapel			25.. Curie		
19. Gandhi			26. World Population		
20. Koran			27. Speed of Light		
21. Water			28. Faust		

Total Raw Score
(Maximum = 28)
(Include credit for items on previous page.)

Additional Items

29.	Bird		
30.	Two Oceans		
31.	Stethoscope		
32.	Oldest City		
33.	Picasso		
34.	Telephone		
35.	Mountain		
36.	Country		
37.	Biko		
38.	World War II		
39.	Mona Lisa		
40.	Transplant		

10. Picture Arrangement

DISCONTINUE RULE
4 consecutive scores of 0 starting with item 2

SCORING RULE
Item 1: 2 pts. for correct response on Trial 1
1 pt. for correct response on Trial 2
0 pts. for incorrect response on Trial 1 or Trial 2
Items 2–11: Circle the appropriate score up to a maximum of 2 pts.

Note: Letters in item names correspond to correct order for 2-point responses (e.g., for item 5, examinee must arrange cards in C-L-E-A-N order to score 2 points.)
Items 5–9 have possible 1-point responses.

Item (2 pts.)		Item (1 pt.)	Time Limit	Response Order	Completion Time in Seconds	Score (Circle One)
START 1. CAP	Trial 1		30"			0 1 2
		Trial 2	30"			
2. BAKE			45"			0 2
3. OPENS			60"			0 2
4. CHASE			60"			0 2
5. CLEAN		NCLEA	90"			0 1 2
6. HUNT		THUN	90"			0 1 2
7. SAMUEL/AMUELS		SALMUE	120"			0 1 2
8. LUNCH		LUCNH	120"			0 1 2
9. CHOIR		HCOIR	120"			0 1 2
10. DREAM			120"			0 2
11. SHARK			120"			0 2

Total Raw Score (Maximum = 22)

11. Comprehension

REVERSE RULE
Score of 0 or 1 on item 4 or 5, administer items 1–3 in reverse sequence until two consecutive perfect scores are obtained.

DISCONTINUE RULE
4 consecutive scores of 0
DO ADDITIONAL ITEMS

SCORING RULE
Items 1–3: 0 or 1 pt. for each response
Items 4–18: 0, 1, or 2 pts. for each response

Item	Response	Score (0 or 1)
1. Money		
2. Watches		
3. Clothes		
		(0, 1, or 2)
START 4. Envelope		
5. Food*		
6. Parole*		

* If the examinee replies with one idea, ask for a second response. Rephrase the test item saying, "Tell me another reason."

11. Comprehension *(continued)*

7. Child labor*	
8. Professional service	
9. Taxes	
10. History*	
11. Deaf	
12. Forest	
13. Jury*	
14. City land	
15. Marriage license	
16. Free press	
17. Swallow	
18. Shallow brooks	

Total Raw Score
Maximum = 33

Additional Items

19.	TV License		
20.	Legal*		
21.	Disaster		
22.	Make hay		
23.	Vessels		
24.	Defendant*		
25.	License		

12. Symbol Search

DISCONTINUE RULE
Discontinue after 120 seconds.

Time Limit	120"
Completion Time in Seconds	
Number Correct	
Number Incorrect	
Total Raw Score	Maximum = 60

13. Letter–Number Sequencing

DISCONTINUE RULE
After failure on all 3 trials of an item.

SCORING RULE
0 or 1 pt for each response.
Item score = Trial 1 + Trial 2 + Trial 3

	Trial	Item/Response	Trial Score (0 or 1)	Item Score (0, 1, 2, or 3)
1. START	1	L - 2 (2 - L)		
	2	6 - P (6 - P)		
	3	B - 5 (5 - B)		
2.	1	F - 7 - L (7 - F - L)		
	2	R - 4 - D (4 - D - R)		
	3	H - 1 - 8 (1 - 8 - H)		
3.	1	T - 9 - A - 3 (3 - 9 - A - T)		
	2	V - 1 - J - 5 (1 - 5 - J - V)		
	3	7 - N - 4 - L (4 - 7 - L - N)		
4.	1	8 - D - 6 - G - 1 (1 - 6 - 8 - D - G)		
	2	K - 2 - C - 7 - S (2 - 7 - C - K - S)		
	3	5 - P - 3 - Y - 9 (3 - 5 - 9 - P - Y)		
5.	1	M - 4 - E - 7 - Q - 2 (2 - 4 - 7 - E - M - Q)		
	2	W - 8 - H - 5 - F - 3 (3 - 5 - 8 - F - H - W)		
	3	6 - G - 9 - A - 2 - S (2 - 6 - 9 - A - G - S)		
6.	1	R - 3 - B - 4 - Z - 1 - C (1 - 3 - 4 - B - C - R - Z)		
	2	5 - T - 9 - J - 2 - X - 7 (2 - 5 - 7 - 9 - J - T - X)		
	3	E - 1 - H - 8 - R - 4 - D (1 - 4 - 8 - D - E - H - R)		
7.	1	5 - H - 9 - S - 2 - N - 6 - A (2 - 5 - 6 - 9 - A - H - N - S)		
	2	D - 1 - R - 9 - B - 4 - K - 3 (1 - 3 - 4 - 9 - B - D - K - R)		
	3	7 - M - 2 - T - 6 - F - 1 - Z (1 - 2 - 6 - 7 - F - M - T - Z)		

Total Raw Score (Maximum = 21)

14. Object Assembly

(Optional)

DISCONTINUE RULE
Do *not* discontinue.
Administer all items.

SCORING RULE
Enter time in seconds and enter number of correct junctures.
Apply time bonus and weighting and circle the appropriate score.

Item	Time Limit	Completion time in Seconds	Number of Correct Junctures	Multiply by	Score (Circle the appropriate score for each object. Completion time in seconds.)
START 1. Man	120"		(0-5)	1	0 1 2 3 4 5 6 7 8 21-120 16-20 11-15 1-10
2. Profile	120"		(0-9)	1	0 1 2 3 4 5 6 7 8 9 10 11 12 36-120 31-35 21-30 1-20
3. Elephant	180"		(0-8)	1	0 1 2 3 4 5 6 7 8 9 10 11 51-180 31-50 21-30 1-20
4. House	180"		(0-14)	$\frac{1}{2}$*	0 1 2 3 4 5 6 7 8 9 10 111-180 71-110 51-70 1-50
5. Butterfly	180"		(0-8)	1	0 1 2 3 4 5 6 7 8 9 10 11 111-180 76-110 51-75 1-50

* Round half scores up.

Total Raw Score (Maximum = 52)

Digit Symbol - Coding

1	2	3	4	5	6	7	8	9
—	⊥	⊐	∟	⊔	○	∧	×	=

Sample Items

2	1	3	7	2	4	8	2	1	3	2	1	4	2	3	5	2	3	1	4

5	6	3	1	4	1	5	4	2	7	6	3	5	7	2	8	5	4	6	3

7	2	8	1	9	5	8	4	7	3	6	2	5	1	9	2	8	3	7	4

6	5	9	4	8	3	7	2	6	1	5	4	6	3	7	9	2	8	1	7

9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	8	6

2	7	3	6	5	1	9	8	4	5	7	3	1	4	8	7	9	1	4	5

7	1	8	2	9	3	6	7	2	8	5	2	3	1	4	8	4	2	7	6

Digit Symbol - Incidental Learning

Pairing

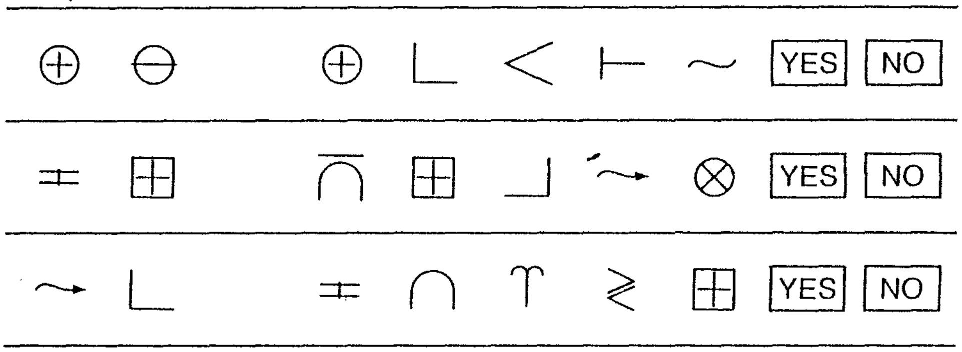
5	1	8	2	9	4	6	3	7

8	5	6	3	1	9	4	7	2

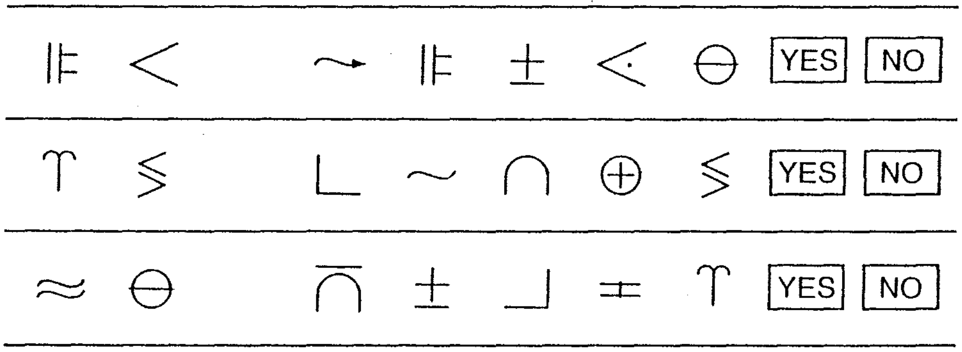
Free Recall

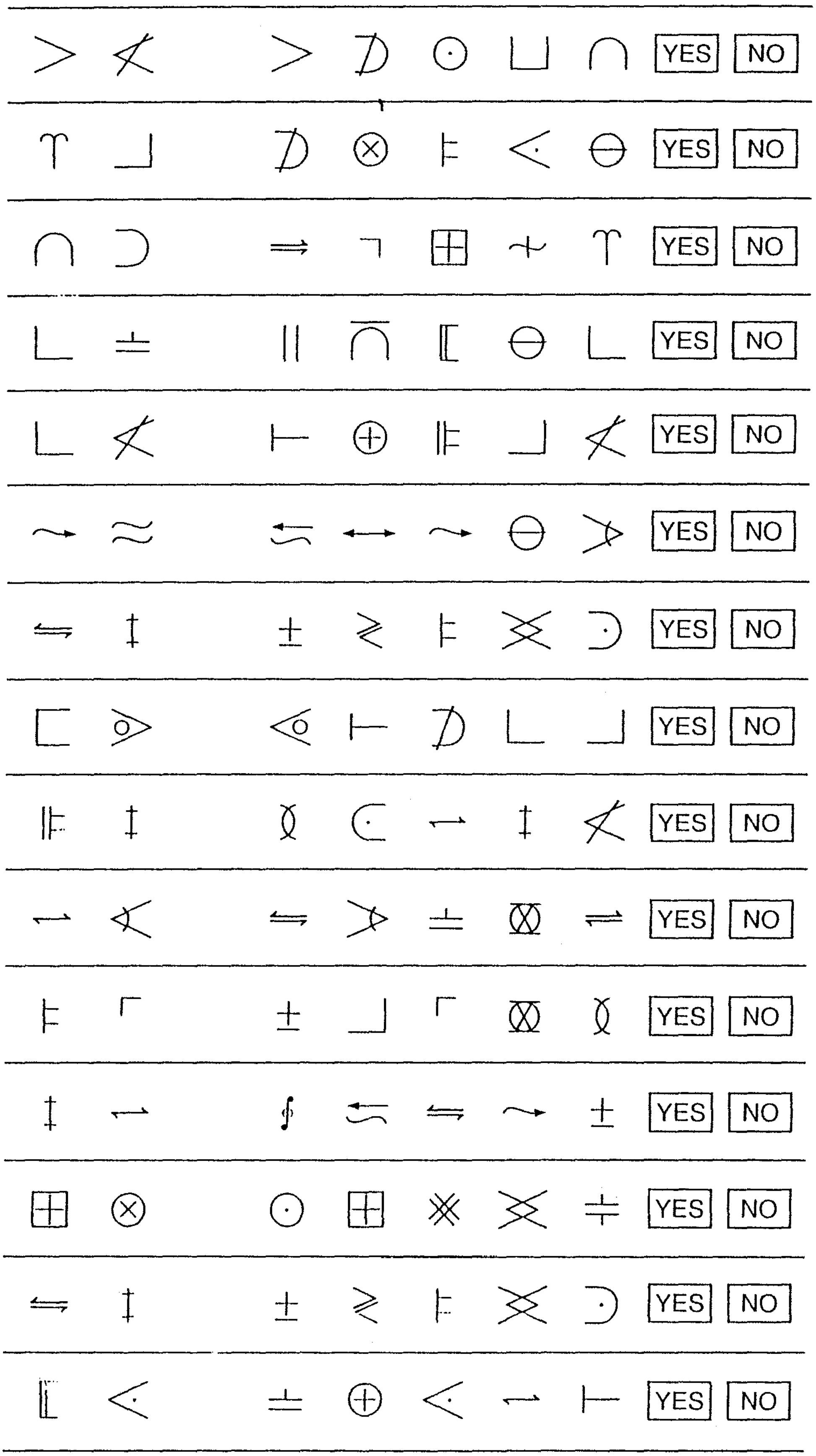
Symbol Search

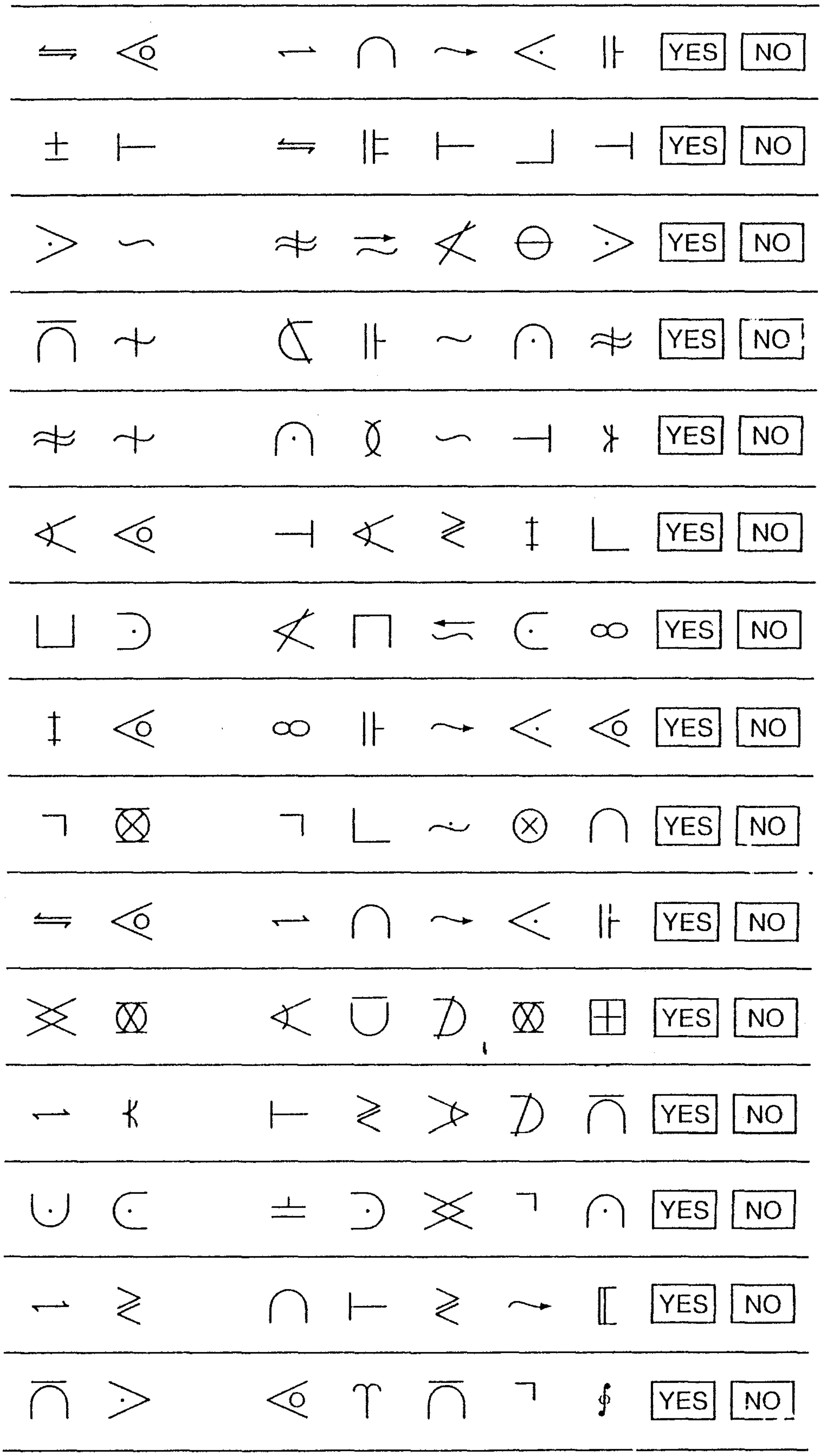
Sample Items



Practice Items




YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO


YES NO
YES NO
YES NO
YES NO
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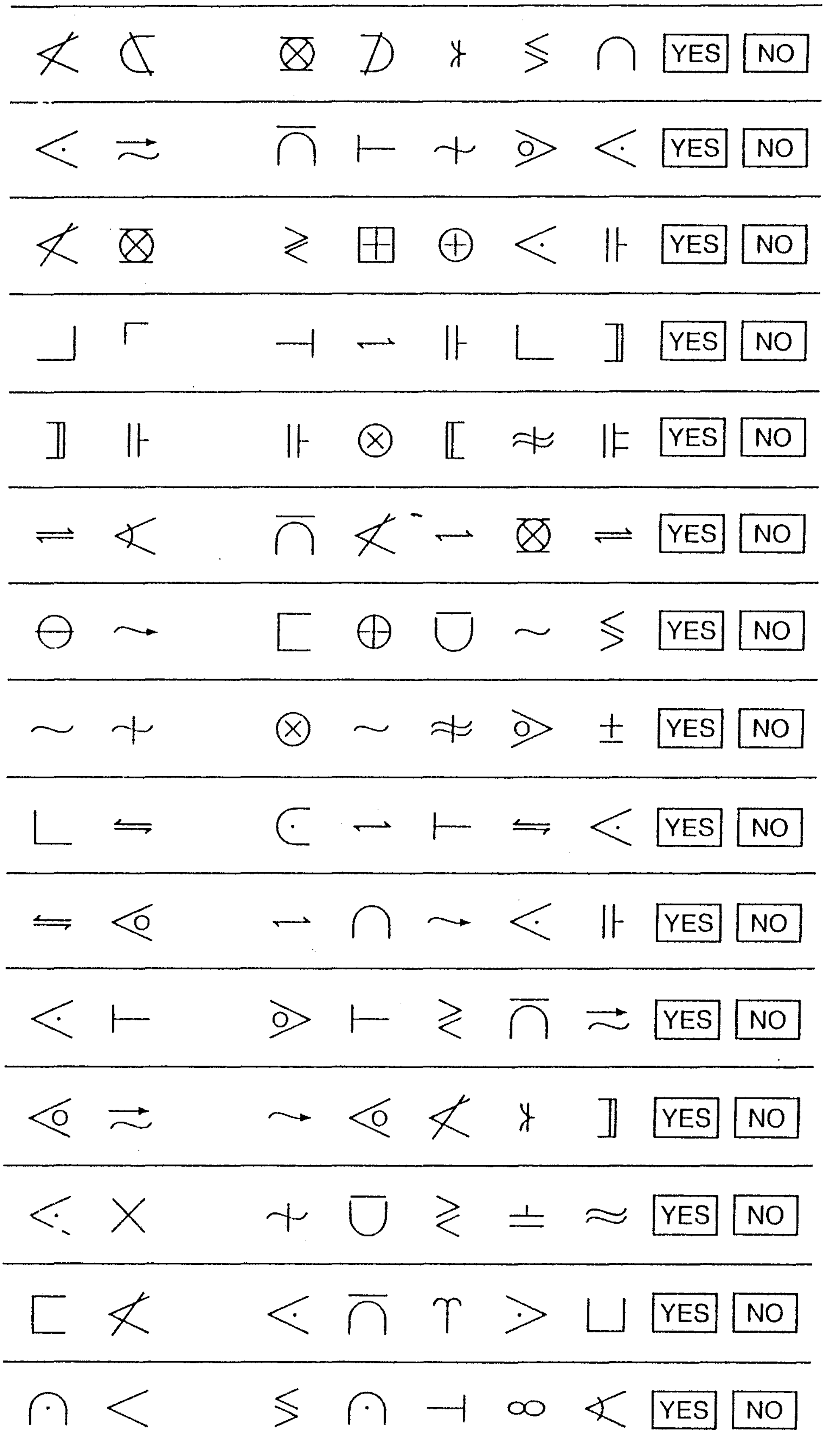
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO
YES NO


YES NO
YES NO
YES NO
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YES NO
YES NO
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YES NO
YES NO
YES NO
YES NO

⊞	≷	⊃·	⊗	⊕	±	⊞	YES	NO
⊧	‡	⌝	±	⊣	∩·	⤳	YES	NO
)(	⊂·	≷	‡	∢	⊄	⊗	YES	NO
⇌	⤳	≈	+	<	⤳	⊗	YES	NO
⊖	>	≯	⋖	⌟	⊅	⊕	YES	NO
⊂·	⊕	+	⊃·	⊗	⊂·	⥊	YES	NO
∪	⥢	ϒ	⊅	∟	⊕	⊞	YES	NO
⋖	∩̄	∩	⊢	∢	⋚	⌟	YES	NO
∓	⋇	±	≷	⊗	∼	⋚	YES	NO
∓	≄	⇉	≷	≎	∓	⊧	YES	NO
⊙	≈	⊗	≈	⟊	∼	=	YES	NO
⊗	∟	⊢	⊏	∼	⊕	∟	YES	NO
|⊂	⋚	⩹	⊅	∪̄	∩̄	∩·	YES	NO
⥲	⊣	∞	⊩	⤳	⊂·	⟷	YES	NO
∼	ϒ	⋖	⩹	⊕	∓	⥊	YES	NO

Symbol Copy

Samples

WAIS-III Master's Research

Scoring Sheet

Protocol Number:

		Age Adjusted Scaled Scores					
	Raw Score	VIQ	PIQ	VCI	POI	WMI	PSI
Picture Completion							
Vocabulary							
Digit Symbol							
Similarities							
Block Design							
Arithmetic							
Matrix Reasoning							
Digit Span							
Information							
Pic. Arrangement							
Comprehension							
Symbol Search			( )				
Let. Num. Sequencing		( )					
Object Assembly			( )				
Sum of Scaled Scores							
Index Scores (From Tables)							

Sum of Scaled Scores VIQ:	
Sum of Scaled Scores PIQ:	
Total:	
Full Scale IQ (From Table):	

Additional Scores:

Digit Symbol - Incidental Learning - Pairing	
Digit Symbol - Incidental Learning - Free Recall	
Digit Symbol Copy	
Vocabulary - Additional Items	
Information - Additional Items	
Comprehension - Additional Items	

Approximate Time Taken for the Protocol: ________________

INSTRUCTIONS

General Introduction

I'll be asking you to do a number of things today like giving some words definitions and solving a few number problems. You will find some of these tasks easy, whereas others may be more difficult. Also, most people don't answer every question correctly or finish every item, but please give your best effort on all of the items. Do you have any question?

1. Picture Completion

I am going to show you some pictures in which there is some part missing.
Look at each picture and tell me what is missing.

Item 6:
Now, look at this picture. What important part is missing?

Following Items:
Now, what is missing in this one?

If Item 6 is failed:
You see the door knob is missing.
If Item 7 is failed:
You see, the nose is missing.
No further teaching

If object named rather than missing part:
Yes, but what is missing ?
If part that is off the page is mentioned:
Something is missing in the picture. What is it that is missing?
If unessential missing part is mentioned:
Yes, but what is the most important part that is missing?

2. Vocabulary

Now we are going to do something different. In this next section, I want you to tell me the meaning of some words. Now listen carefully and tell me what each word I say means. Are you ready?
Tell me what _________ means.

Prompt with:
Tell me more about it. OR Explain what you mean.

DO ADDITIONAL ITEMS

3. Digit Symbol Coding

In this section, I'm going to ask you to copy some symbols.
Look at these boxes. Notice that each has a number in the upper part and a special mark in the lower part. Each number has its own mark.
Now look down here where the squares have numbers in the top part but the squares at the bottom are empty. In each of the empty squares, put the mark that should go there.
Like this. Here is a 2; the 2 has this mark. So I put it in the empty square, like this.
Here is a 1; the 1 has this mark, so I put it in this empty square.
This number is a 3; the 3 has this mark. So I put it in the square.
Now fill in the squares up to this heavy line.

Now you know how to do them. When I tell you to start, you do the rest of them.
Begin here and fill in as many squares as you can, one after the other without skipping any.
Keep working until I tell you to stop. Work as quickly as you can without making any mistakes.
When you finish this line, go on to this one. Go ahead!

If any are skipped:
Do them in order. Don't skip any. Do this one next.

Digit Symbol - Incidental Learning

Pairing

Now I want you to fill in all of the symbols you can remember that go with these numbers, one after another, across both rows. Tell me when you're finished

Free Recall

In this area, I'd like you to write down all of the symbols you can remember, in any order. Tell me when you have finished.

Copy

These marks are the same ones that you matched with numbers earlier. I'd like you to copy each mark into the empty box below it as fast as you can. Watch me first.
Now you do it up to this line.
Now you copy the rest of the marks as fast as you can until I tell you to stop. Ready? Begin.

4. Similarities

Okay, let's go on. In this section, I am going to read two words to you, and I want you to tell me how they are alike.
In what way are __________ and _____________ alike?

If response unclear or ambiguous:
What do you mean?
Tell me more about it.

If multiple acceptable answers:
Now which one is it?

5. Block Design (designs shown from your perspective)
Designs 1-5 : copy models made by examiner
Designs 6- 14: copy designs from book

Design 1-4:
Let's try a new one.
I am going to put these blocks together and make a design. Watch me.
Now make one just like this. Tell me when you are finished. Go ahead.

Trial 2:
Watch me again. Now, try it again and be sure to make it just like mine.

Design 5: (Demonstrate with your own set of blocks and leave them for examinee to see)
Now I am going to ask you to make some designs. you see these blocks? They are all alike.
On some sides they are all red; on some, all white; and on some, half red and half white.
I am going to put some blocks together to make a design watch me.
Now make one just like this. Tell me when you have finished.

Design 6: (use examinee's blocks to demonstrate and then scramble - and let them do it)
This time we are going to put blocks together to make them look like this picture. Watch me first.
You see, the tops of the blocks look the same as this picture.
Now look at the picture and make one just like it with these blocks. Tell me when you are finished. Go ahead.

If unsuccessful for Design 5 or 6 - Trial 2: (and then do 1-4 in reverse order till perfect scores for 2)
Watch me again. Now try to make it just like mine. Tell me when you are finished.

Design 7-9:
Now make one just like this. Try to work as quickly as you can. Tell me when you have finished.

Design 10-14:
Now make one just like this using nine blocks. Be sure to tell me when you are finished.

6. Arithmetic

Now we are going to switch tasks again. In this next section, I will ask you to solve some arithmetic problems.

1. Place 3 blocks, all red sides facing up, about 2cm apart, in front of the examinee.
   How many blocks are there all together?
2. Place 7 blocks, like for 1.
   How many blocks are there all together ?
3. Place 7 blocks and demonstrate:
   If you have 7 blocks and take away 2 blocks, how many do you have left?

4. If you have 3 books and give 1 away, how many do you have left?

5. How much is R4 plus R5?
6. If you buy R6 worth of oil and pay for it with a R10 note, how much change should you get back?
7. Cooldrinks are sold 6 to a pack. If you want 30 cans, how many packs must you buy?
8. Chewing gum costs 25c per pack. How much would it cost to buy 6 packs?
9. How many hours will it take a person to walk 24 kilometres at a rate of 3 kilometres per hour?
10. If you buy 7 20c mints and give the shop assistant R5, how much change should you get back?
11. If you have R18 and spend R7 and 50c, how much will you have left?
12. Maria bought 6 lollipops for R1,60. An additional 20 cents sales tax was added to this price. How much did she pay for each lollipop including sales tax?
13. The price of baskets is 2 for R31. What is the price of 1 dozen baskets?
14. What is the average of these numbers: 10, 5 and 15?
15. A family bought some second hand furniture for two-thirds of what it had cost new. They paid R400 for it. How much did it cost new?
16. A family travelled 215 kilometres in 5 hours. What was their average speed in kilometres per hour?
17. A T-shirt that normally sells for R60 is reduced by 15% during a sale. What is the price of the T-shirt during the sale?
18. Chris has twice as much money as Robert. Chris has R99. How much money does Robert have?
19. Linda had 8 yellow paper clips, 5 green paper clips, and 7 orange paper clips. She picked out one paper clip without looking. What was her chance of picking out a green paper clip?
20. If 8 machines are needed to finish a job in 6 days, how many machines would be needed to finish the job in half a day?

7. Matrix Reasoning

I am going to show you some pictures. For each picture, there is a part missing. Look at all aspects of each picture carefully and choose the missing part from the five choices.

Sample A:

For Example, tell me which of these pictures should go here. Make sure you carefully look at the picture on top and at the response choices below before making your selection. If you think there is more than one correct answer to the problem choose the best one. Remember, you are to choose the one that best completes the pattern.

If incorrect:

For this item, the missing part should complete the pattern by making the picture the same colour. See, this choice would best complete the pattern because the squares are all yellow.

Sample B:

Now tell me which of these pictures should go here. Again, make sure you carefully look at the picture at the top and at the pictures below before choosing your answer. If you think there is more than one correct answer to the problem, choose the best one.

If incorrect:

There are a number of ways you can solve this problem. For instance, you can look at the pictures separating them into two columns. Notice the pictures in the left column are the same. They are both the same shape, and they are both blue. Now look at the right column. One of the choices below will make the picture on the right column the same as well. See, this choice here would make the pictures in the right column both yellow circles.

Sample C:

Now tell me which of these pictures should go here.

If incorrect:

All the pictures at the top are circles, and each large circle is followed by a small one. Therefore, the small circle is the best answer.

Items 1-26:

Now tell me which of these pictures should go here.

8. Digit Span

Digits Forwards

I am going to say some numbers. Listen carefully, and when I am through, I want you to say them right after me. Just say what I say.

Digits Backwards

Now I am going to say some more numbers. But this time when I stop, I want you to say them backwards. For example, if I say 7-1-9, what do you say?

If incorrect:

No, you would say 9-1-7. I say 7-1-9, so say it backwards, you would say 9-1-7. Now try these numbers. Remember, you are to say them backwards: 3-4-8

9. Information:

Now I am going to ask you some questions, and I would like you to tell me the answers.

If answer incomplete or unclear:

Explain what you mean OR Tell me more about it.

1. What is the day that comes after Saturday?
2. How old are you?
3. What is the shape of a ball ?
4. How many months are there in a year ?
5. What is a thermometer ?
6. In what direction does the sun rise ?
7. How many weeks are there in a year ?
8. Who wrote Hamlet ?
9. On what continent is Brazil ?
10. Who was Martin Luther King, Jr. ?
11. Who was President of the United States during the Civil War ?
12. Who was Cleopatra ?
13. What is the capital of Italy ?
14. Whose name is usually associated with the theory of relativity ?
15. In what country did the Olympic Games originate ?
16. On what continent is the Sahara Desert ?
17. What is the main theme of the Book of Genesis ?
18. Who painted the Sistine Chapel ?
19. Who was Mahatma Gandhi ?
20. What is the Koran ?
21. At what temperature does water boil ?
22. Name three kinds of blood vessels in the human body ?
23. Who was Catherine the Great ?
24. Name all the continents.
25. What was Marie Curie famous for ?
26. What is the world population ?
27. What is the speed of light ?
28. Who wrote Faust ?

DO ADDITIONAL ITEMS:

29. Name the largest living bird on earth.
30. Between which two oceans does South Africa lie ?
31. What is a stethoscope ?
32. Name the oldest city in South Africa.
33. What do Picasso, Michelangelo and Van Gogh have in common ?
34. Who invented the telephone ?
35. Which mountain range is the highest on earth ?
36. Who wrote "Cry the Beloved Country" ?
37. Who was Steve Biko ?
38. On which side did South Africa join World War II ?
39. Who painted the Mona Lisa ?
40. Who performed the world's first human heart transplant ?

10. Picture Arrangement

In this section, I am going to give you a group of cards that are in the wrong order. Put them together so that they tell a story that makes sense.

Item 1:

These pictures tell a story about a worker building a house, but they are in the wrong order. Put them in the right order so they will tell a story that makes sense.

In incorrect - Trial 2:

These pictures are about a worker building a house. The first one shows when work is just beginning on the house, the next one shows the house partly built, and the last one shows the house finished and being painted.
Now put the cards in the right order.

Items 2-11

I have some more sets of pictures for you to arrange. In each case, they are mixed up, and you are to put them in the right order so they make the most sensible story. Work as quickly as you can and tell me when you have finished

11. Comprehension

Now I am going to ask you to tell me some solutions to everyday problems or social concerns.

Can prompt with:

Explain what you mean OR Tell me more about it OR Tell me another reason.

1. What do people use money for ?
2. Why do people wear watches ?
3. Why do people wash clothes ?
4. What is the thing to do if you find an envelope in the street that is sealed, addressed, and has a new stamp on it ?
5. Tell me why many foods need to be cooked ?
6. Tell me some reasons that we have a parole system.
7. Tell me some reasons why child labour laws are needed.
8. Why does the state require people in some professions to obtain licenses before offering services to the public ?
9. Why should people pay taxes ?
10. Tell me some reasons it is important to study history
11. Why do people who are born deaf have trouble learning to talk ?
12. If you are lost in the forest in the daytime, how should you go about finding your way out?
13. What are some reasons a defendant would choose to be tried by a jury of peers ?
14. Why does land in the city cost more than land in the country?
15. Why does the state require people to get a license before they get married ?
16. Why is the free press important in a democracy?
17. What does this saying mean ? "One swallow doesn't make a summer."
18. What does this saying mean? "Shallow brooks are noisy".

DO ADDITIONAL ITEMS:

19. Tell me why one should be paying for a television license ?
20. Tell me some reasons why one would prefer to have a legal representative in court ?
21. When is an area declared disaster area ?
22. What does this saying mean: "Make hay while the sun shines" ?
23. What does this saying mean: "Empty vessels make the most noise" ?
24. What are some reasons a defendant would choose to be tried in a court of law ?
25. Tell me why all drivers must have a valid driver's license ?

12. Symbol Search

In the next task, I want you to look at two target shapes. Then see if you can find either one of them in the group of shapes next to them.

Sample Item 1:

Look over here. Notice there are two shapes on the left side and a group of shapes on the right side.

You are to mark the "YES" box if one of these shapes on the left side is the same as any of the shapes from the group on the right side.

For example, this shape here is the same as this shape here, so I will mark the "YES" box like this.

Sample Item 2:

For this second item, this shape here is the same as this shape here, so I will mark the "YES" box like this.

Sample Item 3:

Mark the "NO" box if none of the shapes on the left side is the same as any of the shapes from the group on the right side. In this case, none of the shapes here is in this group over here, so this time I will mark the "NO" box like this.

Practice Items:

Now you do these here. Go ahead.

If correct:

Good / Correct / Now you know what to do.

If incorrect:

That is not quite right.

Look here. Here is the shape. Now look over here. Here is the same shape. The shape is the same, so you mark the "YES" box.

OR Look here are the two shapes, but when we look over here, none of the shapes is the same. The shapes are not the same, so you would mark the "NO" box.

Items 1-60:

When I tell you to start, you do these the same way. Begin here and do as many as you can.

When you finish the first page, go on to the next page and so on.

Most people don't do all of them. Work as quickly as you can without changing your answers.

Don't skip any items and don't stop until I tell you to do so. Any questions?

Okay, Ready, Begin!

13. Letter-Number Sequencing

I am going to say a group of numbers and letters. After I say them, I want you to tell me the numbers first, in order, starting with the lowest number. Then tell me the letters in alphabetical order. For example, if I say B-7, your answer should be 7-B. The number goes first, then the letter. If I say 9-C-3, then your answer should be 3-9-C, the numbers in order first, then the letters in alphabetical order. Let's practice.

Practice Items:

6-F	(6-F)
G-4	(4-G)
3-W-5	(3-5-W)
T-7-L	(7-L-T)
1-J-A	(1-A-J)

14. Object Assembly:

Now I want you to put some puzzles together for me.

Item 1:

If you put these pieces together the right way, they will make something. Go ahead and put them together as quickly as you can. Tell me when you are finished.

If incorrect:

See, it goes like this.

Items 2-5:

Now put these pieces together as quickly as you can. Tell me when you have finished.