

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND TO THE RESEARCH

Several researchers have evaluated the extent to which the Jungian cognitive paradigm modelled by the Myers-Briggs Type Inventory (MBTI) may reflect cognitive ability and more specifically, cognitive style (McCaulley & Myers, 1985). This study, is in part, an extension of the research by Richter (1992) and Hardijzer (2000), who found only limited correlations between the Cognitive Process Profile (CPP) and the Myers-Briggs Type Inventory (MBTI). They suggested that there were a number of intervening variables impacting on the relationship between the MBTI constructs and cognitive complexity as defined by the CPP. Since these studies were completed, the CPP has undergone a number of developments, included amongst these, an increase in the norm group, an increase in the technological sophistication of the tool, and a refinement of the scoring process. A number of cognitive styles that were initially included in the range of styles as depicted by the CPP have also been removed. The samples utilised in the study by Hardijzer (2000) were taken from a financial institution and included a predominance of ESTJ types whereas the sample for the present study consists of a group of individuals, across a range of job levels whose predominant work focus is sales. Finally, the study by Hardijzer (2000) looked only at the relationship between cognitive style and personality type (rather than the range of CPP constructs).

Given this, earlier work is reflected and built upon by:

- re-examining the relationship between cognitive processes / competencies (i.e. the performance processes used to manage task material) and personality.
- re-examining the relationship between cognitive styles (i.e. a person's general approach to problem solving – particularly in new and unfamiliar situations) and personality.
- determining whether a relationship exists between work-related processing aspects (e.g. indicating the levels of work complexity an individual is cognitively equipped to deal with) and personality.

In light of the above, despite a number of studies examining the empirical links between personality and cognition, the theoretical integration of these two constructs remains largely unexplored and inconclusive. According to Das, Naglieri and Murphy (1995) there is a certain relationship between cognition and personality in that the term personality includes both intellectual and non-intellectual aspects of personality. Huitt, (as cited in Gaffner & Hazler, 2002) suggests that personality type dimensions such as those measured by the MBTI have been suggested as potentially related to problem-solving and decision making. Furnham and Stringfield (1993) in their study, found that MBTI personality factors related to reliable, behavioural ratings of manager's actual managerial practices (innovation, direction, support, decision making, planning, commitment, and participation). Whilst this is only a review of some of the available literature, there is much literature that suggests that personality and cognition are separate constructs and should not be viewed interchangeably.

1.2 PROBLEM STATEMENT

Measures of cognitive ability serve so many selective purposes of our society that tests have become the gatekeepers to educational and occupational opportunities. In turn, several studies have shown a correlation between cognitive ability and personality, amongst these, studies indicating a correlation between personality and tolerance for ambiguity (Grace, 1997), individual-difference measures and the need for cognitive closure (Webster & Kruglanski, 1994), personality type, hemispheric dominance and cognitive style (Hartman, Hylton & Sanders, 1997), personality and the ability to perceive and assimilate data, make decisions and solve problems (Coetzee & De Boer, 2000).

The MBTI in particular has become associated with academic achievement and intelligence (Sak, 2004). In fact, McCaulley and Myers (1985) assert that the possibility of being a given personality type, increases as academic giftedness increases and that type is related to high intellectual capacity and high academic achievement in one or more areas.

As a result, there seems to be a trend in which human resource practitioners and psychologists either infer cognitive ability from personality, or utilise personality measures as a means of determining cognitive constructs. For example,

- MBTI “Thinking” types are seen to be analytical, logical problem solvers whilst MBTI “Feeling” types are seen to be less decisive, less structured and more concerned with making decisions based on emotion (Briggs & Briggs-Myers, 1998).
- MBTI “Judging ” types are seen to be organised, planful, systematic , attentive to detail and comfortable making quick judgments (decisions) whereas MBTI “Perceiving” types are seen to be unstructured, less organised, inattentive to detail and open-ended in their decision making (Briggs & Briggs-Myers, 1998).
- MBTI “Sensing” types are seen to be factual and concrete, attentive to detail and practical whereas MBTI “Intuitive” types are seen to be strategic, abstract, theoretical and future-oriented (Briggs & Briggs-Myers, 1998).
- MBTI “Extravert” types are seen to be experiential learners whereas MBTI “Introvert” types are seen to be reflective learners (Briggs & Briggs-Myers, 1998).

On the basis of a small sample of colleagues, Hardiman (as cited in Coplien, Kerth & Weinberg, 1998) theorised that MBTI preference indicates success in a job. However, Coplien, Kerth and Weinberg (1998) disagree with this and state that despite the vast amount of research and data that has gone into validating the MBTI, there is no evidence that type preference predicts ability or success.

It would seem that there are no clear research indications that personality and cognition is related, or that cognitive styles predict cognitive performance dimensions as measured by the MBTI. There is also very little differentiation in terminology between the constructs (perhaps adding to the confusion) for example, in his article, Lemire (2000) makes reference to "learning styles" as one of a related group of constructs, such as learning style, cognitive style, and personal style, when other literature seems to define these as different constructs. Doyle, Radzicki, Rose and Scott-Trees (1997) state that there is a plethora of literature and research related to cognitive styles but that what has been written reveals how unsettled the field seems to be. They go on to say that terminology is not consistent and that there exists a wide assortment of competing instruments used to elicit cognitive styles. They refer to the MBTI as a cognitive style assessment rather than an assessment of personality.

Grabowski and Jonassen (1993) state that cognitive abilities refer to the content and level of cognitive activity whereas style, refers to the manner and form of learning. Abilities specify

the competencies, the mental operations, and the kind of information being processed, whereas styles are stated in terms of propensities.

The question thus remains, do personality constructs measure aspects of cognitive ability (be it judgment, attention to detail, planning, organizing etc.) and does preference equate to performance. Should an individual have a natural preference in one area, does this necessarily indicate capability? Black (1994) states that personality measures (of which the MBTI would be one) are a form of psychological testing used for screening job applicants and for making promotion and other job-related decisions. However, he believes that these tests measure motivational, emotional, interpersonal and attitudinal characteristics and are not concerned with cognitive ability. Chamorro-Premuzic and Furnham (2004) state that without undermining the importance of intellectual ability in human performance, research in the last ten years has yielded important evidence for the significant predictability of academic performance by personality traits. They go on to say that at a psychometric level, there is a significant relationship between personality traits and both 'actual' intelligence and test performance.

1.3 AIM OF THE RESEARCH

The primary aim of the research is to investigate the possible relationship between cognition, in terms of style, processes and work complexity (determined by the CPP) and personality (determined by the MBTI).

1.3.1 Primary aims

- Theoretical aims:
 - to conceptualise cognition
 - to conceptualise personality
 - to determine whether a theoretical relationship exists between cognition (particularly those aspects of cognition as defined by the CPP) and personality

- Empirical aims:
 - to determine whether a relationship exists between cognitive styles (i.e. a person's general approach to problem solving, particularly in new and unfamiliar situations) and personality
 - to determine whether a relationship exists between cognitive processes / competencies (i.e. the performance processes used to manage task material) and personality
 - to determine whether a relationship exists between work-related processing aspects (e.g. indicating the levels of work complexity an individual is cognitively equipped to deal with) and personality

1.3.2 Secondary aims

A secondary aim of the current study is to discuss the possibility of generalising findings on the MBTI to cognitive abilities and cognitive style. Recommendations will also be made in line with the findings from both the primary and secondary aims in terms of the utility of the MBTI and the CPP in recruitment, selection and development settings.

1.4 PARADIGM PERSPECTIVE OF THE RESEARCH

With reference to the paradigm perspective of the research, the relevant paradigm, the metatheoretical statements, the intellectual resources and the methodological assumptions will be discussed.

1.4.1 Relevant paradigms

The word paradigm according to Kuhn (as cited in Hergenhahn, 1992) refers to a thought pattern in any scientific discipline or other epistemological context and tends to define :

- what is to be observed and scrutinised,
- the kind of questions that are supposed to be asked and probed for answers in relation to the subject,
- how these questions are to be put,

- how the results of scientific investigations should be interpreted.

A paradigm is a viewpoint that is commonly shared by most members of a science and suggests a shared set of assumptions or beliefs about their subject matter.

The design of the MBTI is based upon Carl Jung's theories of psychological types (Folger, Kanitz, Knudsen & Mchenry, 2003) which is in turn, rooted in the psychodynamic paradigm, and more specifically, the school of analytical psychology.

The integrated literature study will thus be presented from the cognitive–developmental psychological paradigm (for the study on cognition) and the psychodynamic paradigm, and more specifically, the analytical psychology paradigm (for the study on personality).

In terms of application, the research will focus on psychology and industrial psychology. Given this, the focus of the literature survey will be cognitive and analytical psychology and the focus of the empirical study will be psychometrics and statistical analysis :

Industrial psychology: according to Weiten (1992), Industrial psychology is also referred to as organisational psychology and encompasses a wide variety of tasks in the world of business and industry. Included amongst these is the organisation and management of human resources departments, a focus on improving workplace morale and productivity, striving to increase job satisfaction and productivity, examining organisational structures and procedures and making suggestions for organisational change and improvement.

Cognitive psychology: Das, Naglieri and Murphy (1995) state that the central concern of cognitive psychology is the development and representation of knowledge. They also suggest that contemporary interest in cognitive psychology can be traced to the theories of information processing, the psychological studies of attention, and the study of problem solving. Weiten (1992) summarises cognitive psychology as encompassing a focus on higher mental processes such as memory, reasoning, information processing, language, problem-solving, decision making and creativity. In essence, cognition is then defined as the process or system through which this occurs. Bourne, Dominowski, Loftus and Healy (1986) trace the history of cognitive psychology and indicate how contributions from a large number of

disciplines in the 1940's and 1950's culminated in the emergence of cognitive psychology in the early 1960's. They conclude by stating that cognition, cognitive processes and cognitive structures are the dominant theoretical ideas in psychology today.

Analytical psychology: According to Weiten (1992), analytical psychology is a school of depth psychology based upon the movement started by Carl Jung and his followers and distinct from the Freudian-dominated psychoanalysis. It is based on the concept that we are not aware of our personal unconscious and its' concomitant forces and processes.

1.4.2 Theoretical models

The literature review on cognition will be presented from a cognitive-psychological perspective with the aim of integrating and assessing a number of theories applicable to this domain.

The literature survey on personality will be presented from the analytical psychology school of thought (and more specifically, the theory of personality type) as conceptualised by Jung (Bilsker, 2002).

1.5 RESEARCH DESIGN

The following section provides an overview of the research variables, the type of research and reliability and validity indicators for the current study.

1.5.1 Research variables

Weiten (1992) refers to the independent variable as the condition or event that the researcher varies in order to see its impact on another variable. The dependant variable on the other hand is the variable that is thought to be affected by manipulation of the independent variable (Weiten, 1992). The independent variable for the current research is personality, whereas the dependant variable is cognition.

1.5.2 Type of research

The research report entailed both an exploratory literature review as well as a quantitative empirical study that investigated the relationship between the independent variable (personality) and the dependent variable (cognition) (Weiten, 1992). Hypotheses were tested by means of a measurement of the variables and a statistical analysis of the results.

1.5.3 Reliability and Validity

Mouton and Marais (1990) state that the primary aim of any research design is to plan and structure a given research project in such a way as to ensure maximal internal and external validity.

Leedy (1993) defines internal validity as the freedom from bias in forming conclusions in view of the data. He expands this by stating that internal validity seeks to ascertain that changes in the dependant variable are the result of the influence of the independent variable rather than the manner in which the research was designed. External validity on the other hand is concerned with the generalisability of the conclusions reached through observation of a sample to that of the universe.

Reliability in essence, refers to accuracy and asks the question; how accurate are the instruments being used in making the proposed measurements (Leedy, 1993).

According to Mouton and Marais (1990) the main consideration in the process of data collection, is that of reliability or the requirement that the application of a valid measuring instrument to different groups, under different sets of circumstances should lead to the same conclusions. The authors state that the reliability of the data is thus influenced by the researcher, the participants, the measuring instruments and the research context.

In this research, internal validity on a contextual level is ensured through the use of theories that have been chosen in a representative manner and are presented in a standardised format. Furthermore, in accordance with the literature by Mouton and Marais (1990) all variables have been carefully considered with the aim of ensuring validity and reliability.

1.6 RESEARCH METHODOLOGY

The research was conducted in two phases, each with specifically defined steps.

1.6.1 Literature review

The relevant theory and literature pertaining to the constructs was reviewed as follows:

- **Step one – Cognition**

Cognition is conceptualised within the cognitive–developmental psychological paradigm and based on a review of different theoretical elements advanced by various theorists and researchers.

- **Step two – Personality**

Personality is conceptualised within the psychodynamic paradigm and based on a review of analytical psychology.

1.6.2 Steps followed in the Quantitative study

- **Step one - Selection of the sample**

The sample under consideration consists of 100 individuals from a team collectively responsible for sales and marketing.

- **Step two - Discussion and justification of the method of measurement**

The method of measurement is discussed and substantiated to ensure that specific concepts relevant to the research were measured. The MBTI demonstrates its applicability in understanding how individuals process information, make decisions, and solve problems (Folger et al. 2003) and in line with the research question, is often seen as overlapping with

elements of cognition, particularly that of cognitive style. The CPP was included as a tool in the study because of its thorough assessment of thinking skills and orientations. The cognitive constructs and styles also overlap significantly with a number of the personality types as described by the MBTI.

- **Step three - Data gathering**

Personality and cognitive data was gathered by means of standardised measuring instruments.

- **Step four - Data processing**

Data was processed by means of statistical analysis, the hypotheses were as follows:

- H0: there is no significant relationship between the constructs measured by the CPP and those measured by the MBTI.
- H1: there is a significant relationship between the constructs measured by the CPP and those measured by the MBTI.

- **Step five - Reporting and interpretation of results**

The results were presented graphically in order to compile a holistic picture of the findings. The results were integrated with the literature study to compile interpretations.

- **Step six - Conclusion**

The conclusions were based on the results and presented per specified aim.

- **Step seven - Discussion of the limitations of the research**

The relevant limitations were discussed with reference to the literature review and to the quantitative study.

- **Step eight - Recommendations**

Recommendations were formulated with reference to the literature review, the quantitative study as well as the broader industrial psychology context.

1.7 OVERVIEW OF CHAPTERS

- Chapter two - consists of a comprehensive literature study incorporating an historical overview of cognitive psychology and its historical roots, a clarification of the concepts associated with cognitive psychology, and the integration of the various concepts and approaches. The chapter is concluded with an overview of the CPP, its related constructs and motivating choice for the use of the CPP in the study.
- Chapter three - consists of a comprehensive literature study incorporating an historical overview of personality psychology, the concept of personality and general definitions of personality. The chapter then continues with particular focus on the analytical psychology school of thought, Jung's personality theory, and the extension of Jung's theory to the MBTI. The final aspect of the chapter details an overview of personality type as defined by Jung and integrated into the MBTI as well as a motivation for utilising this assessment tool in the study.
- Chapter four - covers an integration of the relationship between personality and cognition as well as an overview of past research on the relationship between the two constructs.
- Chapter five - consists of a discussion of the research design and the planning and operationalisation of the variables.
- Chapter six - Empirical results are reported and interpreted
- Chapter seven - Conclusions and recommendations are made and the limitations of the research are discussed

1.8 CHAPTER SUMMARY

In Chapter one, the background to the research was discussed and the problem statement, aims, paradigm perspective, research design, research methodology and chapter divisions were presented.

CHAPTER 2

COGNITION

Chapter two, which represents the first part of the literature study, focuses on cognition and its historical roots as well as definitions of the concepts related to cognitive psychology. A brief history of the Differential, Information processing, Contextualist, Developmental and Psychophysiological approaches to cognition will be discussed with reference to the integrated CPP model. Past and present conceptualisations of cognition will also be integrated in an attempt to provide a platform to understanding cognitive assessment and more specifically, the CPP.

2.1 INTRODUCTION

Gillespie (1992) summarises much of the history of psychology and suggests that most historians consider psychology's "golden age" to have occurred between 1930 and 1960. At the time, psychology was centered on the methods and concepts of behaviorists in search of the laws that govern behavior. By the 1960s, however, in stark criticism of the behaviourist approach, cognitive psychologists began to focus on and explore what behaviourism had always considered the unobservable and unscientific. Slowly, the cognitivists, opened up psychology to the study of common experiences such as problem solving, by attempting to understand the complex mental processes underlying behaviour. Hergenhahn (1992) states that there is in fact, no better example of how developments outside of psychology can and have influenced the field as much as cognitive psychology. By the 1970's, cognitive psychology had become institutionalised as mainstream academic psychology and by the 1980's, the shift from behaviourism to cognitivism was considered a revolution in scientific paradigms (Gillespie, 1992).

Prinsloo (1998) highlights that the new cognitive approach enabled researchers to focus on the internal states and processes that individuals experience whilst performing cognitive tasks. The collection of data, in turn, enabled the development of a number of processing models.

According to Hergenhahn (1992) cognitive psychology assumes the existence of cognitive events and is concerned with bringing back the mind-body problem into psychology. It is

predominantly concerned with studying cognition and the mental processes that are hypothesised to underlie behaviour. It covers a broad range of research domains, examining questions about the workings of memory, attention, perception, knowledge representation, reasoning, creativity and problem solving (Das, Naglieri & Murphy 1995). The authors suggest that interest in cognitive psychology began with information processing and the psychological studies of attention and problem solving, with particular attention to problem solving as a part of the broader category of planning behavior at the top of a hierarchy of cognitive activities (Das, 1995). Holistically, Das (1995) suggests that cognitive psychology is concerned with human information processing and is related to studies of individual differences in cognition. It is also different from previous psychological approaches, particularly that of behaviourism, in that it accepts the use of the scientific method and posits the existence of internal mental states.

Lubinski (2002) states that the last two decades of research in psychology have witnessed many ambitious examinations of cognitive ability measures and the constructs they assess, with particular focus on the construct of general intelligence (g). However, he agrees that the discourse has also extended into cognitive abilities beyond (g) and that psychologists and researchers have battled to fully integrate the dimensionality and psychometric organisation of the resulting array of intellectual and cognitive components, definitions and concepts.

Currently, cognitive psychology encompasses the subdisciplines of the differential approach, the information processing approach, artificial intelligence and neuroscience (Prinsloo, 1998) and is predominantly a reaction to radical behaviourism (Hergenhahn, 1992). According to Das (1995) the current central concern of cognitive psychology in general, is the development and representation of knowledge which has its roots in information processing and the psychological studies of attention and problem solving. In summary, the field includes a number of approaches to studying mental processes and intelligence (Prinsloo, 1998). Pardo and Sternberg (1998) summarise the major areas of specialisation within cognitive psychology as:

- The study of **perception** and perceptual abilities, which all constitute a major part of both older and more recent psychometric theories of intelligence.
- **Memory**

- **Mental representation** and the formation, manipulation, and retrieval of mental representations
- **Language** – the authors state that linguistic abilities have appeared in most major theories of intelligence, albeit under different names, such as "crystallized abilities", "verbal-comprehension", "verbal-fluency" and "linguistic intelligence".
- The study of thinking, reasoning, and problem solving.

Pardo and Sternberg (1998) also state that in essence, cognitive psychology is about aspects of intelligence as defined by both traditional and modern theories, is represented by test items in many tests of intelligence, and contain tasks whose measures correlate positively with scores on tests of intelligence.

Prinsloo (1995) states that so many theoretical models of intelligence, problem solving and reasoning have been proposed, yet all, in one way or another, overlap considerably. She also mentions that despite a marked history and significant research, the emergent problem solving models all contain a number of shortcomings. She suggests the need for theory building, and particularly, the development of parsimonious models with practical utility.

Prinsloo (2000) proposed a theoretical model that has significantly contributed to the development of a nomological network with regards to cognitive processing. This model has in time, evolved into the CPP, or more specifically, the Cognitive Process Profile. Whilst not the immediate focus, the specific roots of cognitive psychology are particularly relevant to her model and the historical roots that are discussed in the following section, have all contributed, in some way or another, to the development of her theoretical model. Given this, the specific roots are not all-inclusive, but merely incorporate an overview of the theory that is relevant.

2.2 SPECIFIC HISTORICAL ROOTS OF COGNITIVE PSYCHOLOGY

The following section serves to provide an overview of the numerous researchers and research paradigms that have contributed to the development of cognitive psychology.

2.2.1 The differential / IQ approach

The differential approach (also referred to as the structural / psychometric approach) according to Boodoo, Bouchard, Boykin, Brody, Ceci, Halpern, Loehlin, Neisser, Perloff, Sternberg and Urbina (1996) was prevalent during the first half of the 20th century and aimed to identify and study the nature of intelligence and to thereby reveal the structure of the intellect. It was characterised by a number of proponents and is considered the root of the IQ paradigm.

Jensen (2000) provides a slightly different overview and suggests that differential psychology was largely initiated by Galton, and his interest in the study of individual and group differences in human traits. Galton introduced the idea of objective measurement of human capacities, devised a number of psychometric tests to measure simple sensory and motor functions, and differentiated individual level of ability based on these. He was the first to apply empirical methods to studying the inheritance of mental ability and also introduced the concept of factor analysis. Differential psychology is thus defined as the psychometric assessment of abilities, personality, and vocational interests, with special emphasis devoted to their real-world significance and their developmental antecedents (Lubinski, 2002).

Whilst Galton is generally considered the father of differential psychology, (Jensen, 2000), the following proponents are considered essential to the development of the differential approach:

Binet: The modern field of Intelligence Quotient (IQ) testing according to Weiten (1992) began with the Stanford-Binet test. Alfred Binet, who created the IQ test in 1904, aimed to identify students who could benefit from extra help in school. The assumption was that lower IQ indicated the need for improved teaching methodology, rather than an inability to learn. The term "intelligence quotient" was rooted in Binet's test, in which each student's score was the quotient of his or her tested mental level with his or her actual age and indicated the capacity to demonstrate "higher mental processes". Binet's theory forms the base of the Stanford-Binet intelligence scale, which yields an "intelligence quotient" or, as it is more popularly known, an IQ score. According to Walsh and Betz (1990), IQ as an expression of intelligence is one of the most widely used intelligence measures in the world.

Spearman: Emphasised the importance of a general factor of intelligence (g), which represented what all IQ tests are considered to have in common (Boodoo et al. 1996). Jensen (2000) summarises Spearman's two-factor theory by stating that every mental test, however diverse in terms of the contents or skills called for, measures only two factors: (g) and (s), a factor specific to each test. Spearman observed that an individual's scores on any two cognitively demanding tasks were positively correlated which in turn, led him to believe that a general intellectual factor (g), was responsible for this correlation. By comparing tests with high and low (g) factor loadings, Spearman concluded that (g) is most strongly reflected in tests which call for the deduction of relations and correlates rather than merely the application of learnt skills and abilities (Jensen, 2000). Spearman later acknowledged that there are other factors besides (g), called group factors, which different groups of tests, each with similar task demands (such as being either verbal, spatial, numerical, or mechanical), have in common.

Gardner: Boodoo et al. (1996) summarises the theory of multiple intelligences proposed by Howard Gardner. Gardner's research suggested that conceptions of intelligence should be informed by work across a variety of contexts, including work with normal children and adults, gifted individuals, individuals who have suffered brain damage and individuals from diverse cultures. Gardner's theory suggested that there are a number of personal intelligences including musical and bodily-kinaesthetic, as well as more familiar spatial, linguistic, and logical mathematical abilities.

Burt and Vernon: Caretta, Green and Ree (2003) refer to the emergent consensus over the past fifty years that abilities have a pyramidal or hierarchical structure incorporating (g). Burt for example, proposed a five level hierarchy of intelligence with (g) at the top and expanding levels below. Included in these layers were: general intelligence, relations, association, perception and sensation with the second level made up of group factors based on form and content (verbal-numerical-educational and spatial-practical-mechanical). Vernon's model also had (g) at the apex with the next level consisting of two broad factors of verbal-educational and spatial-mechanical ability. These were then further subdivided into smaller group factors that were more specific and could account for patterns of association seen in cognitive ability tests.

Thurstone: Thurstone believed that the (g) factor could not explain all variation across cognitive tests and thus theorised that there were common group factors present in different classes of tests. He suggested that these group factors are independent of one another, but still related to (g) (Caretta, Green & Ree, 2003). Grabowski and Jonassen (1993) provide a somewhat more simplistic overview. They suggest that Thurstone attempted to define intelligence in terms of a domain of essential mental abilities by using empirical, experimental methods to identify the domain of skills that comprise intellectual behavior. He believed that primary mental abilities represented these component skills but that they could then be combined to define larger intellectual components. These in turn, could be combined to define the concept of intelligence. Thurstone referred to primary mental abilities as the cognitive skills that enable individuals to learn, think, reason and perform in the real world. He also suggested that primary mental abilities are stable throughout life and account for differences in individual cognitive performance.

Essentially, Thurstone hypothesised that there were seven primary mental abilities that were independent of a higher-order (g) factor, which together combined to create (g). He believed it more important to measure these separately rather than to simply assess (g).

- Verbal Comprehension - vocabulary, reading, verbal analogies
- Word Fluency - anagrams, rhyming tests
- Numerical reasoning - mathematical operations
- Spatial reasoning - spatial visualizations and mental transformation.
- Associative Memory - rote memory
- Perceptual Speed - quickness in noticing similarities and differences
- Reasoning - skill in inductive, deductive, and math problems

Cattell: Grabowski and Jonassen (1993) summarise some of the history of the early part of the 20th century, during which time researchers sought to describe intelligence as a singular, general mental ability (g). During the 1930's and 1940's, researchers then rejected the idea of a single intellectual ability in favour of primary mental abilities, or the cognitive skills that enable individuals to learn, think, and reason as defined by Thurstone. Cattell on the other hand, questioned both approaches and believed that the idea of a unitary structure defining

intelligence, would be rejected by researchers. He also believed that the numerous primary mental abilities identified by factor-analytic studies could be combined into more comprehensive structures. The results of his factor analysis of the primary mental abilities thereby produced the theory of fluid and crystallized intelligence. Fluid Intelligence, referred to the ability to see relationships, represented general reasoning ability and was often related to general intelligence. Crystallized Intelligence, referred to as an individual's acquired set of knowledge and skills or those that had been habituated or crystallized as a result of previous learning experiences (Kerlinger, 1986).

Crystallised intelligence is generally exhibited in situations to which individuals have been previously exposed and in which they can reapply their general learning ability. In other words, what Kerlinger (1986) refers to as skilled judgment habits, which have become fixed or crystallized. Fluid intelligence on the other hand, refers more to adaptive ability, particularly within new contexts where individuals are required to apply their general ability in a more fluid manner.

Kline (1995) refers to fluid intelligence as basic reasoning processes which can be applied to most problems. On the other hand, crystallised ability, which Kline states loads on traditional measurements of intelligence, is more the investment of fluid ability in the skills required in a particular cultural context.

Guilford: Jensen (2000) reflects on Guilford's Structure-of-Intellect (SOI) or cube model which consists of five different operations, 6 products and 4 different types of content, all of which claim to measure 150 separate abilities. In essence, operations refer to what an individual does; contents, refer to the material on which the individual performs these operations; and products, refer to the basic forms in which the information can be fit. The cube contains 150 smaller cubes (5 operations X 6 products X 5 contents), each of which refer to one type of intelligence. According to Guilford's model, each of these 150 intelligences can and should be measured individually to determine a person's intelligence. Braden (1995) suggests that Guilford's model, more so than any other factor approach to the study of intelligence, has stimulated much educational curricula. Braden states that up until the SOI model, creativity, divergent production and other aspects of thinking were virtually absent in traditional curricula.

Guttman: Guttman's radex model, according to Boyle, Cattell and Stankov (1995) consisted of a multidimensional scaling method for spatially representing the relations between diverse mental tests. Essentially, Guttman rank ordered correlations between tests and suggested that the structure of intellect comprises simplex, circumplex and radex structures. Jensen (2000) states that the structures perfectly parallel the relationships shown in a hierarchical factor analysis and that tests' (g) loadings derived from factor analysis are displayed spatially in the radex model by the tests' proximity to the center of the circular array, with the most highly g-loaded tests being closest to the center (Jensen, 2000).

2.2.2 The information processing approach

The information processing approach maintains that intelligence is to be measured by focusing on functions such as sensory processing, coding strategies, memory and other mental capacities involved in remembering and learning (Prinsloo, 2000). Lohman and Rocklin (1995) suggest that the information processing approach was largely a response to increasing disillusionment with the psychometric approach and resulted in an attempt to understand the cognitive processes and knowledge structures that generate the behaviours constituting what is either termed more or less intelligent. Hergenhahn (1992) summarises the contents of the information processing approach and suggests the analogy between the computer and humans. Hergenhahn states that most psychologists note the similarities specifically in terms of their definitions, both receive input, process the input, have a memory and produce output. Although definitions are similar, he confines the area of study to higher mental processes such as language, thinking, perception, problem solving, concept formation, memory, learning, intelligence and attention. Lohman and Rocklin (1995) state that cognitive processes were modelled as information processes and ability constructs were investigated either by searching for differences in information encoding, transformation, or storage between individuals identified as exhibiting high or low levels of some ability.

Lohman (2000) suggests that the term "Information processing" does not label a unified approach, but rather a spectrum of researchers and theorists who use a variety of methods to study an equally diverse array of problems. Lohman states that all information-processing models suggest sequences of processing activities by which cognitive tasks and operations are

performed. He also says that the fuzzy notion of "cognitive process" is thus concretely operationalised as a particular cognitive transformation performed on a particular mental representation.

The various information processing theories see intelligence in terms of mental representations, the processes underlying these representations and the way in which these processes are combined. The primary research goal of the information processing approach is thus the identification of cognitive processes, accomplished by systematically varying task attributes rather than subject attributes.

2.2.3 The Contextualist approach

To the exponents of the contextualist approach, the concept of intelligence reflects adaptation to everyday situations rather than academic results (Prinsloo, 2000). Hettema (2001) summarises some of the more common definitions of contextual intelligence, all of which stress adaptation to an existing environment. Intelligence is thus measured according to the extent to which an individual is capable of adaptation. Hettema reflects on the definitions by Binet and Freeman both of which incorporate the terminology "adaptation" and "adjustment".

Hergenhahn (1992) defines "context" in terms of association and meaning, suggesting that sensations are never isolated and that every sensation elicits images that were previously experienced along with the sensation. Sensations thus form the core of experiences and the elicited images form the context that gives the experience meaning. According to Gillespie (1992) the root metaphor for contextualism is an historic event, and the main goal, understanding the intentional behaviours, or actions, engaged in by an individual. Gillespie explains this further by stating that the focus on intention and purpose underlies the importance given to meaning in understanding human cognition, along with interactions between the individual and the specific culture and contextual variables. Cognition is thus an interactive, ongoing, and ever-changing activity in which the individual both shapes and is shaped by the surrounding environment.

Contextual factors have often been downplayed by theorists whose bias towards genetics led them to reduce intelligence to an entity in the head of a person, or to a manifestation of

differentially distributed biological attributes (Prinsloo, 2000). The contextualists thus re-directed attention to aspects such as: cross-cultural studies, ethnographic studies, everyday practical intelligence, tacit knowledge, work performance, self-reports, and case studies.

2.2.4 The developmental approach

The developmental approach can be highlighted by touching very briefly on the contributions of Piaget and Vygotsky.

Piaget: Piaget's theory of cognition is rooted in the structuralist paradigm and defines cognitive development in terms of developmental stages (Haines & Moore, 2003). Prinsloo (2000) summarises Piaget's approach as developmental in nature, with a focus on the progressive construction of cognitive structures through assimilation and accommodation. Intelligence thus develops in all children through the continually shifting balance between the assimilation of new information into existing cognitive structures and the accommodation of those structures to incorporate the new information.

Assimilation refers to the interpretation of new experiences in terms of existing mental structures without changing them. Accommodation on the other hand refers to the active changing and adaptation of existing mental structures in order to explain new experiences (Weiten, 1992).

In essence, Piaget focussed on the mental processes, rather than on the actual measure of intelligence. The theory incorporates several principles for building cognitive structures (patterns of physical or mental action that underlie specific acts of intelligence and correspond to stages of child development). During all development stages, children experience their environment using whatever mental maps they have constructed thus far. If the experience is a repeated one, it is assimilated into the child's cognitive structure so that he or she maintains mental equilibrium. If, however, the experience is different or new, the child loses equilibrium, and alters his or her cognitive structure to accommodate the new conditions. This way, the child erects more and more adequate, complex and sophisticated cognitive structures (Weiten, 1992).

Hergenhahn (1992) defines the stages of development in terms of the following:

- **Sensorimotor stage (birth - 2 years old)** – where the child, through physical interaction with his or her environment, builds a set of concepts about reality and how reality works. At this stage, the child does not know that physical objects remain in existence even when out of sight (object permanence) and symbolic manipulation is largely absent.
- **Preoperational stage (ages 2-7)** – at this stage, the child shows rudimentary symbolisation and concept formation but remains unaware of concrete physical situations.
- **Concrete operations (ages 7-11)** - as physical experience accumulates, the child starts to conceptualise, creating logical structures that explain his or her physical experiences. Abstract conceptualisation begins to take root albeit that the application applies only to concrete problems with which they can deal directly.
- **Formal operations (beginning at ages 11-15)** - By this stage, the child's cognitive structures are like those of an adult and include conceptual reasoning.

Hergenhahn (1992) suggests a particularly close link between Piaget's theory of cognitive development and information processing psychology in that both emphasise the importance of cognitive structures as well as adaptability of these.

Vygotsky: Das (1995) summarises Vygotsky's work as an attempt to explain psychological development in terms of the development of social systems comprising action and interaction in which the individual remains a participant. In other words, the emphasis is on studying an individual's psychological processes in the context of their externalised activities. The major theme of Vygotsky's theoretical framework is that social interaction plays a fundamental role in the development of cognition and that every function in a child's cultural development appears twice: first, on the social level, and later, on the individual level. Vygotsky defined the first development as interpsychological (or between people) and the second as intrapsychological or within the child. Vygotsky also believed that intrapsychological

developments applied equally to voluntary attention, to logical memory, and to the formation of concepts whilst higher level functions originated as actual relationships between individuals.

Vygotsky believed that the study of intelligence should focus not on the development of individual functions but rather, on the development of relationships between mental functions (Boodoo et al. 1996). A functional relation between memory and speech was thus emphasised where mental functions played the role of intervening variables. This is further emphasised by Haenen (1994) who states that crucial to Vygotsky's approach is the view that the nature of human mental functioning can be understood only by considering the specific contexts of social practice in which it exists. Haenen (1994) integrates these ideas and suggests that Vygotsky has had a substantial impact on the recognition that mental functioning should be analysed within the overlapping domains of psychology, anthropology, sociology, linguistics, semiotics, and education.

A second aspect of Vygotsky's theory is the idea that the potential for cognitive development depends upon the "zone of proximal development" (ZPD) or the level of development attained when children engage in social behavior. Boodoo et al. (1996) states that full development of the ZPD depends upon extensive social interaction and is increased by adult guidance and peer collaboration. Furthermore, the authors suggest that traditional intelligence tests ignore this zone and focus on measuring only the intelligence that is already fully developed. They conclude with the recognition of Vygotsky's impact on contemporary psychology and the field of dynamic testing.

2.2.5 The psycho-physiological or Neuro-scientific approach

Prinsloo (2000) suggests that the focus in the neuro-scientific and psycho-physiological approaches to the study of intelligence and cognition, is primarily on research on brain damage, anatomical studies, tests such as EEGs (electroencephalograms) and AEPs (average evoked potentials), computer simulations of neurological processes, hemispheric dominance and localisation issues. Barrat (1995) refers to some of the history on the biological bases of intelligence and mentions that as far back as 1950, researchers were proposing neural processes as the basis of serial order behaviour. He links some of this work directly to what is

known today about brain functions and behaviour. Halstead (as cited in Barrat, 1995) for example, isolated four factors of “biological intelligence” that were directly related to biology and neural networks, he referred to these as : the integrative field factor, the abstraction factor, the power factor, and the directional factor.

Sternberg (2003) dedicates an entire chapter to what he defines as biological intelligence or the study of intelligence by focusing on the brain and it’s functioning rather than the products and processes of behaviour. Sternberg (2003) also summarises some of the approaches that are currently utilised in understanding biological intelligence.

- Hemispheric specialisation – which suggests that each hemisphere of the brain functions in primarily unique ways, with visual and spatial functions situated on the right and linguistic functions primarily situated on the left.
- Rate of neural processing – suggests that intelligence is rooted in the speed of neural functioning. Intelligent individuals thus think and act much faster than less intelligent individuals.
- Electrophysiological approaches – suggests that intelligence correlates with increased electrical activity in the brain.
- Metabolic processes – Suggests that the root of intelligence lies in the ability of the brain to effectively and efficiently metabolise glucose.
- Brain size approaches – suggests that the size of the brain is directly related to the level of intelligence. Individuals showing larger brains are considered to have higher IQ’s.
- Genetic and behaviour-genetic approaches – suggests that heredity and environment work together in determining level of intelligence.

2.2.6 Historical roots overview

Virtually all present day researchers in psychometrics now accept as a well established fact that individual differences in all complex mental tests are positively correlated, and that a hierarchical factor model, consisting of a number of group factors dominated by (g) at the

apex (or the highest level of generality), is the best representation of the correlational structure of mental abilities (Jensen, 2000)

Dreary and Smith (2004) suggest that there is currently, converging consensus about mental ability differences and that theories, tend to incorporate ideas from the differential psychology paradigm through to the contextualist and developmental approaches. They go on to state that despite the methodology utilised, human mental ability differences show near universal positive correlations.

Lohman (2005) makes a similar point and states that literature attempting to relate cognitive task performance to psychometrically measured intelligence consistently finds that the correlations of task performance and IQ seems to be a direct function of the amount of reasoning involved in a given task, independent of the paradigm or label given to the paradigm. He suggests that reasoning ability is thus central to intelligence

2.3 CONCEPTS ASSOCIATED WITH COGNITIVE PSYCHOLOGY

Prinsloo (2000) states that the investigation of constructs associated with cognitive psychology and the cognitive processes involved in problem solving behaviour span a number of disciplines. Lubinski (2002) suggests that whilst the last two decades have witnessed numerous examinations of cognitive ability measures and the constructs they assess (with particular emphasis on the construct of general intelligence), concepts have remained unclarified. Lohman (2005) highlights some of these concerns and mentions that human intelligence exceeds the span of any one discipline or method of inquiry. Lohman goes on to say that different aspects of intelligence are best understood from disciplines as diverse as evolutionary biology, neuropsychology, cognitive psychology, anthropology and education.

In light of the above, concepts associated with cognitive psychology, and specifically the CPP (Prinsloo, 2000) will be discussed and expanded upon.

Table 2.1 on the next page provides a brief overview of the concepts associated with cognitive psychology :

Table 2.1 Concepts associated with Cognitive Psychology

CONCEPT	DEFINITION
Cognitive psychology	The psychological science which studies cognition and the mental processes that are believed to underlie behaviour (Petrovsky & Yaroshevsky, 1997).
Cognitive science	Cognitive science refers to a multidisciplinary approach to studying cognition in humans, animals and machines (Hergenhahn, 1992).
Cognition	Cognition is referred to as the awareness, recognition, comprehension, or elementary understanding of information and is thus essential to all other mental operations (Grabowski & Jonassen, 1993).
Cognitive ability	Kreitler and Kreitler (as cited in Hardijzer, 2000) suggest that the term cognitive ability generally refers to mental activities in the sense of both product and process.
Intelligence	Jensen (2000) integrates much of the diversity of interpretations and states that the word "intelligence" as an intraspecies concept has proved to be either indefinable or arbitrarily defined.
Problem solving	Bourne, Dominowski, Loftus and Healy (1986) suggest that problem solving forms part of thinking and emphasises the discovery of correct responses in various situations.
Reasoning	Petrovsky and Yaroshevsky (1997) define reasoning as the act of using reason to derive a conclusion from certain premises.
Cognitive style	According to Cheng, Lucket and Schulz (2003) a person's cognitive style refers to the distinctive way in which they acquire, store, retrieve, and transform information, it also suggests the preferred way in which individuals perceive information.

These concepts are discussed in more detail below :

2.3.1 Cognitive psychology

Weiten (1992) summarises cognitive psychology as encompassing a focus on higher mental processes such as memory, reasoning, information processing, language, problem-solving, decision making and creativity. In essence, cognition is then defined as the process or system through which this occurs. Petrovsky and Yaroshevsky (1997) suggest that cognitive psychology is the psychological science which studies cognition and the mental processes that are believed to underlie behaviour. Their particular definition also suggests that cognitive psychology encompasses a broad range of research domains, examining issues such as the workings of memory, attention, perception, knowledge representation, reasoning, creativity and problem solving.

2.3.2 Cognitive science

Cognitive science refers to a multidisciplinary approach to studying cognition in humans, animals and machines (Hergenhahn, 1992). Cognitive scientists attempt to understand the mental processes that intervene between stimuli and response but take a broader perspective than that initially taken by the information processing psychologists.

2.3.3 Cognition

The term cognition is used in several different and loosely related ways but generally refers to the mental processes of an individual, with particular relation to a view that argues that the mind has internal states and can be understood in terms of information processing. It is also used in a wider sense to mean the act of knowing or knowledge, and may be interpreted in a social or cultural sense to describe the emergent development of knowledge and concepts within a group (Weiten, 1992).

Cognition is modelled as a simple, low-dimensional representation of more complex, higher dimensional abilities (Gavetti & Levinthal, 2000). They also expand this definition and suggest that cognition is a forward-looking form of intelligence rooted in beliefs (derived

from an individual's mental model of the world) about the linkage between the choice of actions and the subsequent impact of those actions on outcomes. Cognition is also referred to as the awareness, recognition, comprehension, or elementary understanding of information and is thus essential to all other mental operations (Grabowski & Jonassen, 1993).

2.3.4 Cognitive ability

Kreitler and Kreitler (as cited in Hardijzer, 2000) suggest that the term cognitive generally refers to mental activities in the sense of both product and process. They also state, however, that the terms are used so widely, that one has to ask whether there is in fact, anything in psychology that is not cognitive.

Cognitive abilities, according to Grabowski and Jonassen (1993) refer to the content and level of cognitive activity and specify the competencies, the mental operations, and the kind of information being processed. They are stated in terms of maximal performance and are affected by the content domain or the nature of the task. The authors utilise this particular definition specifically in relation to the confusion that surrounds the terms cognitive ability and cognitive style.

2.3.5 Intelligence

Prinsloo (2000) suggests that few terms in psychology have elicited the amount of controversy as the concept of intelligence. She refers to the word intelligence as a fuzzy concept that can be seen as prototypical in nature. She does, however, mention that various trends concerning the nature of intelligence can be identified and lists these as; those studying adaptation within a particular cultural milieu, those supporting a genetic-epistemological approach and those focusing on individual difference research and information processing.

Lohman (1989) divides these into areas of research and study and suggests that the recent advances in the theory and research of intelligence can be summarised as; trait theories (fluid and crystallized intelligence), information processing theories and general theories. Lohman also comments on the "controversy of intelligence" and lists the debates and controversies that still ensue; is the so called g factor a psychological entity or merely a mathematical

abstraction?, is intelligence an innate cognitive capacity or is it an acquired set of cognitive competencies? And finally, is intelligence a unitary construct or is it composed of multiple dimensions?

Boodoo et al. (1996) refers to intelligence as an attempt to clarify and organise a complex set of phenomena. They state that despite the fact that considerable clarity has been achieved in some areas, no model, theory or conceptualisation has answered all the questions and there remains universal dissent. They go so far as to say that the study of intelligence has become about politicised assertions, recriminations and lack of self-restraint.

Meehl (as cited in Lubinski, 2002) suggests that definitions of the intelligence concept have never been adequate or commanded consensus, largely because writers tend to focus on the unique features of their formulation rather than the communality that they share (Lubinski, 2002).

This is even further emphasised by Lohman (2000) who states that although intelligence tests efficiently estimate individual differences in the intellectual competencies required by and developed through formal schooling, they fail to explain what intelligence might be.

Jensen (2000) perhaps integrates much of the diversity of interpretations and states that the word "intelligence" as an intraspecies concept has proved to be either indefinable or arbitrarily defined. Jensen also states that the term is without a scientifically acceptable degree of consensus. He does, however, suggest a remedy which entails dispensing with the term "intelligence" altogether. Jensen believes that when referring to interspecies individual differences in the scientific context, the focus should be on specific mental abilities, which can be objectively defined and measured.

2.3.6 Problem solving

Bourne, Dominowski, Loftus and Healy (1986) suggest that problem solving forms part of thinking and emphasises the discovery of correct responses in various situations. They refer to both well structured and ill- defined problems as well as the impact of both short and long term memory on the solving of problems. The authors list a number of problem solving

characteristics and mention that individual differences in dealing with these, defines problem solving effectiveness or ineffectiveness. Listed amongst these are:

- The complexity or structure of the problem.
- Solution length .
- Type of problem - which refers to “what must be done” – here they give examples of problems requiring inducing structure, transformation or arrangement.
- Processing dimensions .
- Representation of the problem – for example organising, changing or incubating.
- Generating solutions.

Prinsloo (2000) suggests that problem solving and intelligence are closely linked and often used interchangeably. Prinsloo traces the history and states that the nature of human problem solving has been studied by psychologists over the past hundred years, beginning with the early experimental work of the gestaltists and behaviourists. Continuing the trend, problem solving research has focused on the following aspects:

- Identification of strategic approaches.
- Modelling of expert knowledge storage.
- Exploration on semantically rich domains.
- The development and testing of production systems.
- The modeling of the understanding of natural language instruction.

For the purposes of understanding the CPP, Prinsloo (1992) defines problem solving as the broad range of predominantly active theoretical and practical efforts that are directed towards changing a particular state to a different and possibly desirable or reinforcing end state. This mainly involves the purposeful application, in an appropriate manner, of previously acquired knowledge and skills to task materials.

2.3.7 Reasoning

Petrovsky and Yaroshevsky (1997) define reasoning as the act of using reason to derive a conclusion from certain premises. They differentiate between deductive reasoning, in which the conclusion necessarily follows from the premise and inductive, where the conclusion probably follows from the premise. Prinsloo (1998) defines this more simply by stating that the popular conception of the difference between deduction and induction is that deductive arguments lead from the general to the particular whereas inductive thought follows from the specific to the general.

Prinsloo (1995) suggests that reasoning is, however, merely an everyday activity, but as with many constructs in intelligence research, she states that reasoning has been described in numerous ways and by numerous researchers, again, making it vulnerable to criticism in terms of its theoretical and practical usefulness.

Grabowski and Jonassen (1993) suggest that reasoning is a process of thought that yields a conclusion from perceptions, thoughts, or assertions. They imply that the process may be entirely conscious or unconscious and in line with Prinsloo (2000), suggest that reasoning plays a role in decision making.

Grabowski and Jonassen (1993) define the two types of reasoning, namely inductive and deductive, as the following:

- Inductive Reasoning – is the ability most frequently linked to reasoning tasks such as inference, extrapolation and interpolation.
- Deductive reasoning – refers to the progression of knowledge from the general to the particular, which is usually analysed in connection with the psychic processes and the process of thinking in general.

2.3.8 Cognitive styles

According to Cheng, Lucket and Schulz (2003) a person's cognitive style refers to the distinctive way in which they acquire, store, retrieve, and transform information, it also

suggests the preferred way in which individuals perceive information. Cano-Garcia and Hewitt-Hughes (2000) on the other hand, suggest that style represents a distinct notion of coherent singularity (in a variety of contexts) which reflects the need for a sense of identity which is arguably the essence of individuality.

According to Prinsloo (1992) cognitive style refers to a person's general approach to problem solving, particularly in new and unfamiliar situations and incorporates the following: memory, analysis, logical reasoning, metaphoric thinking, reflection, structured-integrative thinking, holistic thinking, exploration, intuition, quick insight, impulsivity and randomness.

Cognitive style is defined by Cox, Goodenough, Moore and Witkin (1977) as the individual way in which a person perceives, thinks, learns, solves problems, and relates to others.

Messick (1984) defines cognitive styles as consistent individual ways of organizing and processing information and experience. Hunt, Krzystofiak, Meindl, and Yousry (1989) define cognitive style as the way in which people process and organise information, and arrive at judgments or conclusions based on their observations.

It is important to note, that in light of the research question, Sadler-Smith (1999) highlights the difference between ability and preference and suggests that style differs from ability, in that the latter may be thought of as unipolar whereas the former is used non-pejoratively and is a description of qualitatively different types of thinking. Messick (1994) confirms this by stating that abilities are unipolar constructs, while style is bipolar, in other words, both end points may be equally valued, but in different situations.

2.3.9 Integration

Pardo and Sternberg (1998) state that although theorists may disagree in the details of their definitions of intelligence, most agree that intelligence comprises the mental abilities underlying adaptation to the environment. As far as integration of concepts and constructs is concerned, they believe that the construct of intelligence provides a way of conceptualising cognition at the same time that cognitive theories and methods help to understand intelligence. They propose that the construct of intelligence is a useful, unifying theme for the study of

cognition, whilst recognising that different themes (information processing, working memory) highlight different aspects of cognitive psychology.

Jensen (2000) looks at the integration between the psychometric definition of general intelligence and cognition. Jensen suggests that general intelligence can be studied more analytically by means of cognitive tasks than is possible with the conventional IQ tests.

Lohman (1989) puts it a little differently, suggesting that whilst most research on intelligence has focused on the product or outputs of intelligence, there remains little integration. Lohman concludes the argument by stating that perhaps there is a long called for need to focus greater attention on the process of intelligent thinking.

Prinsloo (2000) mentions that mental processes are highly integrated and have a multifaceted nature. However, the proposed model, which is represented as the CPP, is an attempt to meet certain theoretical and methodological criteria by reorganising a number of theoretical constructs and research findings from diverse paradigms. The model contains a number of elements that have been discussed and have been integrated in accordance with the assumption that performance on different tasks can be understood in terms of common processes.

2.4 THE COGNITIVE PROCESS PROFILE

Developed by Prinsloo (2000), the CPP is a computerised assessment instrument designed to assess a person's thinking processes and styles. It furthermore provides an indication of potential to develop certain thinking processes and to develop the ability to deal with more complex and unstructured problems. The response process consists of a series of computerised challenges during which the respondent is asked to decipher the meaning of on-screen hieroglyphs.

The results of the CPP allow an understanding of the thinking styles the respondent employs during exposure to unique and complex challenges (Prinsloo, 2000). It also matches demonstrated ability with the levels of work proposed by Jaques (1989).

Additional to the identification of current level of operation, the CPP also indicates the person's potential level of functioning. This potential work environment is calculated using mathematical formulae of learning potential.

2.4.1 Cognitive processes

In accordance with the model, problem solving is construed in terms of six thinking processes. The processes in turn, are described as functional categories and can be represented as overlapping fields in a matrix. Prinsloo (2000) summarises the thinking processes as follows:

Exploration : refers to the process of looking for different sources of information and the depth and effectiveness by which issues are investigated. The objective of which is to identify relevant information for further processing. Exploration incorporates the functional categories of :

- Pragmatic orientation - 'will it work in practice?' which refers to determining relevance in structured contexts
- Exploration – which refers to the effectiveness, depth and width of exploration

Linking : refers to the process of identifying the different elements and establishing relationships among them. Linking incorporates the functional categories of :

- Analytical thinking - which refers to a systematic, detailed and precise approach in differentiating and linking information
- Rule Orientation – which suggests a careful focus on the rules of the task

Structuring and integration : refers to moving beyond identifying the relationships among different elements by fitting the elements and their relationships into meaningful wholes. Linking incorporates the functional categories of :

- Categorisation – which incorporates the process of creating external order, categories and reminders, in other words, structuring tangibles

- Integration - Synthesis of ambiguous / discrepant / conflicting information
- Complexity - The preferred level of complexity and the unit of information used

Transformation : refers to the application of logical and lateral reasoning processes in order to adjust information structures purposefully. Transformation incorporates the functional categories of :

- Logical Reasoning - The disciplined, logical following through of reasoning processes
- Verbal Abstraction - Unusual, creative, abstract verbalisation and conceptualisation

Memory : refers to retention and recall of information, although, as a functional category, it supports all the other thinking processes. Memory incorporates the functional categories of :

- Use Of Memory – the tendency to rely on memory / concentration / degree of effort
- Memory Strategies – the effectiveness of memory strategies

Metacognition : refers to an awareness of one's own thinking processes. Metacognition directs, evaluates and monitors thinking. As such, it forms an important basis for learning and is responsible for strategising in terms of an appropriate thinking approach.

Metacognition is also relevant to all the other thinking processes. Metacognition incorporates the functional categories of :

- Judgment - Using judgment to clarify unstructured and vague information
- Learning 1 - Quick insight learning
- Learning 2 - Gradual improvement/experiential learning

According to Jaques (1989), Stratified Systems Theory (SST) proposes that natural hierarchies assert themselves wherever human beings organise themselves in the workplace. For this reason, Jaques examines organisational hierarchies not from a group dynamic point of view, but rather from a structural point of view. SST proposes that people's problem solving abilities develop through youth and maturity in predictable patterns. The implication of this is

that each person has the inherent potential to develop cognitively and is thus equipped to rise only so high and no higher in an organisation. SST recognises the role of learning and experience to enhance skills and knowledge, but that the inherent potential to approach problems in an increasingly sophisticated way stays the same.

In summarising SST as it relates to the CPP, Jaques (1989) highlights that work roles and levels differ in terms of complexity and that individual capability needs to match complexity. Jaques defines complexity in terms of the number of elements in a task, their interaction, the time frame within which they will be worked with, their rate of change and the degree of clarity and precision by which they can be identified. Organisational structure in turn, reflects complexity and individual capability.

As an assessment instrument, the CPP is in line with the various levels of cognitive functioning as proposed by the SST. As a measure of an individual's cognitive style, cognitive processes, learning potential, work related processing aspects as well as timing control, the CPP is interpreted in terms of the levels of work complexity an individual can handle cognitively. It subscribes to what the SST Theory postulates by identifying 5 levels of work environments.

2.4.2 Levels of work

According to Prinsloo (2000), these levels range from:

- **Level 1 - A purely operational environment**, where the individual is confronted with concrete information, definite rules and clear and linear procedures.
- **Level 2 - A diagnostic accumulation environment**, that involves some theoretical information, albeit that there are relatively fixed rules. Goals and rules in this environment are not as clear-cut as that of the previous level. Instead this environment entails the accumulation of a group of tasks, applying it to overcome anticipated problems.
- **Level 3 – An alternative paths environment**, which entails working within one system of the organisation instead of working across different systems. Information at this level tends

to be complex and abstract, where the emphasis is on meaningful wholes, systems, plans and networks with specialized knowledge to incorporate theory and experience. Reality and goals are thus not clearly defined.

- **Level 4 – The parallel processing environment**, which involves working across systems and contexts instead of just working within one system. Information in this work environment tends to be more complex than that in the alternative paths environment, and often deals with intangible, ambiguous and unfamiliar information. Since the nature of information is more abstract and theoretical, it is aimed at designing long-term business solutions.
- **Level 5 – The pure strategic environment** involves big systems thinking. Relationships are formed between previously unrelated concepts, while new systems and knowledge fields are shaped in the process. The work environment on level 5 requires the individual to work with macro issues, emerging patterns and lots of ambiguity. Therefore, information is also highly complex and abstract.

Essentially SST suggests that when individuals are capable of processing increasingly complex information, they increase their potential to project themselves into the future (Jaques, 1989).

2.4.3 Cognitive styles

The stylistic orientations as determined by the CPP are usually combined in a particular manner to indicate value and personality orientation. They are derived from the processing scores and are thus combined to provide an indication of a person's stylistic approach to problem solving situations (Prinsloo, 2000).

The sixteen styles include the following:

- **Analytical** - Refers to differentiation between various characteristics of a situation and the systematic comparison of elements to identify relationships.

- **Logical Reason** - Is characterised by the tendency to look for logical evidence to verify conclusions, to follow reasoning processes through in a self-aware and logical manner and to apply a process approach to solving problems.
- **Metaphoric** - Is characterised by the tendency to view a situation abstractly and symbolically as well as to combine elements of information in novel ways.
- **Reflective** - Involves the tendency to explore and the careful consideration of information, spontaneous comparative behaviour and integration of new elements.
- **Structured** - Is characterised by an emphasis on the rules of the task and the careful grouping and ordering of information.
- **Integrative** - Refers to the tendency to combine, synthesise and structure information as it is encountered in order to make sense of the available data.
- **Holistic** - Is often associated with the tendency to view a problem situation in its totality and to place an emphasis on the global perspective without losing sight of the relevant detail.
- **Explorative** - Is characterised by an emphasis on the investigation of a problem and the careful search for information, it also very often involves repetitive checking and a need for precision.
- **Learning** - Is characterised by an emphasis on memory functions, integration of feedback, understanding and self-monitoring.
- **Intuitive** - Involves careful exploration with the aim of meaningfully interpreting complex information at a gut level.
- **Quick Insight** - Is characterised by quick insight accompanied by effective task and goal orientation, quick processing and integration of information.

- **Memory** - Is characterised by the tendency to internalise and automatise information as a problem-solving approach.
- **Impulsive** - Is associated with inadequate pacing and an emphasis on the speed (rather than the accuracy) of problem-solving.
- **Random** - Is characterised by a vague and unsystematic, trial and error approach to problem-solving.

2.4.4 Validity and Reliability studies

Statistical analyses, based on linear structural equation modelling techniques were used to assess the construct validity (both the convergent and the discriminant validity) of the proposed constructs. The following five performance processes (focusing on task material) met the validity requirements that constitute the theoretical model: focusing and selecting (exploration), linking (analysis), structuring (categorisation and integration), transformation (logical and lateral reasoning), retention and recall and metacognitive processes (self-awareness or focusing on own thinking processes).

The construct validity of the proposed model, using indices of both convergent and discriminant validity, was calculated, by using a multi-trait-multi-method research approach. A confirmatory analysis was performed using linear structural equation modelling techniques, which compared the empirical data to the theoretical model. A goodness-of-fit indication of 0.9 was achieved. This constitutes an acceptable fit. It can thus be inferred from the results that convergent and discriminant validity had been demonstrated for the processing constructs of the self-contained theoretical model.

The CPP was designed to measure novel constructs that had not yet been operationalised and therefore only partially overlap with traditional measures of mental ability. For this reason, only a limited assessment of the concurrent validity was possible. However, where validity studies could feasibility be performed, highly significant correlations were found between subdimensions of the CPP and other indices of mental ability.

The computerised version of the CPP was designed with a learning component, which rendered indices of internal consistency as a measure of reliability inappropriate.

Summary of reliability and validity studies:

- **Construct Validity** - The Construct validity of the Constructs measured by the CPP (Convergent and discriminant validity) has been established at a 0.9 level using LISREL, RAMONA & MUTMUM (Prinsloo, 2000).
- **Concurrent Validity** – 16 PF Factor B (Intelligence) correlated significantly with the CPP ($r = 0.6$; $p > 0.001$). This highly significant correlation was also found between various CPP sub-dimensions and the B-factor (Prinsloo, 2000).
- **Concurrent Validity** - Based on a Spearman's rho statistical analysis, cognitive styles as measured by the Career Path Appreciation (CPA) and the CPP were found to correlate significantly ($r = 0.45$; $p = 0.000$). This can be regarded as evidence for the validity of the stylistic dimensions as measured by the two instruments (Prinsloo, 2000).
- **Reliability** - Given that the CPP is a test of learning capacity and measurement of an individual's learning curve, internal consistency is irrelevant and normal indices of reliability can thus not be measured. Because consistency is the only statistical way in which to determine reliability, the Construct validity of the test has been used to determine whether the test is acceptable in terms of error rate (Prinsloo, 2000).

2.4.5 Normative data

The CPP has been normed on a sample of 3 000 individuals of relatively equal biographical distributions (race, age, gender, education level of work, discipline) (Prinsloo, 2000).

2.4.6 Administration of the CPP

The CPP is a computer based assessment and thus requires a minimal amount of supervision. It takes between one and a half to three hours (depending on cognitive style) to complete the

assessment and once individuals have been instructed what to do, the computer guides them through the remainder of the process.

2.4.7 Justification

The cognitive styles and brain hemisphere preference which are measured by the CPP have been selected for their relevance and seeming relationship to a variety of the personality types measured by the MBTI. Given the nature of this particular study, the CPP provides effective and adequate means to explore pairwise comparisons of the MBTI personality types with the cognitive styles and levels of work complexity as defined by the CPP. Finally, the scale is based on sound theoretical principles and extensive research evidence demonstrates its validity and reliability. The instrument has furthermore, been normed and validated on a diverse sample of South Africans ensuring representation across all groups and has been shown to meet all psychometric requirements in terms of validity, reliability and cross-cultural application

2.5 CHAPTER SUMMARY

Chapter two consisted of a comprehensive literature study incorporating an historical overview of cognitive psychology, a clarification of the concepts associated with cognitive psychology, and the integration of the various concepts and approaches. The CPP model was introduced as an integrative model encompassing aspects of the Differential, Information processing, Contextualist and Developmental approaches. The CPP as a cognitive assessment tool was also discussed in terms of its constructs, amongst these, the processing dimensions, namely; exploration, analysis, structuring, transformation, memory and metacognition. A brief overview of cognitive styles and levels of work provided a conclusion.

CHAPTER 3

PERSONALITY

3.1 INTRODUCTION

Chapter three represents the second aspect of the literature survey, namely to discuss the history of personality psychology and to define personality with the aim of creating a foundation upon which to introduce the personality theory of type. Type theory, which refers to a school of thought originally conceptualised by Jung, is discussed, its concepts defined and its development traced. The final aspect of the chapter represents the transformation of type theory into the MBTI.

3.2 HISTORICAL OVERVIEW OF PERSONALITY PSYCHOLOGY

According to Funder (2001) the mission of personality psychology is theoretical, empirical and institutional, aiming to account for individuals' characteristic patterns of thought, emotion, and behaviour together with the psychological mechanisms, hidden or not, behind those. Funder goes on to say that whilst personality is unique in psychology, it is historically based upon several different widely encompassing paradigms: psychoanalytic, trait, behaviourist, and humanistic, each of which has sought to subsume not just all of personality, but all of psychology, as befits personality psychology's integrative mission.

Mayer and Sutton (1996) define personality psychology as the study of internal processes and overt behaviour of normal individuals with the aim of providing a meaningful and integrated view of personality. However, they also suggest that in the history of personality psychology, the attempt to present a complete picture of an individual's personality, has caused the field to continuously find itself at a crossroads with several other subfields of psychological investigation.

Moller (1995) suggests that personality psychology is a broad field which represents a variety of views on personality and the study thereof.

Weiten (1992) suggests that the field of personality psychology lacks an integrated, agreed-on framework to organise its areas of inquiry, which is largely why multiple frameworks are used, with some researchers emphasising theory, and others emphasising research. In fact, Weiten suggests that there is no other area of psychology that is as theoretically diverse and disintegrated as that of personality psychology.

Mayer (1998) suggests that the first personality theories of this century were those of Freud, Jung, Adler and others whose theories originally appeared not to be a part of any subdiscipline of psychology in particular. He then moves onto Allport and Murray whom he credits as the first researchers to recognize that a new academic discipline was emerging and to start systematizing the field.

Mayer (1998) summarises much of the remaining progression of personality psychology in terms of frameworks of time, encompassing the transition from Freud's psychodynamic theory between the years of 1950 and 1957, to the next framework of the 1957 to 1970 period where the focus was on individual differences and finally the Big Five research framework.

Weiten (1992) concludes that despite developments such as the Big Five research framework, the areas of personality research are often arranged according to the individual author's preference and remain unsystematic. He also suggests that much of the theoretical diversity reflects disagreements on basic questions of personality as well as attempts to focus on entirely different facets of behaviour.

Revelle (1995) shares some of these sentiments. Revelle states that although the past few years have seen a resurgence of interest in personality, research still continues to span a range of fields and areas, all in the name of personality theory. He suggests that whilst evolutionary, biological, sociological, developmental, cognitive, and clinical approaches all provide unique perspectives to the field, what is required is an integration of the many fields.

Despite an array of literature on the history of personality theory, it seems that very little literature covers the development and history of personality type theory in particular. Benfari (as cited in Richter, 1992) states that type theory was relatively unknown until the advent of Jung. Smith (as cited in Mayer & Sutton, 1996) traces the history of type theory to

temperament. He suggests that twenty-five centuries after the Greeks sought an orderly understanding of human temperament, their efforts were revisited by many of the early psychoanalysts. Included amongst them, Jung, Freud and Adler. It is related that Carl Jung developed his interest in psychological type in an attempt to understand the disagreement on type between Freud and Adler.

The term temperament, according to Petrovsky and Yaroshevsky (1997) can be traced to Hippocrates and Galen who linked organic states to various body fluids. They distinguished four types of Temperament, namely; sanguine, choleric, melancholic and phlegmatic. The authors suggest that this early work has inspired much of personality psychology as it is theorised today. Stevens (2001) for example suggests that the ancient classificatory systems have found modern expression in Rorschach's Theory and Kretschmer's Physique and Character at about the same time as Jung published Psychological Types.

3.3 DEFINITIONS OF PERSONALITY

Weiten (1992) defines personality as an individual's unique constellation of consistent behavioural traits. However, Weiten goes on to say that few areas in psychology are characterised by as much theoretical diversity and differing paradigms.

Ewen (1998) suggests that at present, there is no one universally accepted definition of personality. However, there seems to be some general considerations, one of these being that personality originates within the individual and generally refers to important and relatively stable aspects of a person's behavior. For the rest, Ewen mentions that personality deals with a wide range of human behavior and that to most theorists, personality includes virtually everything and anything about a person, mental, emotional, social, and physical.

Rothbart (2004) refers to personality as the content of cognitions and attitudes concerning the self, others, and the physical world. Included in this, are general attitudes, goals, and values that are largely shaped through reward and punishment.

Whilst all four of the abovementioned paradigms have significant merit in their respective areas, for the purposes of this study (and in view of the utility of the MBTI) the

psychoanalytic paradigm will be employed. Psychoanalytic theorising conceptualises behaviour and consciousness, or “personality” as the result of an ongoing compromise among numerous independently operating mental subsystems (Funder, 2001). Although Jung’s theory shows a move away from characteristic Freudian psychoanalytical theory, his approach retains much of its Freudian heritage and thus continues to be considered a psychoanalytical or psychodynamic theory. Maddi (1996) summarises Jung’s theory in terms of intrapsychic conflict which assumes that opposing forces within an individual direct behaviour and form the basis of personality.

3.4 ANALYTICAL PSYCHOLOGY

Analytical psychology according to Stevens (2001) is a term utilised primarily to distinguish it from Freud's psychoanalysis and from experimental psychology. Moller (1995) lists the following characteristics in which Jung differed from Freud:

- Jung could not reconcile himself to Freud’s focus on sexual instincts and rejected this aspect of Freud’s theory
- Jung was interested in the healthy person and thus rejected Freud’s emphasis on stress and pathology
- Jung could not reconcile himself with Freud’s emphasis on the biological history of the individual and was far more interested in human development and actualisation.

Stevens (2001) suggests that Jungian Analytical Psychology is as much a state of mind as it is a system of theory and practice. He contrasts Jung with Freud and states that Jung was concerned with both the universal and the particular in human life and thus for him, Psychology had to define what psychic structures and functions all people shared in common and then describe how these came to be assembled in the unique combination that makes up the individual personality. Stevens (2001) also suggests that Jung was hostile to politics, primarily because this stripped and deprived individual’s of their right to become authentic. Stevens (2001) concludes his remarks on Jung by summarising the origins of the two ideas which became central to the practice of analytical psychology:

- that part personalities or ‘complexes’ existing in the unconscious psyche can ‘personate’ in trances, dreams, and hallucinations, and
- that the real work of personality development proceeds at the unconscious level.

These ideas, in turn, gave rise to Jung’s therapeutic technique, his theory of type and his conception of the goal of personal development as wholeness.

3.5 JUNG’S THEORY OF TYPE

The following section provides an overview of Jung’s theory of personality, with particular reference to the structure of personality, the dynamics of personality and the development of personality. Jung’s theory of type is also included.

3.5.1 The structure of personality

Jung referred to the total personality as the psyche, which was defined as a complex network of systems continually interacting with each other. Jung believed that psychic energy flowed from one system to another in a continual striving for harmony. Maddi (1996) refers to this as the intrapsychic version of the conflict model and suggests that conflict is at the root of attaining selfhood. To attain selfhood is to have balanced all of the conflicting polarities. Ewen (1998) states that although the self lies between consciousness and unconsciousness, it is beyond the realm of awareness. Furthermore, while every personality possesses the innate tendency to individuate and develop selfhood, this ideal is rarely if ever achieved to the fullest.

Jung, however, divided the structure of personality into three interdependent systems which he referred to as the ego, the personal unconscious and the collective unconscious.

- **The Ego** - Jung identifies the ego with the conscious mind or that part of personality that perceives reality accurately and differentiates the outer world from inner images. Phares (as cited in Hardijzer, 2000) equates the ego to the persona, or the masks and roles that people take on. Ewen (1998) suggests that the persona is essentially what the outside world sees.
- **Personal unconscious** – includes anything which is not presently conscious. The personal unconscious is like most people's understanding of the unconscious in that it includes both memories that are easily brought to mind and those that have been suppressed for some reason. The shadow, which Jung locates in the personal unconscious, is the primitive and unwelcome side of personality or the side which people wouldn't want the world to see. However, it also provides a necessary ingredient of vitality and is thus not only considered to yield positive aspects but also to create wholeness in the personality (Ewen, 1998).
- **The collective unconscious** - Jung identifies the collective, or transpersonal, unconscious as the centre of all psychic material that does not come from personal experience. The collective unconscious is a storehouse of archetypes inherited from ones ancestral past and thus direct behaviour at a purely unconscious level (Stevens, 2001).

Archetypes in turn, are considered universal thought forms and emotions that result from repeated experiences of past generations and predispose us to perceive the world in particular ways. Included among the many archetypes are the shadow, persona, anima, animus, self, wise old man and great mother. We never become aware of the archetypes themselves but experience them through the images or symbols that they produce and transmit to consciousness (Ewen, 1998).

3.5.2 The dynamics of personality

Jung, according to Moller (1995) views personality as an energy system. The motivation of personality is thus explained in terms of the movement of energy between the various structural systems of the psyche and always in relation to a specific aim. Thus, in contrast to Freud, Jung implies free will and capacity to choose. In terms of the dynamic operation of the psyche, Jung refers to three principles:

- **The principle of opposites** - According to Jung, it is the opposing forces in the psyche that create the psyche's energy (Moller, 1995). Psychic energy is created by the tension between such opposites as introversion-extraversion, thinking-feeling, sensation-intuition, good-evil, consciousness-unconsciousness, love-hate and others. When one extreme is primarily conscious, the unconscious compensates by emphasising the opposite tendency. Successful adjustment requires uniting the various opposing forces through some middle ground (Ewen, 1998).
- **Psychic energy** - All mental activity is powered by psychic energy, which is called libido regardless of the instinct(s) involved. The greater the amount of libido that is invested in a mental event, the more the event is desired. Psychic energy thus attracts complexes of related and emotionally charged ideas (Ewen, 1998).
- **Principle of entropy** – this refers to the tendency for oppositions to come together and for energy to decrease. Jung borrowed the idea from physics, where entropy refers to the tendency of all physical systems to run down. Moller (1995) suggests energy within the psyche flows from stronger to weaker components and that entropy entails maintaining balance or equilibrium.
- **Principle of equivalence** – is based on Jung's theory that energy within the system is never lost and will constantly redistribute itself. In other words, for each quantity of energy which is spent to bring about a certain condition, an equal amount of energy will appear somewhere else (Moller, 1995).

3.5.3 The development of personality

Jung perceives the primary developmental task of a person to be self actualisation. Personality is thus determined by what the person hopes to become (defined as progression) as well as what he was (defined as regression). Progression and regression then interact with the processes of individuation and transcendence as the basis of personality development or self actualisation (Moller, 1995).

- **Individuation** - Jung believed that human beings are inwardly whole, but that most people have lost touch with important parts of their selves. Individuation is thus the process through which people regain wholeness and re-establish self. Jung referred to individuation as the process of a single, homogenous being embracing all of their innermost uniqueness (Moller, 1995)
- **Transcendence** – refers to the integration of various systems in the psyche in order to achieve unity and harmony (Moller, 1995)

Stevens (2001) traces the development of the personality, suggesting that during childhood the various components of personality develop, with sexuality not appearing until puberty. A second puberty then occurs at about age thirty-five to forty, at which time interests in sexuality and power yield to more spiritual and cultural values. Stevens states that the lifelong unfolding of one's inherent potential, or individuation, results in the formation of a new center of personality (the self) that unifies the many opposites. However, he also suggests that individuation can never be fully achieved and is often beyond the reach of many people.

3.6 ATTITUDES AND FUNCTIONS OF CONSCIOUSNESS

Jung, according to Maddi (1996) theorised that people, from birth, make clear choices on how to use their minds and although they may not always use them in exactly the same manner, with time, they acquire a mental preference or psychological type that characterises their personality. He went on to speculate that there were three basic psychological types (ranges of orientation) common to all people which manifest in terms of functions of consciousness and attitudes of consciousness; perceiving (sensing versus intuitive), interpreting (thinking versus feeling) and responding (extraversion versus introversion). By being aware of individual psychological types, Jung theorised that people would be able to understand differences in personalities and be better suited to working together.

3.6.1 The Attitudes of Consciousness

Bilsker (2002) defines the attitudes of consciousness as the basic direction in which a person's conscious interests and energies may flow, either inward to subjective, psychological

experience, or outward to the environment of objects, other people and collective norms. These two directions define the two attitude types of introversion and extraversion. As with the psychological functions, whichever attitude dominates consciousness, its opposite will tend to be repressed and to characterise the functioning of the unconscious.

3.6.2 The Functions of Consciousness

The functions of consciousness according to Bilsker (2002) refer to the different ways in which the conscious mind apprehends reality. According to Jung, these were:

- **Sensation** – refers to a non-evaluative first experience of a phenomenon or the transmission of a physical stimulus to perception.
- **Intuition** – refers to the psychological function which transmits perceptions in an unconscious manner. Intuition also results in the perception of complete wholes without the individual necessarily being able to explain the manner in which the content was arrived at.
- **Thinking** - refers to the presentation of conceptual connection, or more simply stated, the linking up of presentations by means of a concept.
- **Feeling** – refers to a subjective evaluation of experience that may be independent of external stimuli.

Jung then arranged these four functions into two pairs of opposites, two perceiving, or non-rational functions of sensation and intuition and two judging, or rational functions of thinking and feeling.

Jung believed that whichever function dominated consciousness, its opposite would be repressed and would therefore characterise unconscious functioning.

In addition to the dominant function, Jung also suggested that people have an auxiliary function. The auxiliary would be one of the functions from the other pair. For example, if

thinking is dominant, the auxiliary function may be sensation or intuition (but not Feeling). Jung suggested that it is most useful to refer to both the dominant and auxiliary functions and to describe someone's function type as, for example, sensory thinking or intuitive feeling.

Stevens (2001) explains Jung's theory more concisely. He suggests that out of the two attitude types and the four functional types, it becomes theoretically possible to describe eight psychological types. Stevens (2001) reflects on Jung's work and suggests that it is rare for people to use an exclusive function, they thus tend to develop two functions, usually one rational function and one irrational function. In turn, one of these becomes the primary or superior function and the other an auxiliary function. The other two functions remain relatively unconscious and associated with the shadow.

In accordance with this, Bilsker (2002) summarises the eight types as follows:

- **The Extraverted Sensation Type**

According to Bilsker (2002), the extraverted sensation type is a realist who seeks to experience as many concrete sensations as possible. They strive for experience derived from concrete objects and physical activities and their consciousness is therefore directed outward to those objects and activities that may be expected to arouse the strongest sensations. They generally mistrust inner psychological processes and prefer to account for such things in terms of external events.

- **The Introverted Sensation Type**

The introverted sensation type depends upon internal psychological processes. The introverted sensation type may be inclined to react subjectively to events in a way that is unrelated to objective criteria. In essence, they are unconcerned with the world of outer reality and prefer to focus on inward sensation (Bilsker, 2002).

- **The Extraverted Intuition Type**

Extraverted intuition attempts to envisage all the possibilities that are inherent in an objective situation and they therefore show a constant need for new situations and experiences to provide a fresh stimulus for the intuitive process. They tend to see exciting possibilities in every new venture and are excellent at perceiving opportunity. However, in their continual quest for new experiences, they often overlook the needs and feelings of others and fail to follow-through on what they have started (Bilsker, 2002).

- **The Introverted Intuition Type**

Introverted intuition is directed inward to the contents of the unconscious. This type, attempts to fathom internal events by relating them to universal psychological processes or to other archetypal images. Consequently, individuals with this type, are attracted to experiences with a mythical, symbolic or prophetic quality. This type generally remains on the purely perceptual level but is often misunderstood and perceived as distant or aloof (Bilsker, 2002).

- **The Extraverted Thinking Type**

Extraverted thinking is driven by the objective evidence of the senses or by objective ideas that are derived from tradition or learning. Its purpose is to abstract conceptual relationships from objective experience, linking ideas together in a rational, logical fashion. Essentially, the extraverted thinking type bases all actions on the intellectual analysis of objective data and tend to live by a general intellectual formula or universal moral code (Bilsker, 2002).

- **The Introverted Thinking Type**

Introverted thinking is contemplative and directed inward to subjective ideas and personal convictions rather than outward to practical concerns. The main concern of such thinking is to elaborate as fully as possible all the ramifications and implications for their internal thoughts and ideas. As a consequence, introverted thinking can be complex, overly abstract and somewhat withdrawn (Bilsker, 2002).

- **The Extraverted Feeling Type**

Extraverted feeling is based upon accepted or traditional social values and opinions. It involves a conforming, adjusting response to objective circumstances that strives for harmonious relations with the world. Thinking is always subordinate to feeling and is ignored or repressed if intellectual conclusions fail to confirm the convictions of the heart (Bilsker, 2002).

- **The Introverted Feeling Type**

Introverted feeling strives for an inner intensity that is unrelated to any external object. It devalues objective reality and is rarely displayed openly. The introverted feeling type aims to be inconspicuous, makes little attempt to impress and generally fails to respond to the feelings of others. Given this, they are often conceived of as inaccessible (Bilsker, 2002).

3.7 EXTENSIONS OF JUNG'S THEORY

Isabel Briggs Myers and her mother, Katherine Briggs, developed the MBTI model to make Jung's theory practical and applicable (Briggs & Briggs-Myers, 1998). Their adaptation of the model was based on a series of questions that, when completed by an individual, seemed to indicate personal viewpoint and behaviour style which they later defined as personality dimensions or psychological types.

The types included the following:

- Extraverts/Introverts (E/I)
- Sensors/iNtuitors (S/N)
- Thinkers/Feelers (T/F)
- Judgers/Perceivers (J/P)

By utilising these personality dimensions they were able to classify an individual (based on that individual's preference for one aspect from each of the four personality dimensions) in

one of sixteen personality types. The classification system utilises four indicators that classify personality type, each consist of one letter representing a trait from each pair of personality dimensions.

When viewed in terms of the original type theory as defined by Jung, type or personality dimension is the intent of the tool, with emphasis on individual preference in relation to behaviours associated with each of the dimensions.

Arnau, Gleaves, Green, Melancon and Rosen (2003) state that the MBTI Indicator is the most popular instrument for the measurement of Jungian personality with between one and a half and two million people completing it each year. They summarise that both the response format and the scoring system of the MBTI are based upon the assumption that individuals have dichotomous preferences for one attitude, one perceiving function, and one judging function, and that these preferences imply preference rather than level of development or expertise in the use of the functions.

Although the MBTI in essence, measures Jungian preferences, Briggs and Briggs-Myers, (1998) extend the original theory and suggest that complete portrayal and explanation of people should include; the constant presence of an auxiliary process, the results of a combination of perception and judgment and the role of a balancing auxiliary between introversion and extraversion.

They suggest that the basic differences concern the way people prefer to use their minds, particularly the manner in which they perceive and make judgments. They thus define perceiving as the process of becoming aware of things, people, occurrences and ideas, and judgment as the process of coming to conclusions about what has been perceived. They summarise these extensions and suggests that the combination of perception and judgment make up a large proportion of individual mental activity and governs much of their behaviour. In essence, perception determines what people see in situations and judgment in turn, determines what they decide to do about it.

3.7.1 The four bipolar preferences

Jung identified two basic attitudes and four accompanying functions, very simplistically, his theory thus consisted of the four functions; sensation, intuition, thinking and feeling. Jung then arranged these four functions into two pairs of opposites, two *perceiving*, or non-rational functions of sensation and intuition and two *judging*, or rational functions of thinking and feeling, both of which are considered merely implicit aspects of his theory.

Briggs and Briggs-Myers (1998) in the development of the MBTI took Jung's implicit functions and incorporated them as a fundamental extension of Jung's original theory. Given this, the MBTI as it is currently utilised, consists of four bipolar sets of preferences, extraversion and introversion, sensing and intuition, thinking and feeling, judgment and perception, resulting in a typology of 16 personality types.

The four bipolar sets of preferences are defined as:

3.7.1.1. *Extraversion attitude or Introversion attitude*

Stevens (2001) summarises thinking and behavior that is directed inward or to oneself as introversion, and thinking and behavior that is directed outward, or to the surrounding environment, as extraversion. Stevens suggests that the extraversion and introversion preferences on the MBTI have to do with how people find their energy, extraverts get energy from people, activities, and things, in other words, they find stimulation outside of themselves. Introverts on the other hand, show a preference for getting energy from internal sources and thus tend to keep their thoughts and ideas to themselves.

Zumbo and Taylor (1993) state that there is substantial confusion as to the definition of extraversion, particularly when it relates to extraversion as defined by different assessment instruments. They trace the roots of extraversion as dating back to the late seventeenth century when extraversion was used in reference to the mind as a turning outward of one's thoughts toward objects. They summarise the word "extraversion" as taken from "extra" meaning "outward" and "vert - ere" meaning "to turn". By contrast, introversion is derived from a different prefix, "intro", meaning "inward". Zumbo and Taylor (1993) emphasise the

importance of caution when interpreting extraversion as defined by any psychological measurement.

Gaffner and Hazler (2002) summarise the work of Myers and suggests that typically, the extravert has an outgoing, candid and accommodating nature that adapts easily to a given situation, they quickly form attachments and are confident venturing forth into unknown situations. The introvert, tends to be hesitant, reflective and retiring, keeping to themselves and shrinking away from objects. Gaffner and Hazler (2002) also cite a study by DiRusso, Carney and Bryan in which it was concluded that the introverted preference types are less decisive in their thinking and prefer an introspective and cautious approach to decision making. Individuals preferring introversion will thus want to take time to think and clarify their ideas when solving problems. Extraverts on the other hand, showed a tendency towards impulsivity and quick closure.

Myers and Myers (1980) summarise the extraversion-introversion function in terms of the basic difference in people's use of perception and judgment, which arises from their relative interest in their outer and inner worlds. They state that the introvert's main interests are in the inner world of ideas and concepts and the extravert in the outer world of people and things. They do, however, suggest that individuals are not limited to inner or outer and can adapt to a variety of situations when required to do so. McCaulley (1990) adds to this and states that a common misunderstanding of those unfamiliar with type theory is that all extraverts are sociable and all introverts are withdrawn. McCaulley comments on the work by Jung and Myers who both believed that for good development and balance it is essential for every person to develop richness both in the extraverted outer life and in the introverted inner life.

3.7.1.2. Sensing perception or Intuitive perception

Stevens (2001) suggests that sensing and intuition preferences have to do with how people gather information and what attracts their attention. As a psychological function, sensation is the means by which individuals consciously process the evidence of their senses and build up precepts of their world. Intuition on the other hand, is the means by which people make inferences about the possibilities inherent in situations, and particularly those in immediate awareness.

McCaulley (1990) suggests that sensing persons are interested in what is real, immediate, practical, and observable by the senses. Intuitives, are interested in future possibilities, implicit meanings and symbolic or theoretical patterns suggested by insight. McCaulley goes on to say that a sensing person will want information that is practical, has useful applications and makes common sense and is thus likely to pay attention to facts, details, and reality. They also tend to base their decisions on what has worked in the past.

Gaffner and Hazler (2002) suggests that whilst sensing individuals will be more likely to pay attention to facts, details, and reality, an intuitive person will emphasise paying attention to insights and looking for underlying meanings or relationships. They summarise the intuitive as future oriented and focused on making changes, paying more attention to the meaningfulness of the facts and the relationships among the facts.

3.7.1.3. *Thinking judgment or Feeling judgment*

Thinking and feeling preferences have to do with how people approach decision making and how they reach conclusions. Thinking types adopt a logical and objective approach to decision making and are effective at evaluating and deciding on impersonal issues where conclusions are reached based on the positives and negatives. The thinking type will want solutions that make sense in terms of facts, models, or principles under consideration. Individuals with a feeling preference find comfort in considering values and feelings in their decision-making process. They thus tend to be subjective and consider how their decisions could affect other people. The feeling person works well for evaluating and deciding on personal issues based on liking and disliking or agreeableness and disagreeableness (Gaffner & Hazler, 2002).

Stevens (2001) suggests that the thinking type interprets events as they happen, working out what it all means as they go along. The feeling type on the other hand, responds to each event in the scene with corresponding value judgments.

Myers and Myers (1980) refer to the distinction between thinking and feeling as a basic difference in judgment which arises from the existence of two distinct and contrasting ways of

coming to conclusions. They differentiate the two by suggesting that the thinking type prefers an impersonal approach to life whereas the feeling type desires to be personally involved.

3.7.1.4. Judgment or Perception

Gaffner and Hazler (2002) suggest that individuals who have a preference for judging will prefer structure, order and careful organisation, they also have a desire for closure and will want to reach conclusions in their decision making. They define the judging type as wanting to set a course of action and run their lives accordingly. They want to have matters settled and will make decisions based on goals and final objectives.

The perception preference relates to a more spontaneous and flexible approach to decision making. Perceivers are more tentative in their approach to making decisions and are characterised as slow in coming to closure (Gaffner & Hazler, 2002). Stevens (2001) refers to perceivers as the holists and big picture thinkers.

McCaulley (1990) refers to the judging orientation as a preference towards quick closure, decision making, organizing, planning, and structuring. On the opposite side, it is suggested that the perceiver enjoys being curious, is open to changes, and prefers to keep things open for longer periods of time.

3.7.2. The sixteen personality types

Stevens (2001) suggests that one of the objections to the MBTI is that it seeks to constrain the apparently infinite variety of human psychological traits within narrow, arbitrarily imposed categories. However, he states that one can never give a description of a type, no matter how complete, that would apply to more than one individual. He also suggests that pure types do not exist and that no one has just one function and one attitude and nothing else. Stevens concludes by stating that each of the functions and attitudes is necessary for psychological adaptation and therefore is present in every person's psychological makeup. Given this, each individual has access to all eight preference poles; extraversion and introversion, sensing and intuition, thinking and feeling, a judging attitude and a perceiving albeit that each is likely to be used with greater or lesser comfort and facility.

McCaulley (1990) supports the above in his commentary on Myers. He suggests that preference scores are only weigh-stations to indicate one of the 16 types and that ultimately, the type is the unit of analysis and interpretation for the MBTI. Variations of scores within types are important and type is always a dynamic constitution of all sixteen of the types. Type is thus considered to be greater than the sum of the four preferences it encompasses.

A comprehensive overview of the type combinations are presented in Appendix A.

3.7.3 The dynamics of psychological type

Stevens (2001) highlights the fact that type is more than simply the four basic preferences but rather, a dynamic and complex interrelated system of personality. He suggests that the different components of a person's psychological type work in an interrelated way to establish balance and effectiveness. Type is thus a lifelong developmental process, with many factors affecting the direction of resultant type development. Some of these factors are discussed below.

3.7.3.1 Dominant function

Myers and Myers (1980) refer to the dominant function as the core or guiding focus of one's personality, the process which will govern the other preferences, giving direction to and setting goals for the personality. They suggest that people need some kind of governing force in their makeup and they need to develop their best process to the point where it dominates and unifies their lives. Although they suggest that people do develop along all four of the dominant processes, they also say that one process, be it sensing, intuition, thinking or feeling, must have sovereignty and opportunity to develop to its full potential. They conclude by stating that in the absence of this, people are likely to remain ineffective.

3.7.3.2 *Auxiliary function*

In relation to the dominant process, Myers and Myers (1980) suggest that one process alone is not enough and for people to have balance, they need to develop a second or auxiliary process.

The auxiliary function is thus defined as the process which is a helper for and which will work in the interest of the dominant process. It will also provide balance between the perceptive - judging and the extraversion - introversion preferences.

If for example the dominant process is perceptive, the auxiliary will be a judging function, either thinking or feeling. The auxiliary process will then act as the provider of balance by supporting the dominant function with that of the secondary or auxiliary function. Richter (1992) summarises this as a mental structure which ensures that people have reliable ways of taking in information and arriving at decisions, as well as trustworthy ways of interacting with both the internal and external world. In other words, if a person has a dominant judging process, their auxiliary process will be one of the perceiving ones. Conversely, a person with a dominant perceiving process will have a judging preference for their auxiliary process.

3.7.3.3 *Inferior and Tertiary functions*

The role of the inferior function is to balance every description of a particular type with one of its other side, which is embodied in the inferior function. Jung (as cited in Richter, 1992) initially referred to the inferior function as the doorway to the unconscious.

Essentially, individuals will always have a favoured way of functioning, this is their dominant function. The auxiliary and the inferior function are supportive functions, particularly in required contexts. The tertiary and the inferior are thus the less conscious mental processes and are also the opposites to the dominant and auxiliary. The tertiary is the process opposite to the auxiliary and the inferior is the opposite of the dominant process. In extending Jung's system in this way, Myers and Myers (1980) suggest that the revised theory provides an explanation for an effective way of extraverting and introverting, both of which are necessary for human functioning.

3.7.3.4 *Lack of a balancing auxiliary*

Lack of a balancing auxiliary is perhaps the most prominent differentiating factor between Jung's theory and the MBTI adaptation (Myers & Myers, 1980).

The basic principle is that the auxiliary function provides needed extraversion for the introverts and needed introversion for the extraverts. In other words, the extraverts' auxiliary gives them access to their own inner life and to the world of ideas and the introverts' auxiliary gives them a means to adapt to the world of action and to deal with it effectively. They go on to state that good type development demands that the auxiliary supplement the dominant process in two respects. Firstly, it is required to create balance between perception and judgment as well as between extraversion and introversion. Secondly, for people to live happily and effectively in both worlds, they need a balancing auxiliary that enables adaptation in both directions.

Myers and Myers (1980) use the following example to explain the process, they state that the extravert's principle function is extraverted, but that the auxiliary function is likely to have a cast of the introverted side. Thus, the extravert's auxiliary function helps them to relate to their inner world. However, since this is only the secondary function, difficulty when having to function in the secondary type is anticipated.

Whilst Myers and Myers (1980) included the auxiliary function, they do acknowledge that Jung cryptically alluded to it in some of his work, albeit ineffectively.

3.7.3.5 *Importance of opposites and balance*

Benfari (as cited in Richter, 1992) suggests that each individual has the inherent potential to develop their opposite or inferior function. Myers and Myers (1980) reflect on this process as the essence of individual development and the realisation that people have other worlds on which they can concentrate.

Myers and Myers (1980) also reflect on Jung's work and comment on the importance of the opposites and their development. They suggest that despite inherent preferences, the development of all preferences or functions results in a balanced personality with resultant perceptions and judgments that are consistent and reliable. For example, the inferior functions can be a source of balance and creativity if cultivated and brought into view.

3.7.4 Personality type development

At the most basic level, Myers and Myers (1980) suggest that type development is the process of gaining comfort and command of one's preferred way of taking in information, and preferred way of coming to conclusions. Developing a particular type of function, thus involves consciously differentiating it from the others, exercising it, and becoming more skilled with it. They refer to the essence of this as the development of perception and judgment and the appropriate ways of using them.

Jung (as cited in Myers and Myers, 1980) believed that all the functions are largely unconscious and undeveloped in infants and as we grow and develop, the different functions develop. It is generally believed that the dominant function develops up to age seven, the auxiliary function up to age twenty, the tertiary function in the thirties and forties and the inferior or fourth function at midlife or later.

In less age specific terminology, Myers and Myers (1980) suggest that the primary task of type development in the first part of life is to establish the dominant function, balanced by the healthy development of the auxiliary function. The development of these functions gives the personality a sufficient degree of consistency, predictability, and effectiveness. Later in life, the focus of development shifts to the less-preferred functions, and an exploration of those that have remained unexplored. This redirection of energy is part of the midlife transition, which Jung saw as the gateway to later life development and satisfaction. The task of the second half of life, then, is to move toward full development of all of oneself, including those parts that were previously neglected and unrealised.

At a deeper level, however, Jung spoke of individuation or the process of becoming a unique individual, or the individual that one had always had the potential to become.

Stevens (2001) suggests some of the following aspects of development that were highlighted by Jung:

- The suggestion that whole systems and the dynamic nature of type is central to understanding development.
- The suggestion that the achievement of personality means nothing less than the optimum development of the whole individual human being, in other words, individuation.
- The suggestion that there is no linear evolution but rather greater depth and understanding of oneself.

When looked at in relation to Myers and Myers (1980), what they refer to as the task of the second half of life as moving toward full development of all of oneself, is later elaborated on. They state that the final stage of development only comes to people who live their type fully whilst continuing to grow. At the point where they have come to the completeness of their own type development, is where they come face to face with the inevitable deficits of their particular type.

Whilst they do not refer explicitly to the terminology of individuation, the elaboration and enhancement of the theory seems to highlight substantial elements of this.

3.7.5 Validity and reliability studies

Quenk (2000) states that internal consistency and test-retest reliabilities have been reported for each scale of the MBTI. Coefficient alpha results are available for the largest and most general sample of male and female adults.

Quenk (2000) reports that test-retest reliabilities vary somewhat with the interval between administrations and also with the age of sample members. Younger samples tend to have somewhat lower reliabilities, a result in accord with the theory, which hypothesises that type

develops over the life span and is more likely to be incompletely developed in younger individuals.

Quenk (2000) states that the developmental hypothesis and its empirical verification are relevant to both administration and interpretation of type to clients in different ages and stages of life and that the MBTI accurately reflects the theory it purports to represent. She also states that years of correlational and behavioral research demonstrate the correspondence of the eight preference poles to theoretical prediction and that, more recently, several different forms of evidence supporting the dynamic hypothesis have been reported. Whilst Quenk (2000) is merely summarising the validity and reliability of the MBTI, McCaulley and Myers (1985) in the "Guide to the development and use of the MBTI" provide extensive validity and reliability data for the tool since it's first publication.

Gardner and Martinko (1996) report that the estimated reliabilities of type categories are satisfactory with split-half reliabilities of continuous scores for numerous samples repeatedly exceeding .75 for each scale. They refer to a number of studies where reliabilities for both continuous and categorical information is provided, all of which exceed .70.

Carlyn (in Gardner and Martinko, 1996) suggests that efforts to validate the MBTI have produced mixed results despite the fact that the tool generally appears to be a valid instrument which is potentially useful for a variety of purposes. Carlyn found that MBTI validation studies yielded "generally positive" results.

3.7.6 Normative data

Quenk (2000) states that that whilst norms are appropriate for trait measures of personality, they remain inappropriate in a type-based instrument. Norms are therefore not reported and tables are used to report the frequency and percent of each of the 16 types in a sample of interest.

She refers to the self-selection ratio (SSR), type tables that show self-selection ratio data and the index of attraction as a means of drawing meaningful conclusions about the frequency of

type in a particular sample. The index is based on numerous statistical studies that have taken place in various industries and therefore present a meaningful way of comparison.

3.7.7 Administration of the MBTI

Questions on the Myers–Briggs Type Indicator are presented in a forced-choice format in which the test taker is required to select between two responses indicating opposing attitudes or functions. In other words, if a question is assessing the perception functions (sensing versus intuition), the respondent must choose either a response indicative of sensing, or one indicative of intuition.

The responses to the instrument ultimately yield a discrete definition of a specific type, although the raw scores used in the classification of type can be examined to identify the strengths of preferences. Individuals are, however, still assumed to belong to one preference category or another.

The MBTI has no time limit, is considered virtually self-administering and all necessary instructions are provided on the cover of the question booklet.

3.7.8 Justification

The personality type preferences which are measured by the MBTI have been selected for their relevance and relationship to a variety of the constructs measured by the CPP. The MBTI has been defined in a number of ways, most of these definitions encompassing some or other aspect of cognitive style or cognitive ability. However, the developers clearly intended the tool to be used as a personality type measurement. Adding to this, there are many research studies cited, that in fact give indication that rather than merely an assessment of personality, the MBTI also assesses ability and correlates of cognitive ability. The research remains divided.

Given that the MBTI reports on two types which are of particular interest, namely thinking and judging, and so too does the CPP, the tool provides effective and adequate means to explore pairwise comparisons and chi-square statistics. Finally, the scale is based on sound

theoretical principles, extensive research evidence demonstrates its validity and reliability and finally, it is considered one of the most widely recognised and utilised assessment tools internationally.

3.8 CHAPTER SUMMARY

Chapter three consisted of a comprehensive literature study incorporating an historical overview of personality psychology, the concept of personality and general definitions of personality. Jung's theory of type was discussed under the analytical psychology paradigm, with a focus on personality structure, dynamics and development. This was then integrated into an overview of his theory of personality types. The final aspect of the chapter dealt with the extension of Jung's work into the development of the MBTI. The chapter was concluded with an overview of the MBTI and its constructs, the sixteen personality types as described by the developers and motivation for the tool as part of the study.

CHAPTER 4

INTEGRATION OF PERSONALITY AND COGNITION

4.1 INTRODUCTION

In this chapter, the relationship between cognition and personality is explored, with particular reference to some of the challenges and difficulties that have prevented integration in the past. The concept of cognitive style is discussed as a key bridging concept and cognitive style and its related theories are explored intensively. The MBTI as a measure of style, is also explored. The chapter is concluded with an overview of past research on the relationship between the two constructs.

Hofstee (2001) refers to the interplay between intelligence and personality as a salad dressing syndrome, the two just do not mix. He cites that in the past six years (which would have been the six years prior to 2001) they occur together in the title of a mere 25 publications.

Piotrowska, Strelau, and Zawadski (2001) comment on past attempts at integration and suggest that for most contemporary researchers, personality and intelligence are isolated from one another. The authors suggest that because there is still no agreement as to what intelligence is, or personality for that matter, a solution to the issue is hardly possible. Ford (1995) seems to agree with the sentiments suggesting that there is very little existing psychological theory and research that aims to integrate the two constructs.

Despite the negative sentiments, however, there are a number of researchers that believe integration is possible as well as useful. Chamorro-Premuzic and Furnham (2004) for example, suggest that an integration of ability and non-ability individual differences in human performance, especially in academic settings, is paramount to understanding academic success. Ford (1995) states that despite the lack of literature, integration of constructs is essential in understanding social behaviour.

Both intelligence and personality are regarded as topics that belong to the psychology of individual differences and this is possibly the starting point of integration. Piotrowska et al.

(2001) dedicate a chapter to answering the question: Why is it reasonable to search for links between temperament and intelligence? As it relates to cognition and personality, why is it reasonable to search for links between personality and cognition? They mention the following:

- Temperament may modify the results of performance on intelligence tests
- Temperamental traits may influence the interaction between genetically determined intellectual potential and the environment.
- Temperament may influence coping with intellectual demands on the borderline of the individual's capacity.
- Divergent thinking is moderated by temperamental traits.

Chamorro-Premuzic and Furnham (2004) share some of these sentiments. Based on a number of their research studies, they conclude that personality traits influence both cognitive performance as well as the development of 'actual' intellectual ability or adult knowledge and skill acquisition. From a selection and placement point of view, they mention the following characteristics as essential to integration:

- Personality variables may affect the results of the cognitive tests on which admission decisions may be based and integration is thus essential
- The development of future skills (which are intrinsic to overall performance) may be enhanced or impaired by certain aspects of the individual's personality and integration is thus essential.

Whilst it is not within the scope of this research to report on all of the above, what follows is a summary of some of the most recent literature on the linkages between personality and cognition, with particular emphasis on cognitive style as a bridging concept (Grigorenko & Sternberg, 1997).

4.2 THE PERSONALITY-COGNITION INTERFACE

Researchers remain divided as to the possibility of integrating personality and cognition. However, despite the separation that generally exists, there is clearly a sufficient communality of interests for the two approaches to overlap.

What follows is an overview of some of the current concerns with the personality-cognition interface.

Barrat (1995) states that although both disciplines (personality and cognition) developed within the context of individual differences research, personality theory has been aimed at developing an inclusive description of individuals whilst cognitive theory has aimed more at a differential description.

Hofstee (2001) suggests that in psychometric reality, intelligence is measured by a person's maximal performance whereas personality is usually judged on the basis of typical behaviour. Lohman and Bosma (2002) share similar sentiments. They suggest that it is unfruitful to try to derive the dimensions of a trait model of abilities from an underlying process theory.

Borkenau (2001) suggests that a major difference between measures of abilities and measures of personality is that ability measurement is based on samples of relevant behaviour collected under maximal performance instructions and personality is based mostly on questionnaires and rating scales where individuals judge and rate their own behaviour.

Roodenburg (2003) traces some of the history of integrative attempts and states that despite the numerous definitions and conceptualisations, many researchers perceive cognitive style as a key in integrating cognition and personality. He suggests that style is a popular consideration because it adds something that is not currently captured by other trait type constructs such as intelligence and personality.

In view of the above, it is evident that there are vast discrepancies between research that suggests the possibility of integration of cognition and personality and research that refutes

the possibility. It would seem that despite the separation that generally exists, there is a move towards recognition that there is possibly some overlap between the two concepts. Roodenburg (2003) as briefly discussed above, provides a foundation upon to which to explore the possibility of cognitive style as a key bridging concept between cognition and personality. What follows is thus an overview of further advances and research findings pertaining to cognitive style.

4.3 COGNITIVE STYLE AS A KEY BRIDGING CONCEPT

Grigorenko and Sternberg (1997) summarise much of the literature on the interface between cognition and personality and conclude that cognitive styles represent a bridge between these two seemingly distinct areas. They go on to say that although these two areas have seemed to represent rather distinct areas of research, as far back as the seventies, Cattell and Royce had already attempted to link them into a single encompassing theory.

Zeidner (2001) reflects these ideas almost identically. Based on analysis of literature, Zeidner suggests that intelligence is more closely related to non-intellectual variables that reflect typical ways of dealing with information.

Das, Naglieri and Murphy (1995) state that although intelligence and personality are treated separately in text books, there is a definite relationship between them that has been acknowledged in the past. They refer to character and personality as twin terms and suggest that both of these include intellective and non-intellective aspects. They also refer to Galton as having made one of the earliest attempts at relating individual differences in intellectual abilities to personality traits. In recent literature, they refer to Guilford's structure of intelligence and the fact that he too, incorporated personality factors such as divergent thinking into his theory. Also of relatively recent origin, is Eysenck's three factors of intelligence; speed, persistence, and error checking, of which persistence is considered a personality variable.

Messick (1984) suggests that whilst cognitive style is conceptualised as characteristic modes of perceiving, remembering, thinking, problem solving, and decision making, reflective of information-processing regularities, all of these processes develop in congenial ways around

underlying personality trends. In other words, they are inferred from consistent individual differences in ways of organising and processing information and experience. In a later edition of his work, Messick (1994) states that styles are interwoven with personological characteristics and function mainly as conative mechanisms that regulate cognitive processes, learning strategies and affect. In this way, cognitive style impacts competence as well as performance. Messick explains the linkage as follows: stylistic modes of conceptualising, categorising, scanning, leveling/ sharpening, memory and restructuring influences the nature and quality of stimulus information available for thinking and problem solving, which in turn, influences both the manner and material of cognition.

Bergman, Donovan and Drasgow (2000) suggest that non-cognitive predictors, personality in particular, may account for some of the residual criterion variance in job performance that is not touched by cognitive abilities.

Lohman and Bosma (2002) suggest that cognitive styles are not just a subfield of differential psychology, but are more like foundational elements that shape the development of theories and the methods used to test them. They also suggest that cognitive style is interwoven with personality characteristics and functions mainly as a conative mechanism that regulates cognitive processes, learning strategies, and affect. They conclude their argument by reflecting on a statement by Messick. Messick (as cited in Lohman and Bosma, 2002) suggested that the human personality is a system that functions as a whole by virtue of the interdependence of its parts. Personality may thus influence the organisation of cognition, the dimensionality and stability of structure, the nature and course of cognitive processes and finally, the level of measured ability.

Cheng, Lockett and Schulz (2003) state that cognitive style appears to be the underlying factor determining individual differences in modes of information processing. They suggest that different personality predispositions can lead to different perceptions of information and problems when given identically formatted information.

Mills and Parker (1998) perceive temperament and cognitive style as an essential link between personality and cognition. They go on to define cognitive style as the structure, rather than the content of thought.

Das, Naglieri and Murphy (1995) refer to cognitive style as an underlying discriminator between successful and unsuccessful problem solvers. They mention the personality variables of impulsiveness, venturesomeness and extraversion as significantly correlated with problem-solving variables. When looked at in light of the literature, impulsivity for example, could be considered a characteristic style. This is supported by Grabowski and Jonassen (1993) who refer to impulsivity as an individual difference in cognitive style related to extraversion and introversion.

Based on their research of the relationship between personality and cognition, Isaksen, Lauer and Wilson (2003) conclude that cognitive style is a concept on the borderline between personality and cognitive functioning. They also reflect on the earlier work by Vernon who suggested that style could be subsumed under the notion of second order or higher order factors of intelligence.

Lohman and Bosma (2002) attempt to reconcile some of the conceptions and suggest that measures of style should yield scores that are bipolar and value differentiated rather than unipolar and value directed. They state that most attempts to measure cognitive styles have inappropriately followed the ability-factor model, which is better suited to value directional questions about unipolar, maximal performance constants. In other words, measures that have looked at how much rather than how, do not really serve the purpose of integration. They believe that a value directional approach may very well be the path towards integration.

In response to Lohman and Bosma (2002) the CPP model perhaps serves to clarify the concepts. Prinsloo (2000) suggests that cognitive style is a broader theoretical construct than cognitive process and thus overlaps with personality. The cognitive styles as they are reported on by the CPP thus reflect the stylistic approaches and response tendencies that individuals apply in new or unfamiliar environments. Prinsloo refers to the CPP styles as broad, descriptive and overlapping categories that provide descriptions of individual cognitive functioning. The CPP could thus be considered an assessment measure that looks at both the how (styles and processing categories), and the how much (levels of work and individual processing scores).

In summary, Grigorenko and Sternberg (1997) suggest that there are at least three major motivations for studying cognitive styles: providing a link between cognition and personality; understanding, predicting, and improving educational achievement; and improving vocational selection, guidance, and, possibly, placement.

Whilst the literature only provides partial support for the concept of style as a bridge between cognition and personality, there appears to be sufficient evidence to suggest that style is fairly fundamental as a bridging concept.

4.4 THEORIES OF COGNITIVE STYLE

With regards to the primary aim of this research, one of the aims is to research the concern relating to the trend of utilising cognitive and personality measures interchangeably in the context of selection and placement, particularly with reference to the MBTI. The discussion on theories of style and the definitions that have been given to the constructs measured by the MBTI serve to illustrate the point.

Messick (1994) traces the historical roots of cognitive styles to differential psychology, psychoanalytic ego psychology, gestalt, and cognitive-developmental psychology. He highlights the history as a means of emphasising and illuminating the varied theoretical issues that have both integrated and fragmented the research.

Cano-García and Hewitt-Hughes (2000) suggest that the consequence of the extensive research into styles has been the development of numerous models that all offer different conceptualisations, included amongst these and considered synonymously are: cognitive styles, approaches to learning, learning styles, learning strategies and thinking styles.

Furnham (as cited in Roodenburg, 2003) states that despite a history spanning 70 years, cognitive style remains seriously handicapped by a confusing lack of unity amongst an array of conceptualisations and operationalisations. Furnham concludes by saying that the field is fragmented, idiosyncratic and egocentric.

4.4.1 The Cognition-Centered Approach

According to Grigorenko and Sternberg (1997) work in this tradition is based loosely on a definition of cognitive styles as characteristic, self-consistent modes of functioning which individuals show in their perceptual and intellectual activities. They suggest that styles in this category closely resemble abilities and are often measured by tests of maximal performance. Included in this tradition are measures of reflection-impulsivity, field dependence-independence and other measures of cognitive complexity, differentiation and integration. Roodenburg (2003) refers to this tradition as information processing centered models and suggests that styles in this model involve cognitive ability and are based on differences in cognitive processes and perception.

Although the CPP integrates aspects of personality into the measurement of styles, it would most likely fall into the cognition-centered tradition.

Table 4.1 on the next page summarises the predominant styles in the cognition centered paradigm.

Table 4.1 Styles in the cognition centered paradigm (adapted from Grigorenko & Sternberg, 1997).

Style	Reference (all cited in Grigorenko and Sternberg (1997))	Definition
Abstract versus concrete	Harvey, Hunt, & Schroder (1961)	Preferred level of abstraction
Category width	Pettigrew (1958)	Degree to which people act on awareness of differences
Cognitive complexity	Gardner & Schoen (1962)	Tendency to make more and more complex associations between groups
Compartmentalization	Messick & Kogan (1963)	Tendency to compartmentalize ideas into discrete categories
Conceptual differentiation	Gardner & Schoen (1962)	Spontaneous differentiation of heterogeneous items into related groups
Conceptual integration	Harvey et al. (1961)	Relating of parts to each other and to prior concepts
Conceptual style	Kagan, Moss, & Sigel (1963)	Preference for analytical versus relational organization of information
Conceptual tempo	Kagan (1958, 1966)	Tendency to consider and reflect on alternative solution versus tendency to respond impulsively
Constricted versus flexible control	Smith & Klein (1953)	Tendency to disregard one of two conflicting cues
Field dependence versus independence	Witkin (1964)	Degree of dependence on the structure of the prevailing visual field
Scanning	Gardner & Moriarty (1968)	Extent to which an individual attempts to verify his or her judgments
Tolerance for unrealistic experiences	Klein & Schlesinger (1951)	Person's readiness to accept or report experiences at variance with what he or she knows to be true

4.4.2 The Personality-Centered Approach

Grigorenko and Sternberg (1997) suggest that whereas the styles produced by the cognition-centered approach closely approximate abilities, the styles produced by the personality-centered approach are closer to personality traits and are measured by typical-performance tests. Roodenburg (2003) refers to the personality centered approach as originating in differential psychology and measuring trait like behaviours. Roodenburg suggests the most common method of measurement as ratings on questionnaire type instruments and includes the MBTI and the Gregorc questionnaire in this tradition. However, he also suggests that despite inclusion of the MBTI into cognitive style literature, the MBTI measures style merely by default with most of its scales measuring other constructs. Roodenburg states that it cannot be assumed that the MBTI comprehensively encompasses the style domain.

4.4.3 The Activity-Centered Approach

A third approach to styles is centered on the notion of styles as mediators of various forms of activities that may arise from aspects of cognition and personality (Grigorenko & Sternberg, 1997). Thus, the activity centered approach could be viewed as a more dynamic conceptualisation of styles. Roodenburg (2003) suggests that the activity centered approach defines more directly observable learning and instruction style preferences.

4.4.4 Curry's Onion Model

Roodenburg (2003) points out that Curry's empirically based three-nested learning style onion model overcomes some of the confusion about style, by classifying learning and teaching style preferences as activity centred constructs that are distinct from cognitive styles. Roodenburg describes the model as onion layers which are analogous to different levels of a person's characteristics, with the innermost being the most stable. Roodenburg also suggests that each level influences the next. The outer layer represents instructional preferences, the middle layer information-processing models, and the inner layer personality-centred models.

4.4.5 The theory of Mental Self Government

Developed by Grigorenko and Sternberg (1997), the theory suggests that styles are related to the self-government of intelligence. Styles are thus characteristic ways of thinking and preferences about how we utilise the aptitudes we have. Style refers to what a person prefers to do and is not intelligence itself, but a way of utilising one's intelligence.

Grigorenko and Sternberg (1997) suggest that the theory embraces all three approaches to the study of styles. The styles in the theory are cognitive in their way of looking at things and correspond to preferences in the use of abilities, however, they are based on typical rather than maximum-performance. Based on this, they also resemble the personality-centered approach. Finally, the styles resemble the activity-centered approach in that they can be measured in the context of activities.

The theory of mental self-government has been operationalised through several inventories, including the Thinking Styles Inventory and the Thinking Styles in Teaching Inventory (Zhang, 2004).

Cano-García and Hewitt-Hughes (2000) in relation to the theory of mental self-government state that the essence of intelligence consists of providing the means for self-government, so that thoughts and actions are organised, coherent and appropriate to internal and environmental needs. In this way, they suggest that most of the predictable features of self-government are also relevant to intelligence and should thus take cognitive style into account.

4.5 COGNITIVE STYLE AND THE MBTI

This next section serves largely to illustrate some of the misconceptions surrounding the construct “cognitive style” and more particularly, misconceptions as they relate to the MBTI.

The MBTI is based upon the assumption that individuals have dichotomous preferences for one attitude, one perceiving function, and one judging function, and that these preferences do not imply level of development or expertise in the use of the functions. Although McCaulley and Myers (1985) do not necessarily dispute that individuals possess varying degrees of skill

in using each of the attitudes and functions, they argue that skill level is irrelevant, and that the categorical preference for one over the other has the most important implications for personality.

Some of the definitions that the MBTI has been given in research :

- The MBTI is a measure of information processing style, often termed cognitive style (Leonard, Richard & Kowalski, 1999).
- The MBTI provides insight into how individuals process information, make decisions, and solve problems (Folger et al. 2003).
- The MBTI is a measure of cognitive style (Doyle et al. 1997).
- The MBTI is a measure of four main personality dimensions (Brown & Harvey, 1996).
- The MBTI is a measure of cognitive style diversity (Cheng, Lockett & Schulz, 2003).
- The MBTI is a self-report instrument used to measure variables delineated in Jung's personality typology. The types are based on pairs of alternatives with the assumption that individuals display a preference for one of the alternatives over the other (Borrello & Thompson, 1985).
- The MBTI measures sixteen personality types according to four dimensions, i.e., extraverted or introverted, sensing or intuitive, thinking or feeling, perceiving or judging. These dimensions do not measure intelligence, motivation, maturity or mental health. Instead, they measure an individual's existing predispositions or tendencies (Black, 1994).
- The MBTI is a measure of information-processing methods and problem-solving capabilities (Austin-Davey, Schnell & Morrison, 1993).

- The MBTI is a measure of personality types that are related to problem-solving or decision making (Gaffner & Hazler, 2002).
- The MBTI is not a measure of skills or abilities. It looks at four personality preferences which together make up our personality type (Furnham & Stringfield, 1993).
- The MBTI is a measure of processing preference (Edwards, 2003).
- The MBTI measures characteristics and cognitive processes that influence behavior (Hartman, Hylton & Sanders, 1997).

Quenk and Hammer (as cited in Isaksen et al. 2003) suggest that by specifying that the MBTI is a personality inventory, its misuse as a test of skills, abilities, cognitive constructs and cognitive styles would be discouraged. They speak quite strongly against the misuse of the MBTI and suggest that a misunderstanding of what the tool measures, is just one of the problematic results of detaching the instrument from its theoretical roots.

Pittenger (1993) comments on MBTI development and users guide which states that the intent of the MBTI is to sort people into equally valuable groups to which, in accordance with Jung's theory, they already belong. It does not measure ability. Pittenger suggests that it is quite a stretch to move from the above statement to an explanation of the MBTI as a measure of learning style or cognitive style.

Quenk (2000) summarises some of the potential misuses of the MBTI as well as the possible consequences of mistaking type categories for trait variables. Quenk states first of all, that reading positive or negative meaning into numerical preference clarity indexes is inappropriate. Second, that it is incorrect to assume that people with very clear preferences have more of a particular function or attitude than people with less clear preferences. Thirdly, that greater clarity of preference does not imply greater skill or maturity of use of a preference and finally, that inferring that one or the other preference pole of a dichotomy is better or healthier than the other is also inaccurate and incorrect.

In conclusion, there is sufficient research to highlight the fact that the MBTI is in fact a measure of personality and does not purport to measure style, ability or skills. There are clear concerns as to the misuses of the MBTI as a selection tool, particularly when conceived as a measure of skill and ability.

Based on the literature, it can be assumed that the MBTI is a personality measure that is often considered to measure style, albeit by default (Roodenburg, 2003). It should be stated, however, that the MBTI falls into the personality-centered approach to style. The CPP on the other hand, could be considered as measuring elements of style that are more categorically, cognition centered.

4.6 COGNITIVE STYLE VERSUS COGNITIVE ABILITY

Another aspect of cognitive style that needs to be investigated is the difference between preference for cognitive style and cognitive skills and abilities. McCaulley and Myers (1985) argue for an interaction between preference and ability because people act on their preference and then develop skills or abilities using those aspects of perception and judgment. However, the MBTI determines preference and not ability. It is fairly easy to see how MBTI measures confound ability with style to a claim that they are primarily ability measures.

Style differs from ability, in that the latter may be thought of as unipolar (more of it is better), whereas the former is used non-pejoratively and is a description of qualitatively different types of thinking. Messick (as cited in Saddler-Smith & Badger, 1998) describe abilities as being unipolar constructs, while style is bipolar.

Research appears to support the view that cognitive style may be thought of as describing different, rather than better, ways of thinking (Saddler-Smith & Badger, 1998).

Ho and Rodgers (as cited in Fuller & Kaplan, 2004) differentiate three cognitive characteristics: abilities, cognitive style and strategy. They suggest that unlike cognitive ability and strategy, cognitive style represents a trait variable. In particular, cognitive style represents an individual's preferred method of acquiring and processing information during

the problem-solving process and thus represents preference in terms of ways of acquiring, storing, retrieving, and transforming information.

Grabowski and Jonassen (1993) state quite explicitly, that cognitive styles are not the same as mental abilities and that they differ substantially in terms of their generalities, their roles, and the values placed on them. They define cognitive abilities as the content and level of cognitive activity where styles refer to the manner and form of learning. Abilities specify the competencies, the mental operations, and the kind of information being processed, whereas styles are stated in terms of propensities. They conclude by suggesting that a good way to capture the core of these overlapping notions is to contrast cognitive styles with intellectual abilities and cognitive strategies. In other words, to compare style to abilities and strategies.

Messick (1994) suggests that abilities are competencies or enabling variables, whereas styles are propensities or performance variables. Abilities are unipolar and value directional whereas cognitive styles are typically bipolar and value differentiated, in other words, more is not better but each pole of a style dimension merely has different adaptive implications. Finally, Messick suggests that ability is usually limited to a particular domain of content or function, whereas style cuts across domains of ability, personality, and interpersonal behavior.

4.7 PAST RESEARCH ON THE RELATIONSHIP BETWEEN COGNITION AND PERSONALITY

Whilst there are numerous research studies that attempt to integrate and understand the relationship between cognition and personality, it would appear that many are flawed in light of the fact that they have utilised the MBTI as a measure of cognitive style rather than personality. The research overview that follows is thus based predominantly on studies that have attempted to relate personality type (as defined by the MBTI) to cognition and related cognitive constructs. I refers to introvert, E refers to extravert, N refers to intuitive, S refers to sensing, T refers to thinking, P refers to perceiving and J refers to judging.

- Hunter and Levy (as cited in Austin-Davey, Schnell & Morrison, 1993), found that intuitive-perceiving types (NP) attempt more problems than sensing-judging (SJ) types and

are more capable of solving a test requiring perceptual flexibility. The SJ types also tend to focus on concrete aspects and order.

- Schweiger and Jago (as cited in Austin-Davey, Schnell & Morrison, 1993) found that S types are concerned about accuracy and details as compared to N types, who tended to prefer fast conclusions and working alone.
- Mills, Robey, and Smith (as cited in Austin-Davey, Schnell & Morrison, 1993) conducted research on project management personnel and found that most respondents were STJ types who concentrated on facts, analysed them objectively, and had a practical orientation to their problem solving.
- Davis, Grove, and Knowles (as cited in Austin-Davey, Schnell & Morrison, 1993) found that S types performed more effectively within a fairly structured decision situation, as compared to N types.
- Austin-Davey, Schnell and Morrison (1993) found that ISTJ preferences are extremely dependable and have a complete, realistic, and practical respect for facts. They absorb, remember, and use a number of facts. They are also careful about their accuracy, good practical problem solvers and rely on past experience in solving problems.
- Boyatzis, Kolb and Mainemelis (2002) explored the relationship between experiential learning and personality type. They define experiential learning theory as the process whereby knowledge is created through the transformation of experience. Knowledge thus results from the combination of grasping and transforming experience. Grasping, refers to two types of experience, namely; concrete experience (CE) and abstract conceptualisation (AC). Transforming, refers to reflective observation (RO) and active experimentation (AE). According to the theory, concrete experiences are the basis for observations and reflections. These reflections are assimilated and distilled into abstract concepts from which new implications for action can be drawn.

They found that E/I correlates with the active/reflective dialectic of experiential learning as measured by the learning style inventory; and F/T dimension correlates with the learning style inventory concrete experience/ abstract conceptualisation dimension. S type is associated with an accommodating learning style and the N type with an assimilating style. F types correlate with diverging learning styles and T types to converging styles.

- Although not an MBTI study, Weinman et al. (as cited in Das, Naglieri & Murphy, 1995) studied individual differences and problem solving using the perceptual maze test. They found that E's spent less time scanning before making a response and more time checking their responses than did I's. These differences were most evident when the task was more difficult and were not evident when the task was easy. The authors interpreted these findings to indicate that the higher arousal levels of I's result in slower performance than that of E's on more complex tasks.
- Gardner and Martinko (as cited in Steiner & Gaskin, 1998) reported that SJ managers tended to perform better at lower management levels or in non-creative positions. They also found that T's seemed to do better than F's in non-dynamic management roles, or roles characterised by structure.
- Steiner and Gaskin (1998) found that ESFP types trusted their personal experiences, their big-picture intuition and their feelings and didn't rationalise their experiences to produce the paradigm-sanctioned response.
- DiRusso, Carney and Bryan, (as cited in Gaffner & Hazler, 2002) concluded that the I preference types are less decisive in their thinking and prefer an introspective and cautious approach to decision making. Individuals preferring I take time to think and clarify their ideas when solving problems.
- Provost and Anchors (as cited in Gaffner & Hazler, 2002) found that E's are more likely to be decisive and confident than I's and enjoy closure as well as making things happen. E's also tend to decide prematurely and may not take the time to gather information and consider possibilities.

- Blaylock and Wirkofsky (as cited in Furnham & Stringfield, 1993) used MBTI concepts to explain the problem-solving differences between scientists and managers. They point out that most scientists are ST or NT while many managers are SF and NF.
- Nutt (as cited in Furnham & Stringfield, 1993) also related 137 top executives' MBTI scores to the way in which they evaluated hypothetical, capital-expansion scenarios with strategic importance. The MBTI score was a highly significant factor in explaining the adoption and perceived risk for strategic decision. Executives with SF profiles were found to be action oriented, ST executives, action adverse, while NT and NF took nearly identical and neutral positions. SF's were inclined to be more strategic and found less risk in this decision than did other styles. INFP's tended to reflect on the reactions of people involved and to modify their decisions to cater for them and ENTJ's were less risk averse and comprehensive in their analyses than INTJ's. Nutt also used the MBTI to define various organisational decision-making styles: ST (Analytic), NF (Charismatic), SF (Consultative), and NT (Speculative) and showed how types related to decision making.
- Tversky and Kahneman (as cited in Furnham & Stringfield, 1993) found that managers experience certain information input and output biases which in turn, lead to operational biases in management. For instances, ST's succumb to functional-fixedness and regularity-and-structure biases while NF's succumb to reasoning-by-analogy and illusory-correlation biases.
- Funder (2001) related MBTI measurements to actual behaviour on the job. They found that N's performed better on analytical review tasks.
- Eigenberger, Sealander, Jacobs and Shellady (as cited in Folger et al. 2003) studied critical thinking as both an attitude and a skill. They found that T's performed better on critical thinking type tasks.
- Doyle et al. (1997) found that the MBTI produced data which was not useful in explaining dynamic decision making or performance.

- Edwards (2003) found that JP preferences are especially likely to manifest themselves when an individual is accuracy motivated. Edwards suggested that this provides support for the notion that J can be thought of as a preference for controlled processing, in other words, problem solving in structured and unambiguous settings.
- Grace (1997) reports on MBTI type and language learning. Grace suggests that tolerance of ambiguity is directly related to language learning and that learners who can tolerate moderate levels of ambiguity are more likely to persist in language learning.
- Ehrman and Oxford (as cited in Grace, 1997) found that learners with S types of personalities manifested liabilities in language learning because of their relatively low tolerance of ambiguity and their dislike of guessing; learners with I types of personalities on the other hand, relied heavily on guessing, did not require complete comprehension of texts to make progress and were comfortable experimenting and taking risks in language learning. Similarly, learners with J types of personalities tended to be inflexible, experienced difficulty using compensation strategies and reported a reluctance to incorporate new information in their developing linguistic competence. In contrast, P's claimed to be open to ambiguity and to the use of a variety of compensation strategies such as guessing or improvising. Also, T's indicated preferences for using metacognitive strategies much more than F's and for having a greater degree of control over structures and content. Ehrman supported these findings and observed that T's tended to use more data analysis strategies than F's.
- Norman and Watson (as cited in Grabowski & Jonassen, 1993) refer to ambiguity tolerance as an individual's willingness to accommodate or adapt to encounters with ambiguity. They found that because E's are less aroused than introverts, they had greater tolerance for inconsistency. I's, on the other hand, viewed the imbalance as aversive and unpleasant.
- Impulsivity/reflectivity, also referred to as cognitive tempo or conceptual tempo, measures a person's tendency to inhibit initial responses and to reflect on the accuracy of an answer rather than responding impulsively. Norman and Watson (as cited in Grabowski &

Jonassen, 1993) found that E's are frequently characterised as active-oriented, whereas I's are reflective-oriented, they in turn, attributed this to impulsivity and reflectivity effects.

- Leonard, Richard and Kowalski (1999) tested the interrelationship among the MBTI, the Group Embedded Figures Test, the Learning Styles Inventory, and the Decision Style Inventory. Their findings suggest that S individuals tend to be field independent and I individuals tend to be field dependent. They also found that T individuals scored high on abstract-conceptualisation and F individuals scored high on concrete-experience. E's tended to be high on the active-experimentation dimension and I tended to be high on the reflective-observation dimension.
- McCaulley and Myers (as cited in Sak, 2004) found that since N types are better at abstraction, symbols, theory, and possibilities, they outperform S types on aptitude tests. Three thousand high school male students' MBTI scores in a college-preparatory curriculum were compared with their IQ scores, all N types had higher scores than S types. The authors also suggest that the most common type among gifted adolescents is N.

From the listed research, it is evident that a number of researchers have attempted to determine relationships between various aspects of cognition and cognitive style and that of personality. It would seem that there are consistent research trends that highlight particular relationships between MBTI preferences and a variety of cognitive styles and generic cognitive behaviours, amongst these, suggestions of E's being more inclined towards impulsivity, S types performing more effectively at structured tasks and N types being particularly skilled at less structured tasks. The cited research provides a foundation upon which to gain some insight into the reasons that the MBTI, although strictly a personality measure, has been utilised as a measure of cognitive style and ability. Given the degree of apparent overlap between the constructs, it seems plausible that a distinction with regards to the primary use of the MBTI, has not been established.

Despite this, however, there is sufficient research to indicate the possibility that the MBTI does in fact measure elements of cognitive ability and style. Given this, the cited research provides the theoretical foundation upon which to empirically explore whether a relationship

between cognitive styles and personality exists, as well as to determine whether a relationship exists between cognitive processes and personality.

4.8 CHAPTER SUMMARY

Chapter four consisted of an overview of the historical attempts that have been made to integrate personality and cognition, with a focus on some of the problems in research methodology, concepts and measurements that have prevented integration in the past. The concept of cognitive style as a key bridging concept between personality and cognition, was thoroughly explored and the theories of cognitive style defined and discussed. The MBTI as a measure of style rather than personality, was researched in relation to its predictive validity as an ability rather than a personality measurement. Based on a substantial amount of literature it was concluded that the MBTI is possibly misused as a cognitive, rather than a personality measurement. The chapter was concluded with an overview of past research on the relationship between cognition and personality.

CHAPTER 5

EMPIRICAL STUDY

5.1 INTRODUCTION

The aim of chapter five is to describe the specific research process that was followed in determining whether a relationship exists between the dependent variable, cognition and the independent variable, personality. More specifically, and in relation to the empirical study aims, the chapter describes the process that was followed in achieving these aims.

Empirical study aims:

- To determine whether a relationship exists between cognitive styles (i.e. a person's general approach to problem solving, particularly in new and unfamiliar situations) and personality.
- To determine whether a relationship exists between cognitive processes / competencies (i.e. the performance processes used to manage task material) and personality.
- To determine whether a relationship exists between work-related processing aspects (e.g. indicating the levels of work complexity an individual is cognitively equipped to deal with) and personality.

The empirical study consists of eight steps, the first four of which are discussed in chapter 5 and the remainder in chapters 6 and 7.

- Step one - Selection of the sample
- Step two - Discussion and justification of the method of measurement
- Step three - Data gathering

- Step four - Data processing
- Step five - Reporting and interpretation of results
- Step six – Conclusion
- Step seven - Discussion of the limitations of the research
- Step eight - Recommendations

5.2 DESCRIPTION OF THE SAMPLE

Gliner and Morgan (2000) refer to sampling as the process of selecting *part* of a larger group of participants with the intent of generalising from the smaller group, called the sample, to the population, the larger group. If we are to make valid inferences about the population, we must select the sample so that it is representative of the total population. However, in terms of cost, administration procedure and the research limits as delineated by the organization to which the researcher was contracted, the participants were selected on the basis of convenience. Gliner and Morgan suggest that convenience sampling does not mean that the sample is, in fact, representative, but it does indicate an attempt by the researcher, at least after the fact, to check on representativeness.

The population for the present study was the total call centre staff compliment of a holding company for a number of short term insurance companies. Individuals are focused on predominantly two areas of expertise, namely direct sales and dealing with brokers. The total sample consists of 100 individuals.

Wilkinson (1999) states that researchers should provide information on sample size and the process that led to sample size decisions. Wilkinson also states, that research needs to document effect sizes, sampling and measurement assumptions, as well as analytic procedures used in power calculations. He believes that the intellectual exercise required to perform power analyses stimulates authors to consider more carefully, prior research and theory in

their field. It also gives an opportunity, despite inherent risks, for others to offer the challenge that there is research applicable to support a given study.

Christensen (1994) indicates that the power of a statistical test increases with increasing sample size. However, Christensen also acknowledges that increasing sample size is directly related to increases in time, and money.

The researcher has attempted to integrate the contributions of both Christensen (1994) as well as Wilkinson (1999).

The demographics of the sample are outlined in table 5.1 through to table 5.6 as well as figures 5.1 to 5.3

TABLE 5.1 AGE DISTRIBUTION

Age	Frequency	Percent	Cumulative Percent
23.00 -29.00	25	25.0	25
30.00 – 39.00	40	40.0	65
40.00 – 48.00	15	15.0	80
49.00 – 59.00	20	20.0	100
	100	100	100

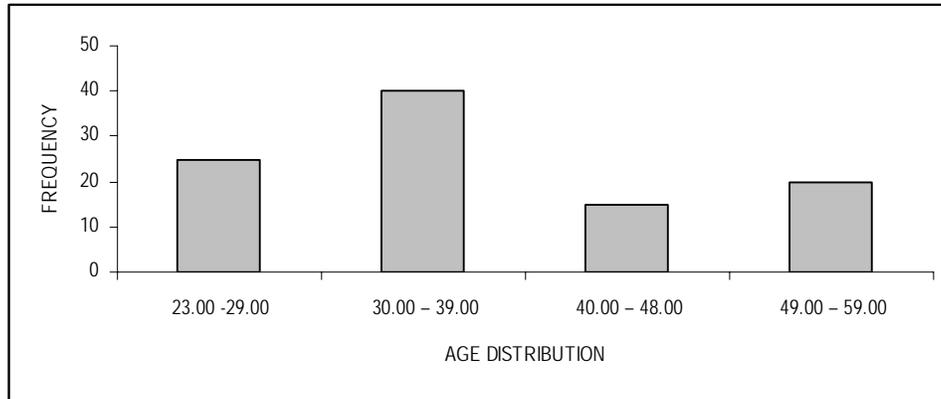


Figure 5.1 Age distribution

Table 5.1 and figure 5.1 indicates that more than half of the employees (65%) are of ages 40 years and younger. The mean age is 37 years.

TABLE 5.2 ETHNIC DISTRIBUTION

Ethnicity	Frequency	Percentage
Asian	13	13.0
Black	15	15.0
White	72	72.0
Total	100	100.0

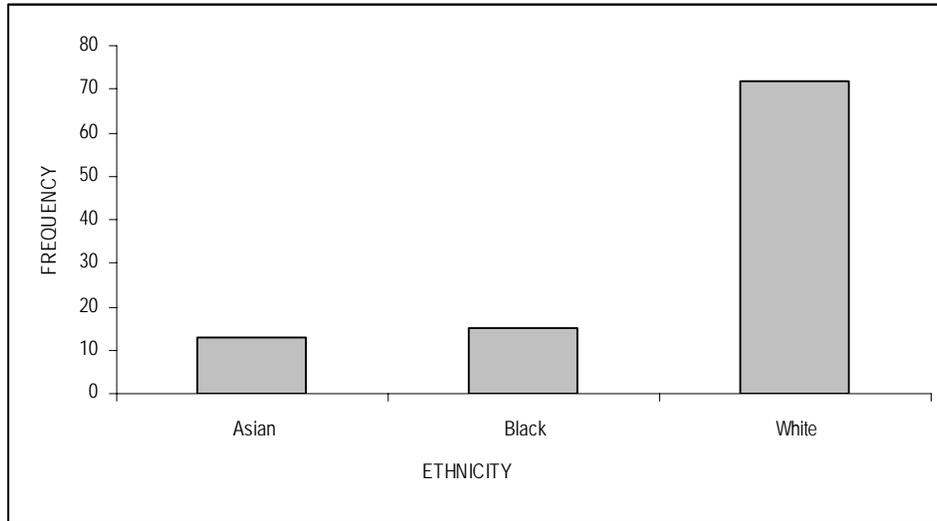


Figure 5.2 Ethnic distribution

Table 5.2 and figure 5.2 indicates that 72 % of the sample consists of white individuals, with only 15 % of the sample being black individuals and 13% being Asian.

TABLE 5.3 GENDER DEMOGRAPHICS

Gender	Frequency	Percentage
Female	34	34.0
Male	66	66.0
Total	100	100.0

From table 5.3 it can be seen that the workforce consisted predominantly of male employees (66%).

TABLE 5.4 EDUCATIONAL LEVELS

	Frequency	Percent	Cumulative Percent
Matric	23	23.0	23.0
Diploma	26	26.0	49.0
Graduate	19	19.0	68.0
Postgraduate	32	32.0	100.0
Total	100	100.0	

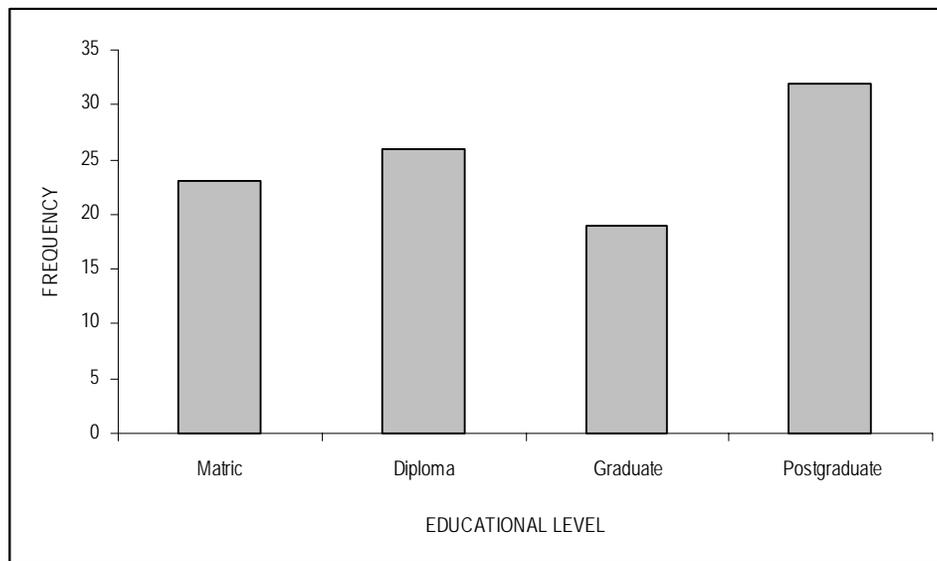


Figure 5.3 Educational levels

The workforce, when looked at in light of table 5.4 and figure 5.3 appears to be reasonably educated, with all individuals having a matric and many having completed post-matric qualifications.

TABLE 5.5 LANGUAGE BY ETHNIC GROUP

		LANGUAGE							Total
		AFRIKAANS	ENGLISH	SOTHO	SWAZI	TSWANA	XHOSA	ZULU	
Ethnicity	Asian	0	12	1	0	0	0	0	13
	Black	0	1	7	1	2	1	3	15
	White	22	49	0	0	0	1	0	72
Total		22	62	8	1	2	2	3	100

From table 5.5 it appears that all Afrikaans speaking employees are White (22) whilst some of the English speakers are Asian (12). One of the blacks are also English but will not be classified in a group. One of the Asians indicated Sotho as a home language and will also not be classified.

The following culture groups have been created for comparison purposes, namely; Asians (11), Afrikaans (White) (22), White English (49) and Black languages (15).

TABLE 5.6 CULTURE GROUPS

	Frequency	Valid Percent
Asian	11	11.2
English	50	51.0
Afrikaans	22	22.4
Black	15	15.3
Total	98	100.0

Table 5.6 provides an overview of the culture groups (rather than ethnic groups) that will be the focus of the current study.

5.3 MEASURING INSTRUMENTS

One of the key aims of the research is to determine whether there is a relationship between cognition (measured by the CPP) and personality (measured by the MBTI), (Iman, 1994).

- **Measurement of the independent variable (Personality)**

The independent variable for the current research is personality, which is measurable by means of psychometric testing. The MBTI was selected as an appropriate measure based on the findings that are discussed in chapter 3 (see section 3). Black (1994) briefly summarises the MBTI as a personality assessment that measures an individual's existing predispositions or tendencies. The test consists of 100 questions and requires the respondent to choose between two descriptive terms or phrases that describe the same trait or same scale. Both responses are equally acceptable and the response is scored on a single scale. Individuals are then divided into sixteen personality types according to four dimensions, i.e., extraverted (E) or introverted (I), sensing (S) or intuitive (N), thinking (T) or feeling (F), perceiving (P) or judging (J).

- **Measurement of the dependent variable (Cognition)**

The dependent variable for the current research is cognition, which is also measurable by means of psychometric testing. The CPP was selected as an appropriate measure based on the findings that are discussed in chapter 2 (see sections 2.4.4, 2.4.5 and 2.4.6).

5.4 DATA GATHERING

5.4.1 Process

- **Contracting the client** - The researcher was contracted to the client to perform assessments as part of an organisational development initiative. The data was merely used later as a convenience sample.
- **Personality data** - Personality data was obtained through administration of the MBTI. Administration procedures are discussed in Chapter 3 (section 3.7.7).

- **Cognitive data** - Cognitive data was obtained through administration of the CPP. Administration procedures are discussed in Chapter 2 (section 2.4.6).

5.4.2 Methods to ensure reliability and validity

Mouton and Marais (1990) suggest that the reliability of research is impacted upon by the researcher, the participants, the context and the measuring instruments. These factors were discussed in chapter 1 (see section 1.5.3). Golafshani (2003) adds to this and suggests that these issues pose greater challenges in quantitative research. With regards to reliability, Golafshani states that the key concern is whether the result is replicable and with regards to validity, whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure.

- **The researcher and the participants**

Golafshani (2003) describes validity in quantitative research as construct validity with specific reference to how the data is gathered. In agreement with Mouton and Marais (1990) Golafshani also asserts that quantitative researchers can actively cause or affect the interplay between construct and data in order to validate their investigation, usually by the application of a test or other process. In this sense, the involvement of the researchers in the research process would greatly reduce the validity of a test.

Gliner and Morgan (2000) include issues of confidentiality, research permission and integrity of the data as factors that could impact on validity and reliability.

As far as the above are concerned, a couple of factors ensure that validity and reliability was maintained. Firstly, the researcher had minimal contact with the participants. Contact only incorporated an initial meeting in which the purpose of the assessments were explained. Furthermore, the purpose first and foremost, was that of development as mentioned above. Secondly, participants were ensured of the confidentiality of their individual results and were required to sign data release forms in cases where their assessments would be handed over to management.

Finally, what Gliner and Morgan (2000) refer to as integrity of data, refers to the fact that researchers may not fabricate data or falsify results in their publications. In terms of ethical obligations, the researcher was bound to honesty and integrity.

- **The context**

Gliner and Morgan (2000) refer to context as individual viewpoint or reality that is determined by situational variables. They suggest that quantitative researchers need to recognise that participants have different perspectives, or points of view, and report these as variability. In addition, quantitative studies often examine factors that are related to and perhaps cause different perceptions.

The context of the study is discussed briefly in the above paragraph, adding to this, the context was a non-threatening one. Both management and the researcher were transparent and the specific purpose was one of opportunity rather than threat. Crucial extraneous variables that could threaten internal validity have also been carefully determined and measured.

- **The instruments**

The measuring instruments used for the study included the CPP and the MBTI. The CPP is discussed in detail in chapter 2 and the MBTI in chapter 3. Reliability and validity measures are provided and the use of both instruments has been motivated.

5.5 DATA PROCESSING

5.5.1 Identification of extraneous variables

Kerlinger (1986) defines extraneous independent variables as variables that may influence the dependant variable but that are not part of the study. Owing to the fact that a number of factors could have an impact on personality measurement, it was recognised that extraneous variables and their impact would need to be considered and factored into the research process.

Anastasi and Urbina (1997) suggest that it is common practice in applied psychological research to investigate the effects of biographical variables such as age, sex and education moderating the relationship between the predictor and criterion variables. Anastasi also stresses the need to include only those variables for which there is evidence of moderating effects.

Based on literature sources, the extraneous variables that were of predominant concern included age, gender and culture.

Quenk (2000) suggests that maturity and expression of MBTI psychological type, go hand in hand. Given this, it is suggested that younger individuals may not entirely fit the descriptions or may show exaggerations of type.

Furnham and Stringfield (1993) found a large number of significant differences on the MBTI scores for both gender and culture. They found that compared to males, females were more extraverted, and less introverted, less sensing and more intuiting, less thinking and more feeling. McCaulley and Myers (1985) suggest that there is a female preference for the F or feeling preference and a male preference for the T or thinking preference. They also mention some studies that have identified a slightly higher percentage of E's and N's in female samples.

Whereas gender differences in personality measures are well documented Furnham and Stringfield (1993) report that cultural differences are less well known. They report that cultural differences are generally in terms of degree of type rather than kind.

Prinsloo (2000) reports a number of studies examining the effects of age, gender and culture on CPP scores. Her findings suggest that younger individuals tend to score lower on the judgment dimension and black candidates tend more towards a story telling or metaphoric style of thinking. There are no findings to suggest that age impacts on either cognitive processes or cognitive styles.

In the current study the basic goal was to compare MBTI groupings with respect to the CPP factors and to determine whether the groups differed in respect to any of the 16 dimensions. This meant logically that the four groups were the crucial effect tested (referred to as the “groups effect”). Given that the effect of “groups” could be impacted upon by other effects (for example gender and culture) as well as possible interaction effects between gender, culture and age, these possible interactions have been controlled. Although not directly interested in these effects (other than to note whether their Wilks Lambda test statistic are significant), they have been included in the model and thus, when “groups effect” are considered, it can be assumed that the other effects are controlled.

The aim of the current study was to establish pairwise comparisons between the MBTI and the CPP factors. However, given that there is a possibility that biographic variables could act as nuisance variables, these were carefully controlled for. For example, should men come across as more extraverted than women and also score higher on CPP potential than women, an artificial relationship between Extraversion and CPP potential would be created. The relation of biographical variables to CPP and MBTI factors was therefore controlled.

Referring to Appendix B and an explanation of effect sizes in paragraph 5.5, it is clear that all the effects are large from a practical effect size point of view as the Partial Eta squared values are larger than 0,10 (with the exception of Gender: Partial Eta squared = 0,070 which is still moderately large).

Referring to Appendix C and an explanation of effect sizes in paragraph 5.5, it is clear that all the effects are large from a practical effect size as the Partial Eta squared values are larger than 0,10.

5.5.2 Main Methodology

The main methodology used in the current study was the General Linear Modelling (GLM) procedure of the Statistical Package for the Social Sciences, SPSS version 12.0 (Pedhazur, 1997).

5.5.3 Multiple dependent variables

The GLM procedure of SPSS allows one to specify several dependent variables. In the current study the 16 CPP factors were specified as the dependent variables and the basic goal was to compare MBTI groupings with respect to these 16 CPP factors. The total sample of 100 employees was divided into groups, and the groups tested to determine whether they differed with respect to the 16 CPP factors.

5.5.4 The multivariate test

The multivariate GLM procedure of SPSS (version 12.0) performs a multivariate test. In the current study the emphasis is on the Wilks Lambda test statistic as this statistic is the more popular and applicable when more than two groups are being compared (Gill, 2001).

In the current study it was important that the Wilks Lambda test statistic be significant at the 0,05 level. In other words, the significance value calculated for the Wilks Lambda test statistic had to be smaller than 0,05.

5.5.5 Pairwise comparisons

In the event that the “groups effect” proved both statistically significant and of practical importance, pairwise comparisons were made between the MBTI groups with respect to each of the 16 CPP factors. As multiple comparisons were made, the level of significance had to be adjusted. The method used in the current study was the Bonferroni adjustment of the significance level.

For example, Bonferroni adjustment is utilised when there are many dependent variables and univariate tests might be significant due to chance alone. In other words, the nominal ,05 level would not indicate the actual alpha level. The researcher may then adjust the nominal alpha level to cater for this. In the current study, the researcher, requires an actual adjusted alpha level of at least ,05. (Gill, 2001).

The SPSS GLM program gives the pairwise comparisons between groups at the Bonferroni adjusted significance levels. When two groups are for example found to differ significantly with regard to a particular CPP factor at the Bonferonni adjusted level of significance of 0,05, the result is discussed.

5.5.6 The Chi-square Statistic

The SPSS users guide refers to the Chi-square as a non-parametric test of statistical significance for bivariate tabular analysis (also known as crossbreaks). Typically, the hypothesis tested with Chi-square is whether or not two different samples (in this case, different MBTI groups and cognitive style) are different enough in some characteristic such that it can be generalised from the sample that the samples from which the samples are drawn are also different in the given characteristic.

The SPSS GLM program tabulates variables into categories and computes a chi-square statistic based on the differences between observed and expected frequencies. If the Chi-square value is larger than the critical value in a cell, the data presents a statistically significant relationship between the variables in the table.

In essence, if Chi-Squared is not significant, variables are unrelated and if Chi-Squared is significant, variables are related.

5.6 STATISTICAL POWER

Cohen (1988) refers to the power of a statistical test as the probability that it will yield statistically significant results. Most computer programs report a so-called p-value with each statistical test of a null hypothesis, which gives the probability of the result under the null

hypothesis. Should the researcher wish to reject the null hypothesis, he or she requires a small p-value. Normally this is the case with statistics such as t- and F-values and correlation coefficients. On the other hand, if the researcher wishes to retain the null hypothesis, a large p-value is required

Cohen (1988) goes on to say that before sample data are gathered, the researcher is required to select some prudently small value (say .01 or .05), so that the researcher may be able to conclude that should the null hypothesis be true, the probability of the obtained sample result is no more than for example, a statistically significant result. If the researcher can make this statement, since the p value is small, the null hypothesis can be rejected with a significance criterion or at the given significance level. If the researcher finds the probability to be greater than the p value, it cannot be concluded that the above statement is true and thus the researcher fails to reject the null hypothesis, or, equivalently finds it tenable or acceptable at the significance level.

In the present study the researcher wishes to reject the null hypothesis which states that there is no significant relationship between the constructs measured by the CPP and those measured by the MBTI. This in turn, would imply acceptance of the alternative hypothesis which states that there is a significant relationship between the constructs measured by the CPP and those measured by the MBTI, which is in essence, the intent of the research. Given this, a small p-value is needed. Usually the researcher sets a so-called level of significance in advance of any statistical tests being calculated and then compares the resulting p-values against this level of significance. If the p-value is smaller than the level of significance, the null hypothesis is rejected. If not, the null hypothesis is not rejected.

Cohen (1988) suggests that it is convenient to conceive of the significance criterion as encompassing the probability of falsely rejecting the null hypothesis, as well as the sidedness of the definition of the existence of the phenomenon. Cohen thus suggests the significance criterion on a two-tailed test of the null hypothesis at the .05 significance level. This in turn, suggests that the research question and the phenomenon under investigation is understood to be manifested by any difference between the two samples' parameter values, and that the standard of proof is a sample result that would occur less than 5% of the time if the null hypothesis is true.

Conventionally, the levels 0,05 and 0,01 are used by most researchers as levels of significance for statistical tests performed.

Cohen (1988) states that when both type 1 and type 2 errors are equally important, lower significance levels are more appropriate than the conventionally used 0,05 and 0,01 levels.

The Society for Industrial Psychology (1992) suggests that a type 2 error is often underemphasised and that Type 1 and Type 2 errors should receive equal attention. In view of the work by both Cohen (1988) as well as the The Society for Industrial Psychology (1992) it would seem that what is required is for researchers to apply more stringent significance levels due to concern with missing a significant result or making a Type 2 error, as well as falsely concluding a significant result (committing a Type I error).

With large samples, it can happen that effects are significant yet not impressive from a practical point of view (Chow, 1988).

In the current study the Partial Squared Eta value is used as an index of practical significance. Partial Squared Eta values of .01, .06 and .14 represent small, medium and large effects (Stevens, 1992).

The larger the Partial Squared Eta value the larger the practical importance of the effect. In the current study results with respect to the “groups effect” had to be statistically significant at the 0,05 level and the practical effect size large (above 0,100).

- **Statistical Computer Package**

All statistical analyses in the present study were computed using SPSS (Statistical Package for the Social Sciences, 2001a, 2001b)

5.7 HYPOTHESIS

The following hypotheses are relevant to the current study:

- H0: there is no significant relationship between the constructs measured by the CPP and those measured by the MBTI.
- H1: there is a significant relationship between the constructs measured by the CPP and those measured by the MBTI.

5.8 CHAPTER SUMMARY

Chapter five consisted of a description of the sample and an in-depth discussion of the research design. The measuring instruments for the dependent (Cognition) and independent (Personality) variables were described and discussed, and the data gathering process was clarified. Extraneous variables were identified and the methods that were implemented to ensure validity and reliability were discussed. Finally, a careful description of the processes for analysing the data, ensuring statistical power and the process of reporting the findings, was provided.

CHAPTER 6

RESULTS

6.1 INTRODUCTION

The aim of chapter six is to report, interpret and integrate the results of the empirical research that was followed in determining the relationship between cognition and personality. The chapter consists of :

Descriptive statistics for :

- The Independent variable (Personality)
- The Dependent variable (Cognition)
- Pairwise comparisons between MBTI symbol groups and CPP factors
- Chi-Square tests of the relationship between MBTI groups and cognitive Style

Please note that from here onwards the following symbols are relevant :

- E – refers to an extraverted preference on the MBTI
- I - refers to an introverted preference on the MBTI
- N - refers to an intuitive preference on the MBTI
- S - refers to a sensing preference on the MBTI
- F - refers to a feeling preference on the MBTI
- T - refers to a thinking preference on the MBTI
- J - refers to a judging preference on the MBTI
- P - refers to a perceiving preference on the MBTI

6.2 DESCRIPTIVE STATISTICS OF THE INDEPENDENT VARIABLE (PERSONALITY)

The following tables provide a graphical overview of the independent MBTI symbols as well as the MBTI symbol combinations. Each independent or combination symbols are considered in relation to gender, culture and educational level.

TABLE 6.1 ONE SYMBOL MBTI PREFERENCE

ONE SYMBOL COMBINATION	NO OF CASES	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
E	72	72.0	72.0	72.0
I	28	28.0	28.0	28.0
N	56	56.0	56.0	56.0
S	44	44.0	44.0	44.0
F	18	18.0	18.0	18.0
T	82	82.0	82.0	100.0
J	57	57.0	57.0	57.0
P	43	43.0	43.0	43.0

From table 6.1 it appears that E (72%) and T (82%) are the most common preferences reported in the highly represented combinations in the research sample. This would suggest the possibility that T predominates among sales and marketing individuals. F (18%) on the other hand, is the only preference reported in the lower score combinations. Botha (as cited in Hardijzer, 2000) reported 92.8 % for the thinking dimension in his management studies, McCaulley and Myers (1985) reported similar findings in a number of their research projects. Hardijzer (2000) in his research reported a percentage of 89.4 % as a predominant preference in his sample. In light of this, the current study seems to be consistent with previous research findings that have indicated a larger percentage of T individuals within management samples.

TABLE 6.2 ONE SYMBOL MBTI PREFERENCE PER GENDER

GENDER	MBTI SYMBOL							
	E	I	N	S	F	T	J	P
M	45	21	40	26	11	55	21	13
F	27	7	17	16	7	27	36	30

Although not an analysis of occupational choice, the industry from which the sample was drawn, specialises in sales and marketing in the context of a call centre setting. The sample also consists of individuals falling across two management levels, namely supervisors and first level management. Brown and Harvey (1996) suggest that with respect to occupational choice, MBTI results can give an indication of preference. They refer to studies that indicate a match between MBTI type and occupational choice, for example, 85% of Psychologists score toward the “N” pole of the SN scale, whereas managers score more towards the STJ scale. Coetzee (as cited in Hardijzer, 2000) also reported an STJ preference of 71 % for individuals in management levels. When looked at in light of table 6.2 the current study seems to correspond with the literature.

Austin-Davey, Schnell and Morrison (1993) also suggest that certain professions have a preponderance of certain types. They state that health-oriented and educational careers seem to attract and retain a larger number of F types, whereas business tends to attract and retain a larger proportion of T types. Rice and Lindecamp (as cited in Austin-Davey, Schnell and Morrison, 1993) found that the majority of small retailers tended to be ESJ types, even though the ET types appeared to be the most successful. In contrast to lower level management positions, however, they found that upper-level management individuals seemed to prefer N, necessary for environments characterised by a high degree of uncertainty and a lack of facts and time. Although not particularly relevant (since the sample consists largely of supervisory and lower level management positions), 56 % of the individuals showed N preferences. It is feasible to assume that given the cognitive potential of the group as well as a fair N

preference, the group as a whole shows potential to move into more senior management levels, particularly those characterised by higher levels of complexity, uncertainty and ambiguity.

Gardner and Martinko (1996) report that 55 to 60 % of all people are E's, 60 % prefer S and J, to N and P and TF preferences vary by gender, with about 60 % of males and females, respectively, being T's and F's. The literature on the TF dimension is not supported in the current study and the frequencies seems to indicate that relative to the number of males and females in the sample, the feeling dimension does not predominate amongst females.

Gardner and Martinko (1996) report that whilst all types appear in managerial samples, TJ's are most prevalent and there is a majority preference for E and S. They also report that managers favour T and J in 97 % of cases and TJ's are overrepresented in management levels. The authors summarise their findings by suggesting that in general, managers are more inclined to prefer T and J over F and P than members of the general population. They go on to state that the findings could imply that certain types self-select themselves for management positions by falsely reporting TJ preferences. In other words, many managers who score as TJ's may be "falsifying" their preferences due to social desirability biases.

As far as females are concerned, they suggest that falsification may be most acute since female managers report T preferences significantly more often than women in general (e.g., 57 % versus 40 %) although not as often as males (this is certainly supported in the current study).

It seems that despite the volume of research which suggests a predominance of TJ managers, studies with more rigorous designs are required before this proposition can be unequivocally accepted.

TABLE 6.3 DESCRIPTIVE STATISTICS : INTROVERSION/EXTRAVERSION

Between-Subjects Factors			
		Value Label	N
Gender	1	Female	34
	2	Male	63
Education	1	Matric	23
	2	Diploma	24
	3	Graduate	19
	4	Postgraduate	31
culture group	1	Asian	11
	2	English	50
	3	Afrikaans	21
	4	Black	15
E_I	E		72
	I		28

From table 6.3 it is evident that E predominates in the group, with 72 % of the group showing a preference for E and only 28 % showing a preference for I. In terms of a sales and marketing environment, it seems plausible that E would be a possible requirement for success in the role.

McCaulley and Myers (1985) suggest that there are no significant differences on the EI dimension across the general population. Shuck and Phillips (1999), reporting on a management study, found that E's and I's were evenly distributed and that there were slightly more T than F types. Among females two-thirds preferred F and one-third preferred T. Shuck and Phillips (1999) in a research study in America, found that despite popular beliefs around the world that Americans are very extraverted, 75 % of a sample of 903 subjects preferred I. They also report that their findings were inconsistent with estimates suggesting that about 80% of the general population prefer the T dimension, regardless of the sex of the individual. This research is also unsupported in the current study, which could lend support to the work by Gardner and Martinko (1996).

TABLE 6.4 DESCRIPTIVE STATISTICS : INTUITION/SENSING

Between-Subjects Factors			
		Value Label	N
Gender	1	Female	34
	2	Male	63
Education	1	Matric	23
	2	Diploma	24
	3	Graduate	19
	4	Postgraduate	31
culture group	1	Asian	11
	2	English	50
	3	Afrikaans	21
	4	Black	15
N_S	N		56
	S		44

When examining Table 6.4 it is evident that N predominates in the group, with 56 % of the group showing a preference for N and only 44 % showing a preference for S. Holistically, this would suggest that the group shows some interest in future possibilities, implicit meanings and symbolic or theoretical meanings (McCaulley, 1990). This is slightly different to the research by Hardijzer (2000) who reported a 50.4 % preference for N and a 49.6 % preference for S. Cheng, Lockett, and Schulz (2003) suggest that managers with preference for S tend to perceive and process concrete stimuli and information, whereas N managers favour more abstract information and perceptual processes.

Shuck and Phillips (1999) suggest that the SN function of the MBTI refers to two kinds of perception that involve becoming aware and gathering information using S or N functions. They suggest that the sensing function establishes what is occurring in the immediate moment whilst the N function refers to possibilities and relationships.

McIntyre, Claxton, Anselmi and Wheatley (2000) in their research on adaptive selling, found that individuals high on N (rather S) were more effective at adaptive selling. It is possible that within a sales environment, N (rather S) is a requirement in terms of understanding the needs of clients and customers, particularly in relation to future possibilities and strategic marketing opportunities.

TABLE 6.5 DESCRIPTIVE STATISTICS : THINKING/FEELING

Between-Subjects Factors			
		Value Label	N
Gender	1	Female	34
	2	Male	63
Education	1	Matric	23
	2	Diploma	24
	3	Graduate	19
	4	Postgraduate	31
culture group	1	Asian	11
	2	English	50
	3	Afrikaans	21
	4	Black	15
T_F	F		18
	T		82

From table 6.5 it is evident that the T preference predominates in the group, with 82 % of the group showing a preference for T and only 18 % showing a preference for F. Aspects of the TF distinction have already been discussed under Table 6.2.

The strong T function in the group, according to Gaffner and Hazler (2002) would suggest a preference for a logical and objective approach to decision making, evaluation and decision making on a strictly objective and impersonal basis and reaching conclusions in terms of facts, models and principles under consideration. This lends support to the largely logical-analytical thinking styles and processing dimensions as evidenced in the CPP data. However,

it should be noted that whilst McIntyre et al. (2000) found that individuals high on N (rather than S) were more effective at adaptive selling, they also found that individuals higher on the F dimension of the MBTI tended to outperform those higher on the T dimension across most areas of selling and marketing. It is thus possible that although a high T preference is considered a norm at managerial level, the high T preference (almost to the exclusion of F) may in fact be a possible risk to the group.

TABLE 6.6 DESCRIPTIVE STATISTICS : JUDGING/PERCEIVING

Between-Subjects Factors			
		Value Label	N
Gender	1	Female	34
	2	Male	63
Education	1	Matric	23
	2	Diploma	24
	3	Graduate	19
	4	Postgraduate	31
culture group	1	Asian	11
	2	English	50
	3	Afrikaans	21
	4	Black	15
J_P	J		57
	P		43

From table 6.6 it would appear that the J preference predominates in the group, with 57 % of the group showing a preference for J and 43 % showing a preference for P.

TABLE 6.7 DESCRIPTIVE STATISTICS : TWO SYMBOL MBTI PREFERENCE

TWO SYMBOLS WITHOUT I AND E				
SYMBOL COMBINATION	FREQUENCY	Percent	Valid Percent	Cumulative Percent
NF	1	1.0	1.0	1.0
NJ	6	6.0	6.0	7.0
NP	18	18.0	18.0	25.0
NT	9	9.0	9.0	34.0
SJ	19	19.0	19.0	53.0
SP	4	4.0	4.0	57.0
ST	8	8.0	8.0	65.0
TJ	27	27.0	27.0	92.0
TP	8	8.0	8.0	100.0
	100	100.0	100.0	

From table 6.7 it would appear that the predominant two symbol preferences in the group include the TJ preference (27 %), the SJ preference (19 %) and the NP preference (18 %).

TABLE 6.8 DESCRIPTIVE STATISTICS : THREE SYMBOL MBTI PREFERENCE

SYMBOL COMBINATION	NO OF CASES
NFJ	2
NFP	9
NTJ	19
NTP	26
SFJ	4
SFP	3
STJ	32
STP	5

**TABLE 6.9 : DESCRIPTIVE STATISTICS : THREE SYMBOL MBTI PREFERENCE
- SMALL GROUPS ELIMINATED**

THREE SYMBOLS WITHOUT I AND E				
	Frequency	Percent	Valid Percent	Cumulative Percent
NFP	9	9.0	10.5	10.5
NTJ	19	19.0	22.1	32.6
NTP	26	26.0	30.2	62.8
STJ	32	32.0	37.2	100.0
Total	86	86.0	100.0	
Missing	14	14.0		
Total		100.0		

From tables 6.8 and 6.9, it would appear that the predominant three symbol preferences in the group include the NTJ preference (19 %), the STJ preference (32 %) and the NTP preference (26 %).

TABLE 6.10 DESCRIPTIVE STATISTICS: FOUR SYMBOL MBTI PREFERENCE

SENSING TYPES				INTUITIVE TYPES			
THINKING		FEELING		FEELING		THINKING	
ISTJ	10	ISFJ	2	INFJ	0	INTJ	2
ISTP	0	ISFP	0	INFP	4	INTP	10
ESTP	4	ESFP	3	ENFP	5	ENTP	16
ESTJ	23	ESFJ	2	ENFJ	2	ENTJ	17

TABLE 6.11 : DESCRIPTIVE STATISTICS : FOUR SYMBOL MBTI PREFERENCE (LARGE GROUPS)

FOUR SYMBOL COMBINATIONS (Large enough groups)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ENTJ	17	17.0	22.7	22.7
	ENTP	16	16.0	21.3	44.0
	INTP	10	10.0	13.3	57.3
	ISTJ	9	9.0	12.0	69.3
	ESTJ	23	23.0	30.7	100.0
	Total	75	75.0	100.0	
	Missing	System	25	25.0	
Total		100	100.0		

From tables 6.10 and 6.11 it would appear that the predominant four symbol preferences in the group include the ESTJ preference (23 %), the ENTJ preference (17 %) and the ENTP preference (16 %).

In view of table 6.12, McCaulley (1990) integrated research from a large number of MBTI studies and listed the following MBTI types as falling into either telephone (call centre) environments, supervisory roles or management roles. When comparing the “Telephone” category with the data in table 6.10 there seems to be some significant similarities and differences. For example, Telephone (ESTJ = 26.7%) and table 6.16 (ESTJ = 23%), Telephone (ESFJ= 2%) and table 6.16 (ESFJ = 3%), however, Telephone (ENFJ = 17.3%) and table 6.16 (ENFJ = 2%).

Table 6.12 MBTI Profiles in a call centre environment

MBTI PROFILE															
	ESTJ	ESFJ	ENFJ	ESTP	ESFP	ENFP	ENTP	ISTP	ISFP	INFP	INTP	ISTJ	ISFJ	INFJ	INTJ
Telephone	26.7	2.0	17.3	4.0	0.0	5.0	6.9	3.0	2.0	1.0	3.0	22.8	2.0	0.0	8.9
Supervisor	4.3	7.9	7.1	4.3	0.0	1.4	2.9	8.6	2.9	4.3	2.9	24.3	10.0	2.9	5.7
Manager	3.7	2.5	11.2	3.1	1.9	2.5	6.2	6.8	1.2	3.7	4.3	21.7	3.7	3.1	9.9

The predominant ESTJ preference corresponds closely with a number of research findings that suggest a predominance of ESTJ types in the work environment. Demarest (as cited in Hardijzer, 2000) for example, reports that the ESTJ preference is not only one of the most predominant types found in the corporate environment, but are also one of the most common types found in the marketing environment. Hardijzer (2000) in his research, reported 16.3 % of his sample being composed of an ESTJ preference, he also cites a number of other research findings that highlight similar results.

The strong ESTJ preference as a whole would indicate that in a work context, the group is likely to come across as goal and task-directed, decisive, realistic and matter of fact as well as reliant on facts, logic and experience in making decisions. The ESTJ preference is also likely to be characterised by a preference for structure and order and behaviour that is systematic and efficient, rule following and decisive.

6.3 DESCRIPTIVE STATISTICS OF THE DEPENDENT VARIABLE (COGNITION)

TABLE 6.13 DESCRIPTIVE STATISTICS : CPP PROCESSING DIMENSIONS

CPP Processing Dimension	N	Mean
PRAGMATIC	100	4.99
EXPLORATION	100	4.7
ANALYTICAL	100	5.38
RULE ORIENTATION	100	4.41
CATEGORISATION	100	4.16
INTEGRATION	100	4.83
COMPLEXITY	100	5.54
LOGICAL	100	5.55
VERBAL	100	5.24
USE OF MEMORY	100	5.11
MEMORY STRATEGIES	100	4.68
JUDGMENT	100	4.28
LEARNING 1	100	5.54
LEARNING 2	100	4.77

From table 6.13, it would seem that the group shows particular strengths in the areas of logical thinking, analytical thinking, learning 1 and complexity.

Holistically, this would suggest the following:

- **Analytical** – indicates that the group prefers a systematic, detailed and precise approach to solving problems and arriving at conclusions. They are likely to carefully differentiate and link elements of information and are unlikely to overlook the detailed aspects of their work. Prinsloo (2000) suggest that individuals with an analytical problem solving preference tend to work with detail in a systematic and careful manner, pay great attention to rules and apply these in a step-by-step fashion to identify relationships between

elements. They are also particularly good at working with precision (measuring, monitoring, and controlling things) and often adopt a technical-specialist approach.

- **Complexity** – suggests that the group prefers to work at a high level of complexity in terms of the number of units of information, the degree to which they make linkages between these units of information and the extent to which they abstract the information that they work with. Prinsloo (2000) refers to this as :
 - the *number of elements* - this can be referred to as the *quantitative* aspect of complexity
 - the *level of abstraction*, that is, how far the elements are removed from concrete reality
 - the *degree of interaction* between the components or systems integration issues

- **Logical Reasoning** – indicates that the group will tend to follow a disciplined, logical and reasoned approach to solving problems. Logical individuals, according to Prinsloo (2000), tend to be very disciplined thinkers who apply an analytical approach, but do not focus on the links between detail issues to the extent that analytical people do. A preference for a logical problem solving process is thus characterised by following arguments through, challenge, discipline, a long-term approach, and the ability to deal with relatively complex information.

- **Learning 1 - Quick insight learning** – suggests that the group was effective at improving their understanding by adjusting, expanding and integrating information structures in a self-aware manner. In contrast to an experiential learning approach, individuals who are strong on quick insight learning are usually capable of integrating new learning experiences through theoretical exposure only. They thus don't require opportunity for practical exposure and feedback and are usually fairly independent.

Holistically, the group tends to utilise fairly high level, complex processing dimensions indicating capacity to deal with vague and abstract issues and to work with complex information.

TABLE 6.14 DESCRIPTIVE STATISTICS : CPP CURRENT AND POTENTIAL

CURRENT AND POTENTIAL CPP LEVELS			
CURRENT CPP LEVEL	N	POTENTIAL CPP LEVEL	N
LEVEL 1	13	LEVEL ONE - POTENTIAL 2	9
LEVEL 2	23	LEVEL 2 POTENTIAL 3	16
LEVEL 3	45	LEVEL 3 POTENTIAL 4	35
LEVEL 4	19	LEVEL 4 POTENTIAL 5	12
LEVEL 5	0		

From table 6.14 it is evident that the group functions at a predominantly level three or Tactical Strategy work environment with potential to function at a level four or Parallel Processing work environment at a later stage.

Tactical Strategy functioning suggests that the group is capable of evaluating systems and practices, making practical decisions about the best way to get things working efficiently, and planning how resources can be deployed optimally. They are also likely to thoroughly think things through and will ensure that they have contingency plans in place should things go wrong. In essence, individuals who function at this level of cognitive complexity are characterised by an ability to come up with short-term solutions that pave the way for longer-term achievement (Prinsloo, 2000).

Parallel Processing capacity suggests that the group is likely to enjoy working both within and across relatively complex systems and will tend to focus on both broad strategy and the operational implications of the strategic direction taken. They will focus on abstract, intangible issues such as theories, models, viability of projects / programmes, and are likely to show skill in coming up with creative, integrated, and abstract conceptual solutions (Prinsloo, 2000).

TABLE 6.15 DESCRIPTIVE STATISTICS : CPP STYLES

CPP STYLES					
	CPP STYLES	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ANALYTICAL	22	22.0	22.0	22.0
	EXPLORATIVE	20	20.0	20.0	42.0
	IMPULSIVE	2	2.0	2.0	44.0
	LEARNING	3	3.0	3.0	47.0
	LOGICAL REASONING	21	21.0	21.0	68.0
	MEMORY	3	3.0	3.0	71.0
	METAPHORIC	9	9.0	9.0	80.0
	QUICK INSIGHT	5	5.0	5.0	85.0
	RANDOM	8	8.0	8.0	93.0
	REFLECTIVE	4	4.0	4.0	97.0
	STRUCTURED	3	3.0	3.0	100.0
	Total	100	100.0	100.0	

From table 6.15 it seems that most individuals in the group show a preference for an analytical thinking style, followed by a logical reasoning style and then an explorative style.

A preference for these styles according to Prinsloo (1995) would reflect the following:

Explorative according to Prinsloo (1995) would indicate that the group:

- Likes to constantly investigate a problem
- Thoroughly explores many different sorts and sources of information
- Checks information carefully and precisely, even repeatedly
- When utilised effectively, asks ‘what is relevant?’ when looking at information
- Focuses on the information that they think is relevant to the problem
- May explore and check so much that they get confused and become ineffective
- May explore without purpose when confronted with unfamiliar information

Analytical according to Prinsloo (1995) would indicate that the group:

- Has a precise, detailed approach

- Works systematically
- Pays attention to the rules
- Likes to pull information apart / subdivide issues
- Analyses, compares and categorises various different elements of the information
- Identifies relationships between elements, and links the different elements
- Often shows a technical / specialist role

Logical according to Prinsloo (1995) would indicate that the group :

- Likes to look for logical evidence
- Is self-aware and focuses on the reasoning processes used
- Follows reasoning processes through in a logical manner
- Likes to verify arguments logically
- Can work with a high level of complexity and looks at things from a long term perspective
- Has an analytical, precise, systematic and detailed focus
- Are disciplined and critical thinkers
- Loves the challenge of complex problems

Holistically, the combination of these three styles would reflect a largely left-brain orientation, a careful approach and a strong foundation for increasing levels of complexity. The strong left brain orientation also seems to be supported by the research findings of Hartman and Hylton (1997) who established that SJ and NP students are likely to be left- and right-hemisphere dominant, respectively. As already discussed, the group as a whole, tends towards a much stronger SJ preference.

Leonard, Richard and Kowalksi (1999) also cite research that suggests that individuals who utilise an analytical style are oriented to tasks and technical concerns. The authors suggest that these individuals are logical, tend to consider every aspect of a given problem and acquire information by careful analysis and the collection of factual data. They conclude by stating that the description of the use of logic and analytical thinking corresponds to the thinking preference of the MBTI.

6.4 PAIRWISE COMPARISONS

The following section includes pairwise comparisons across a number of MBTI symbol groups and CPP factors. Each table summarises the statistical results and below each table (unless the table is in the appendix), an extended interpretation is provided.

6.4.1 One symbol groups and Introversion/Extraversion

When looked at in relation to Appendix D the following conclusions can be drawn:

- Integration - The only significant difference that is reported across the sixteen CPP dimensions occurs on the dimension Integration. E differs (sig. value = 0,05) from I. As the mean difference is negative (-.676), the scores of the E group was higher than that of the I group on Integration

No other significant differences, however, are reported across any of the sixteen CPP dimensions (CPP Current, CPP Potential, Pragmatic, Exploration, Analytical, Rule Orientation, Categorisation, Complexity, Logical, Verbal, Use of memory, Memory strategies, Judgment, Learning 1 and Learning 2) and the Introversion-Extraversion dimension of the MBTI.

Integration, as defined by Prinsloo (2000) refers to the ability to synthesise ambiguous, discrepant and conflicting information in order to make sense of and integrate information into coherent wholes. Whilst the literature overview that follows suggests that ambiguity tolerance would impact largely on CPP Current and Potential, the suggestion that extraverts are more comfortable and more effective at dealing with unstructured and ambiguous information lends some support to the more integrative nature of extraverts. Molloy (2001) suggests that integrative ability denotes an advanced form of thinking incorporating both global *and* analytic processes where previously differentiated parts are combined with intuitively sensed wholes to form complex patterns. He refers to the process of integration as fashioning order out of chaos. Norman and Watson (as cited in Grabowski & Jonassen, 1993)

refer to ambiguity tolerance as an individual's willingness to accommodate or adapt to encounters with ambiguity. They found that because extraverts are less aroused than introverts, they had greater tolerance for inconsistency and ambiguity. Introverts, on the other hand, viewed the imbalance as aversive and unpleasant.

Chiappe and Macdonald (2005) suggest that high level executive functions underlie general intelligence and cognitive ability and are a prerequisite when problems call for substantial planning and keeping track of various subgoals. They also suggest that executive functions are required when individuals are involved in dealing with situations that are demanding of attentional resources, involve multiple constraints and where context has to be taken into account. In summary, more complex tasks require more involvement of executive assembly and controlled processes that enable the structuring and analysis of problems, formulation of strategies and monitoring of performance. Should the arousal hypothesis be supported, it is possible that increasing levels of arousal for introverts impacted on their executive functions and therefore resulted in decreased performance. This would, however, need to be further explored.

When looked at in this light, particularly the process of creating order out of chaos, it is feasible that extraverts would have outperformed introverts. Molloy (2001) also reports that high affect intensity (which could be directly linked to high arousal) is related to a tendency toward subjective behaviour and holistic thinking (globalization, elaboration, generalisation). Whilst he states that his research findings are in direct contrast to the more traditional literature in which anxiety and arousal is observed to result in the narrowing of categories and more analytical perception or what Piaget refers to as *assimilation* (the integration of external elements into evolving or completed structures), the findings provide sufficient support for the relationship between extraversion and integration.

CPP Current and Potential - As evidenced by the number of individuals falling into the category CPP Current (Level 3) or an Alternative paths environment, it would seem that a large percentage of the individuals have a preference to work with information that is complex and abstract and where the emphasis is on meaningful wholes, systems, plans and networks. At this level of functioning, reality and goals are not clearly defined and the primary emphasis is on utilising specialised knowledge to incorporate theory and experience.

Although not an MBTI study, Weinman et al. (as cited in Das, Naglieri & Murphy, 1995) studied individual differences and problem solving using the perceptual maze test. They found that E's spent less time scanning before making a response and more time checking their responses than did I's. These differences were most evident when the task was more difficult and were not evident when the task was easy. The authors interpreted these findings to indicate that the higher arousal levels of I's result in lower performance than that of E's on more complex tasks.

When looked at in relation to the predominance of level three type complexity as well as the increasing degree of ambiguity and unstructuredness that characterises higher levels on the CPP, research would suggest that higher arousal levels of the I's, in combination with increasing complexity of the CPP could have resulted in E's outperforming I's on CPP Current. This, however, is not the case and the current research therefore does not correlate with what has been reported in the literature.

Transformation (logical reasoning and abstraction) - Mathews and Dorn (1985) found that E's exhibit superior performance to I's when tasks are resource demanding and symbolic in nature (as is characteristic of the CPP). The authors also found that E's showed greater speed and accuracy of performance on simulated activates. Yang and Lin (2004) in their research on psychological types, critical thinking and creative thinking found significant differences between E's and I's on critical thinking. Their research suggests that I's outperform E's in inference, recognition of assumptions and interpretation of information (all of which would correspond to the transformation dimension on the CPP). Their findings lend support to Jung's description of the I's preference for inner worlds and ideas, and N preferences for innovative ideas. The literature, however, is unsupported by the current research findings.

Judgment - DiRusso, Carney and Bryan, (as cited in Gaffner & Hazler, 2002) in their research, found that I's were less decisive in their thinking and preferred an introspective and cautious approach to decision making. In other words, I's were much more inclined to take time to think and clarify their ideas when solving problems. Provost and Anchors (as cited in Gaffner & Hazler, 2002) found that E's are more likely to be decisive and confident in their decision-making than I's. They also suggest that E's enjoy closure. Judgment on the CPP,

which refers to the clarification of unstructured and vague information with the intention of decision-making or acting upon such information, would correspond to decision-making as defined by DiRusso, Carney and Bryan. However, there is no support for significant differences in judgment between E's and I's which calls some of the research findings into question. Doyle et al. (1997) on the other hand, found that the MBTI produced data which was not useful in explaining dynamic decision making or performance on decision making. Further findings of this type may provide greater insight into the absence of significant findings.

Pragmatic - Gottfredson (2003) defines "Practical intelligence" as common sense or the ability to adapt to, shape, and select information in everyday contexts, it is the ability to solve real-world, everyday problems. Prinsloo (2000) defines the CPP pragmatic dimension in fairly similar terms and suggests that a pragmatic orientation is concerned with the depth and effectiveness by which issues are investigated with the objective of identifying relevant information for further processing. Sternberg and Wagner (as cited in Gottfredson, 2003) suggest that practical problems tend to require problem recognition and formulation, tend to be ill-defined, require information seeking, possess multiple acceptable solutions and allow multiple paths to solution. Again, the findings are not supportive suggesting that further research in this area would need to be conducted.

Learning - Boyatzis, Kolb and Mainemelis (2002) found that EI correlates with the active/reflective dialectic of experiential learning as measured by the learning style inventory. They define experiential learning as the process whereby knowledge is created through the transformation of experience. Knowledge on the other hand results from the combination of grasping and transforming experience. There were, however, no significant differences reported across the learning dimensions of the CPP and the EI scales of the MBTI.

In accordance with the explanation of EI and complexity-ambiguity tolerance, the same findings could be expected for CPP potential and E. This is, however, not the case. Given this, it would seem that greater research needs to be carried out on learning potential, increasing degrees of complexity, ambiguity and unstructuredness, and the impact on EI.

Grabowski and Jonassen (1993) provide a succinct summary on the research findings and conclude that E learners are more likely to excel at learning tasks that require rapid processing of information, multi-image tasks that present large amounts of stimuli and social and behavioural assessments that require searching for information. I's on the other hand are generally visual and prefer the spatial manipulation of tasks. They are also effective at organising and structuring information, acquiring and using effective learning strategies and concentrating on information. In fact, I's are more effective than E's at concentrating and at evaluating information and rehearsing and reviewing information. These findings are not supported by the current research study.

Although the MBTI does not explicitly lay claim to any characteristic cognitive competencies of E's and I's, the research does seem to support some of the more generic descriptions of the EI preference. In line with the work by Gaffner and Hazler (2002) and their summary of the IE preference as described by Myers it would seem that the integrative capacity of E's reflects some of the MBTI research on IE. More specifically, it would seem that the integrative capacity of E's is reflected in terms of the literature that suggests that they are more accommodating, adapt more easily to unknown situations and are more capable of dealing with ambiguity. However, there is no support for the findings that suggest that I preference types are less decisive in their thinking and prefer an introspective and cautious approach to decision making whilst E's tend towards impulsivity and quick closure.

6.4.2 One symbol groups and Intuition/Sensing

When looked at in relation to Appendix E, the following conclusions can be drawn:

No significant differences are reported across any of the sixteen CPP Dimensions suggesting that there are no significant differences or relationships between the 16 CPP Dimensions (CPP Current, CPP Potential, Pragmatic, Exploration, Analytical, Rule Orientation, Integration, Categorisation, Complexity, Logical, Verbal, Use of memory, Memory strategies, Judgment, Learning 1 and Learning 2) and the Intuition-Sensing Dimension of the MBTI. This is, however, in stark contrast to a number of literature studies that have found significant correlations between Intuition-Sensing and a number of similar constructs as those measured by the CPP.

Gaffner and Hazler (2002) refer to the S and N preferences as a focus on how people gather information and what attracts their attention. They refer to the S person as one who wants information that is practical, has useful applications and makes common sense. They also report research that suggests S individuals to pay attention to facts, details, and reality. The authors refer to N individuals as those paying attention to insights and looking for underlying meanings or relationships. N individuals are thus more future oriented, integrative and holistic. None of this is supported by the current study.

CPP Potential - Gardner and Martinko (1996) report that N managers engage in strategic planning activities more frequently and more effectively than S managers. Strategic planning would correspond to CPP potential (particularly a focus on level four – Parallel Processing) where the emphasis is in essence on strategic thinking. This is not supported.

Analytical, Rule Orientation and Pragmatic - Cheng, Lockett and Schulz (2003) found that S individuals prefer detail-type information processing and focus on individual elements and concrete facts and figures. N individuals on the other hand tend to prefer holistic or global-type information processing and perceiving problems as a whole. This is not only in contrast to the findings that E's are more integrative than I's but also fails to support the absence of findings between analysis on the CPP and the MBTI dimension of NS. The focus on concrete information would also suggest a stronger operational focus (Level one and two) on the CPP and higher scores for pragmatic. This is not the case. Gardner and Martinko (1996) found that S individuals utilised decision rules more than N's and dislike nonquantitative analysis (less focus on the rules of the task). N's on the other hand were found to thrive in situations requiring non-quantitative analysis. The authors also provide research suggesting that S managers are predisposed toward practical, conventional, detail-oriented and systematic behavior wherever N managers are inclined toward idealistic, unconventional and creative behaviors. The literature is unsupported by the current study.

Complexity and Integration - Hayes, Allinson, Hudson and Keasey (2003) suggests that N's have relatively weak or ill-defined perceptual expectancies and therefore, a stimulus can be more complex, novel, surprising, ambiguous, or incongruent without appearing excessively out of line with past experience. Given this, when confronted with a stimulus, N individuals

experience a lower level of arousal than an analyst or sensing type when confronted by the same stimulus. Their research suggests that N's are thus more likely to outperform S's when the stimulus is unusual. The nature of the CPP is exactly this, complex, novel, surprising, ambiguous and incongruous, but the findings are, however, unsupported.

Gardner and Martinko (1996) provide research suggesting that S individuals favor concrete data whereas N's prefer abstractions. Their research also suggest that N's prefer, and are more effective at tasks characterised by higher levels of complexity. Again, the current study does not support the literature.

Judgment - Davis, Grove, and Knowles (as cited in Austin-Davey, Schnell and Morrison, 1993) found that S types performed more effectively within a fairly structured decision situation, as compared to N types. Although the CPP is characteristically unstructured and ambiguous, there were no differences reported for S individuals outperforming N individuals on decision-making. Leonard, Richard and Kowalski (1999) found that although individuals who demonstrate an effective decision-making style are more likely to be T than F, there was no support that they are more likely to be N than S.

Learning and memory – Williams, Turner, Vickers and Salamo (2004) in their research, found that S individuals prefer to work with concrete ideas and processes and learn most effectively through the study of factual information, consistent procedures and pragmatic examples. They are also tolerant of memorising facts as well as repetitive and consistent learning procedures. N individuals on the other hand, learn most effectively through the use of innovative and varying instructional procedures and dislike the use of repetitive learning processes. They are most effective at understanding things conceptually and dislike (and are less effective than S individuals) at memorising facts and learning through repetition. This too is unsupported in the current study.

Holistically, the current study provides no support for the findings reported by McCaulley (1990) that S individuals are practical, pay attention to facts, details, and reality or that they base their decisions on what has worked in the past. The study also fails to support the findings that N individuals are interested in future possibilities, implicit meanings, integration and symbolic or theoretical patterns.

6.4.3 One symbol groups and Thinking/Feeling

When looked at in relation to Appendix F, the following conclusions can be drawn:

Gardner and Martinko (1996) refer to the TF dimension on the MBTI as a basic tenet of type theory which suggest that T individuals focus on impersonal and objective information in making decisions, whilst F individuals favor personal and subjective data in making decisions.

Gaffner and Hazler (2002) summarise the T and F preferences by stating that the dimensions have to do with how people approach decision making and how they reach conclusions. Demarest (1997) suggests that the T individuals are logical and objective in their approach to decision making, do well at evaluating and deciding on information, and are effective at coming to conclusions based on pros and cons. T individual's also want solutions that make sense in terms of facts, models, or principles under consideration.

Despite the literature, however, no significant differences are reported across any of the sixteen CPP Dimensions and the MBTI suggesting that there are no significant differences or relationships between the 16 CPP Dimensions (CPP Current, CPP Potential, Pragmatic, Exploration, Analytical, Rule Orientation, Integration, Categorisation, Complexity, Logical, Verbal, Use of memory, Memory strategies, Judgment, Learning 1 and Learning 2) and the Thinking-Feeling Dimension of the MBTI.

Gardner and Martinko (1996) found that T individuals demonstrate systematic analyses and logic and are more assertive and impersonal than F types who are in turn, more affective, cooperative and personal. Whilst there are no additional personality measurements to support or refute these findings, the CPP pairwise comparisons provide no support for the research which suggests that T individuals are more logical. The current study also fails to provide support for the work by Gardner and Martinko (1996) and Gaffner and Hazler (2002).

Steiner and Gaskin (1998) found that T individuals do better than F individuals in non-dynamic management roles. In terms of the characteristics of a dynamic management role, this would correspond to higher levels of complexity, logical reasoning and verbal abstraction

on the CPP (Prinsloo, 2000). The current study provides no support for the possibility of T individuals outperforming F individuals on any of these CPP dimensions.

Myers and Myers (1980) refer to the distinction between T and F as a basic difference in judgment which arises from the existence of two distinct and contrasting ways of coming to conclusions. They differentiate the two by suggesting that the T type prefers an impersonal, analytical and rational approach to life whereas the F type desires to be personally involved. Holistically, the current study provides no support for the findings reported by Myers and Myers (1980) that T individuals are likely to perform more effectively at tasks requiring dispassionate analysis, logic and reasoning based on facts and data.

6.4.4 One symbol groups and Judging/Perceiving

When looked at in relation to Appendix G, the following conclusions can be drawn:

The significant differences that are reported across the sixteen CPP Dimensions occur on the dimensions CPP Current, Analytical, Integration, Complexity and Judgment.

Lawrence (1997) summarises the JP dimension as follows, he suggests that J individuals approach life in a structured way, creating plans and carefully organizing people and things. They are decisive, quickly take charge and seek closure. P individuals on the other hand are explorative, slow to make decisions, reflective, and highly adaptable. They are effective at integrating information and are flexible and accommodating. Whilst not conclusive, the current study provides some support for relationships between the CPP and MBTI dimensions.

- CPP Current - J differs significantly (sig. value = 0,033, less than 0,05) from P. As the mean difference is negative (-.479) the scores of the J group are significantly higher than that of the P group on CPP Current.

Again, the fact that the majority of the research participants fall into the category CPP Current (Level 3) or an Alternative paths environment, it would seem that a large number of the individuals have a preference to work with information that is complex and abstract and where the emphasis is on meaningful wholes, systems, plans and networks. Reality and goals

are not clearly defined and the primary emphasis is on utilising specialised knowledge to incorporate theory and experience. CPP Current (or Level three) type thinking is characterised by a tendency to evaluate systems and practices, make practical decisions and plan how resources can be deployed optimally. Individuals who function at this cognitive level, thoroughly think things through, have contingency plans in place, are operationally efficient, come up with short-term solutions and learn via systematic experimentation with different operational systems and structures. When viewed in this light, it is feasible that J types would outperform P types on CPP Current. However, in the same vein (and given the inherent characteristics of P types), it may be useful to explore why there aren't a significantly larger number of P individuals functioning at higher and more complex levels on the CPP, specifically levels four and five particularly when viewed in light of the work by Gardner and Martinko (1996) and their suggestion that J individuals are more effective in structured and stable situations, whereas P individuals prefer unstructured and dynamic situations (as is characteristic of the CPP, particularly levels four and five).

- Analytical - J differs significantly (sig. value = 0,028, less than 0,05) from P. As the mean difference is negative (-1.130) the scores of the J group are significantly higher than that of the P group on Analytical.

Gardner and Martinko (1996) suggest that managers with preferences for J favor structured and stable situations, whereas P managers prefer unstructured and dynamic situations. Their research indicates that J behavior is planned and methodical whereas P behaviour is characterised more by creative, spontaneous and unanalytical thought. Edwards (2003) found that individuals with a J preference are accuracy motivated, concerned with logic and focused on closure. Edwards suggests that this provides support for the notion that J can be thought of as a preference for controlled processing or problem solving in structured and unambiguous settings. The work by both authors provides some support for the current research study findings.

- Integration - J differs significantly (sig. value = 0,003, less than 0,05) from P. As the mean difference is negative (-.854) the scores of the J group are significantly higher than that of the P group on Integration.

These findings are not at all supportive of the general literature on the characteristics of P individuals. If looked at in relation to the research by Lawrence (1997), P individuals are considered to enjoy searching for information and have a tendency to procrastinate and delay decision-making. They are also tolerant of ambiguity, prefer working with variety, and are highly adaptable. When considering the definition of integration, as the ability to synthesise ambiguous, discrepant and conflicting information in order to make sense of and integrate information into coherent wholes, it seems unlikely that J individuals would outperform P individuals on the integration dimension. The only feasible explanation is the possibility that J individuals performed more effectively because they were more equipped (in terms of analysis, logical thinking and pragmatic ability) to sift through the information and create order. The fact that J individuals outperformed P individuals on the actual integration of data (once order had been created) will need to be further explored.

- Complexity - J differs significantly (sig. value = 0,026, less than 0,05) from P. As the mean difference is negative (-.7654) the scores of the J group are significantly higher than that of the P group on Complexity.

Given that CPP Current (Level three) suggests fairly high levels of complexity and corresponds closely with complexity as defined here (higher CPP levels are always characterised by increasing levels of complexity), the same explanation as to why the scores of the J group are significantly higher than that of the P group on CPP Current can be applied here.

- Judgment - J differs significantly (sig. value = 0,026, less than 0,05) from P. As the mean difference is negative (-.922) the scores of the J group are significantly higher than that of the P group on Judgment.

Decision making, according to Hastie (2001) refers to the entire process of choosing a course of action. Judgment, in turn, refers to the components of the larger decision-making process that are concerned with assessing, estimating, and inferring what events will occur and what the decision-maker's evaluative reactions to those outcomes will be. Gaffner and Hazler (2002) suggest that individuals who have a preference for J prefer structure, organisation, and logical-analytical decision making. Although not explicitly stated, their research also

suggests that J individuals are more effective decision makers than P individuals, who are more spontaneous and flexible in their approach to decision making. This provides some support for the research findings.

Colquitt, Erez and Lepine (2000) suggest that decision-making performance is likely to be higher for individuals who tend to be orderly and deliberate (a characteristic of J individuals on the MBTI). They report that because decision making demands consideration of a disorganised pool of informational cues, individuals who consider informational cues haphazardly, or who spontaneously make impulsive decisions, should be less effective than individuals who carefully consider and strategise their approach. Given this line of reasoning, it seems likely that those who score high on J on the MBTI will make decisions that are more accurate.

Holistically, the current study provides some support for the findings reported by McCaulley (1990) that J individuals are more effective at quick closure, decision making, organising, planning, and structuring.

6.4.5 Two symbol groups on CPP factors

When looked at in relation to Appendix H, the following conclusions can be drawn:

No significant differences are reported across any of the sixteen CPP Dimensions and the NP/NT/SJ/ST/TJ/TP dimensions of the MBTI, suggesting that there are no significant differences or relationships between the 16 CPP Dimensions and the two symbol combination groups of the MBTI.

In their research, Gardner and Martinko (1996) suggest that the ST individual follows a practical approach to problem-solving and relies on logical analyses of factual data. NT's use logical, impersonal and theoretical analyses to explore the possibilities inherent in a problem. SF's rely on personal values to evaluate facts collected via the senses and NF's consider the possibilities for serving the needs of people in general. When related to the CPP Dimensions, it is possible that relationships could exist between the ST dimension and pragmatic, logical, analytical and rule orientation, this is however, not the case. The NT dimension could also

relate to logic and analysis on the CPP as well as Learning 2 (based on theoretical understanding and experience). This is also not supported.

Hunter and Levy (as cited in Austin-Davey, Schnell & Morrison, 1993), found that NP types attempt more problems than SJ types and were more capable of solving problems requiring perceptual ability and high degrees of cognitive flexibility. The SJ types on the other hand, tended to focus on concrete aspects and the ordering and categorising of information. This should provide some support for the relationship between NP and higher levels of complexity on the CPP (which is not the case) and SJ and pragmatic as well as categorisation on the CPP.

Gardner and Martinko (1996) found that SF's perceive relatively low levels of risk and are extremely risk tolerant, whereas ST's perceive high levels of risk and are highly risk averse; NT's and NF's on the other hand, perceive and tolerate risk at moderate levels. It is possible that the literature lends support to the possibility of finding relationships between increasing levels of complexity on the CPP and higher CPP levels (namely levels four and five). This is unsupported.

Burrows-Horton and Oakland (1997) found that SJ's learn most effectively when curricular materials are concrete and when tasks are well planned and routine. SP's learn best through strategies that highlight variety, action, and entertainment. They also found that NT individuals are most interested in developing theories and concepts and prefer strategies that promote discovery and experimentation. NF individuals are most interested in determining the relevance of learning and prefer strategies that emphasise cooperation and personalised applications of learning. Translated into CPP terminology, the literature lends support to the possibility of finding relationships between SJ individuals and concrete (Level one) type thinking, SP individuals and increasing complexity and NT's and experiential learning (learning 1).

According to the literature that is provided here, it seems feasible that a number of significant relationships should have been found between the 16 CPP dimensions and the MBTI two symbol combinations. However, the current study provides no support for the findings reported and suggests that there is in fact no relationship between the CPP factors and two symbol MBTI Groups (NP/NT/SJ/ST/TJ/TP).

6.4.6 Three symbol groups on CPP factors

When looked at in relation to Appendix I, the following conclusions can be drawn:

The significant difference that is reported across the sixteen CPP Dimensions and the three symbol combination groups of the MBTI occurs on the dimension of Integration.

- NTJ differs significantly (sig. value = 0,015, less than 0,05) from NTP. As the mean difference is negative (-.961) the scores of the NTJ group are significantly higher than that of the NTP group on Integration.

The above findings seem to load fairly significantly on the J and P dimensions of the MBTI, in other words, it is possible that rather than the holistic combination, the core differentiating factor causing the NTJ group to score higher than the NTP group on Integration, is the J dimension. When looked at in relation to the findings for the single symbol combinations and the CPP dimensions - J differs significantly (sig. value = 0,003, less than 0,05) from P. As the mean difference is negative (-.854) the scores of the J group are significantly higher than that of the P group on Integration, the same explanation for the findings can be utilised here.

- STJ differs significantly (sig. value = 0,011, less than 0,05) from NTP. As the mean difference is negative (-.8781) the scores of the STJ group are significantly higher than that of the NTP group on Integration.

In a similar vein as discussed above, it is possible that in the case of the scores of the STJ group being significantly higher than that of the NTP group on Integration, the key differentiating variables are the S and P dimensions on the MBTI. In other words, it is possible that despite the significant findings for the MBTI three symbol group, further research may in fact indicate that S individuals outperform N individuals on Integration and J individuals outperform P individuals on integration. Although the SN hypothesis is unsupported by the current research study, the scores of the J group on the other hand, provide support for the possibility that J individuals outperform P individuals on integration.

These findings may need to be further explored.

No other significant differences are reported across the 16 CPP Dimensions and the three symbol combination groups of the MBTI.

6.4.7 Four symbol groups on CPP factors

When looked at in relation to Appendix J, the following conclusions can be drawn:

The significant differences that are reported across the sixteen CPP Dimensions and the four symbol combination groups of the MBTI occur on the dimensions of CPP Current, Pragmatic, Integration and Use of Memory.

- CPP Current - INTP differs significantly (sig. value = 0,022, less than 0,05) from ENTJ. As the mean difference is negative (-1.069) the scores of the ENTJ group was significantly higher than that of the INTP group on CPP Current.

This would suggest that the ENTJ group (characterised by a need to turn theories into plans, pragmatic, future orientated, having a need for structure and order, showing a dislike for routine, detail oriented tasks, and high levels of judgment and decisiveness) outperformed the INTP group (characterised by a preference for abstraction, a need to understand through analysing underlying principles and structures and a dislike for practical application) on Current (or Level three) type thinking, characterised by a tendency to evaluate systems and practices, make practical decisions and plan how resources can be deployed optimally. In essence, the ENTJ group was thus more effective at carefully thinking things through, creating contingency plans, ensuring operation effectiveness, coming up with short-term solutions and learning via systematic experimentation with different operational systems and structures.

- Pragmatic - INTP differs significantly (sig. value = 0,033, less than 0,05) from ENTP. As the mean difference is negative (-1.247) the scores of the ENTP group was significantly higher than that of the INTP group on Pragmatic.

INTP's live in the world of theoretical rather than practical possibilities living much of their lives within their own heads, and placing very little importance or value on the external, pragmatic world. In essence, they are constantly working to generate new theories, or to prove or disprove existing theories. ENTPs are essentially very similar to INTP's albeit that their focus is an external one (Extraversion). They are less interested in developing plans of action or making decisions than they are in generating possibilities and ideas and are usually fairly ineffective at follow-through. Practical implementation is also not a strength (Demarest, 1997). In view of the above descriptions, the findings seem to reflect the EI preference more so than the NTP preference.

- INTP differs significantly (sig. value = 0,012, less than 0,05) from ESTJ. As the mean difference is negative (-1.247) the scores of the ESTJ group was significantly higher than that of the INTP group on Pragmatic.

Austin-Davey, Schnell and Morrison (1993) in their research found that ESTJ preferences are extremely dependable and have a complete, realistic, and practical respect for facts. They absorb, remember, and use a number of facts, are careful about their accuracy, are good practical problem solvers and rely on past experience in coming up with solutions. When looked at in light of the pragmatic dimension on the CPP, which defines the pragmatic orientation as an ability to determine whether an approach will work in practice as well as the relevance of an approach in structured contexts, it would seem that the ESTJ preference relies heavily on past experience and memory base. Furthermore, Prinsloo (2000) suggests a strong linkage between the pragmatic function and a preference to work in a structured context, the application of a structured thinking style and memory. This seems to provide further support for the possible relationship between an ESTJ preference and pragmatic. When looked at merely in terms of the established differences between the ESTJ and INTP preference, the following should be highlighted:

ESTJ's are generally considered to be practical, realistic, matter-of-fact, decisive, and quick to implement practical solutions (Quenk, 2000). INTP's on the other hand focus on ideas and possibilities, generalities and concepts. Lawrence (1997) goes so far as to describe the INTP preference as one which is focused on general meanings, albeit often overlooking details and practical matters. He also mentions that INTP's very often fail to consider factual information

or to test their ideas for practical soundness. In view of this, the higher scores of the ESTJ group on the pragmatic dimension seems to be supported by a significant amount of literature.

- Integration - INTP differs significantly (sig. value = 0,013, less than 0,05) from ENTJ. As the mean difference is negative (-1.695) the scores of the ENTJ group was significantly higher than that of the INTP group on Integration.
- INTP differs significantly (sig. value = 0,007, less than 0,05) from ESTJ. As the mean difference is negative (-1.691) the scores of the ESTJ group was significantly higher than that of the INTP group on Integration.

The INTP preference is described by Lawrence (1997) as a preference for construction and reconstruction, seeing associations and meanings, reading between the lines and integrating general concepts. Holistically, much of the characteristic behaviour of the INTP preference is described as integrative, holistic and aimed at synthesis. Prinsloo (2000) clusters the CPP dimension of integration with that of structuring. The cluster as a whole, refers to the capacity to move beyond identifying the relationships among different elements by fitting the elements and their relationships into meaningful wholes, with integration specifically focused on the synthesis of ambiguous / discrepant and conflicting information.

The ESTJ preference, as already discussed at length, is to a large degree, characterised by behaviours that are in direct contrast to that of the INTP. Whereas the INTP is considered holistic and integrative, the ESTJ is considered structured, planful and systematic (Lawrence, 1997). In view of this, the current research findings seem unsupported by available literature.

The ENTJ preference on the other hand, is characterised by a need to turn theories into plans, a pragmatic, future orientated approach, a need for structure and order, and a dislike for routine, detail-oriented tasks. Whilst there are a number of overlapping behavioural characteristic between the ENTJ and the ESTJ, the predominant differentiating factor is the S versus the N dimension.

- Use of memory - INTP differs significantly (sig. value = 0,066, less than 0,05) from ENTJ. As the mean difference is negative (-1.498) the scores of the ENTJ group was significantly higher than that of the INTP group on the use of memory.

No other significant differences are reported across the 16 CPP Dimensions and the four symbol combination groups of the MBTI.

6.4.8 Summary of findings

The following section serves to highlight and summarise the findings of the pairwise comparisons between the MBTI and the CPP.

- Extraverts outperform Introverts on Integration

Integration - The significant difference that is reported across the sixteen CPP Dimensions and the IE scale of the MBTI is on the dimension Integration. Integration, as defined by Prinsloo (2000) refers to the ability to synthesise ambiguous, discrepant and conflicting information in order to make sense of and integrate information into coherent wholes. The current research suggests that E's score higher than I's on integration which seems to tie into research that indicates that E's are more accommodating, adapt more easily to unknown situations and are more capable of dealing with ambiguity.

- There is no evidence to suggest that individuals high on either Intuition or Sensing outperform one another on any of the 16 CPP dimensions.

No significant differences are reported across any of the sixteen CPP Dimensions and the NS scale of the MBTI, suggesting that there are no significant differences or relationships between the 16 CPP Dimensions (CPP Current, CPP Potential, Pragmatic, Exploration, Analytical, Rule Orientation, Integration, Categorisation, Complexity, Logical, Verbal, Use of memory, Memory strategies, Judgment, Learning 1 and Learning 2) and the NS dimension of the MBTI. This is, however, in stark contrast to a number of studies that have found significant correlations between NS and a number of similar constructs as those measured by the CPP.

Holistically, the current study provides no support for the findings reported by McCaulley (1990) that S individuals are practical, pay attention to facts, details, and reality or that they base their decisions on what has worked in the past. The study also fails to support the findings that N's are interested in future possibilities, implicit meanings, integration and symbolic or theoretical patterns.

- There is no evidence to suggest that individuals high on either Thinking or Feeling outperform one another on any of the 16 CPP dimensions.

Despite the literature, no significant differences are reported across any of the sixteen CPP Dimensions and the MBTI suggesting that there are no significant differences or relationships between the 16 CPP Dimensions (CPP Current, CPP Potential, Pragmatic, Exploration, Analytical, Rule Orientation, Integration, Categorisation, Complexity, Logical, Verbal, Use of memory, Memory strategies, Judgment, Learning 1 and Learning 2) and the Thinking-Feeling Dimension of the MBTI.

Holistically, the current study provides no support for the findings reported by Myers and Myers (1980) that T individuals are likely to perform more effectively at tasks requiring dispassionate analysis, logic and reasoning based on facts and data.

- The significant differences that are reported across the sixteen CPP Dimensions and the Judging–Perceiving dimensions of the MBTI occur on the dimensions CPP Current, Analytical, Integration, Complexity and Judgment. In other words, the current research seems to indicate that :

- Judging individuals outperform Perceiving individuals on CPP current
- Judging individuals outperform Perceiving individuals on analysis
- Judging individuals outperform Perceiving individuals on integration
- Judging individuals outperform Perceiving individuals on complexity
- Judging individuals outperform Perceiving individuals on judgment

- There is no evidence to suggest that certain MBTI two group combinations outperform other groups on any of the 16 CPP dimensions.

No significant differences are reported across any of the sixteen CPP Dimensions and the NP/NT/SJ/ST/TJ/TP dimensions of the MBTI, suggesting that there are no significant differences or relationships between the 16 CPP Dimensions and the two symbol combination groups of the MBTI.

According to the literature that is provided here, it seems feasible that a number of significant relationships should have been found between the 16 CPP dimensions and the MBTI two symbol combinations. However, the current study provides no support for the findings reported and suggests that there is in fact no relationship between the CPP factors and two symbol MBTI Groups (NP/NT/SJ/ST/TJ/TP).

- There is some evidence to suggest that individuals with an NTJ preference on the MBTI outperform those with an NTP preference on Integration.
- There is some evidence to suggest that individuals with an STJ preference on the MBTI outperform those with an NTP preference on Integration.
- There is some evidence to suggest that certain four symbol combination groups of the MBTI outperform other combination groups on the dimensions of CPP Current, Pragmatic, Integration and Use of Memory.
 - ENTJ individuals seem to outperform INTP individuals on CPP Current
 - ENTP individuals seem to outperform INTP individuals on Pragmatic
 - ESTJ individuals seem to outperform INTP individuals on Pragmatic
 - ENTJ individuals seem to outperform INTP individuals on Integration
 - ESTJ individuals seem to outperform INTP individuals on Integration
 - ENTJ individuals seem to outperform INTP individuals on the use of memory

6.5 CHI-SQUARE TESTS (MBTI GROUPS AND COGNITIVE STYLE)

The following section includes Chi-Square tests of the relationships between one, two, three and four symbol MBTI groups and cognitive styles. Each table summarises the statistical results and below each table, an extended interpretation is provided.

TABLE 6.16 DESCRIPTIVE STATISTICS : INTROVERSION/EXTRAVERSION AND STYLE

		E_I			
		E	I	Total	
Crosstab - One symbol MBTI groups					
INTROVERSION (I)-EXTRAVERSION (E) and Cognitive Style					
STYLE		Count	17	5	22
	ANALYTICAL	% within style	77.3%	22.7%	100.0%
		% within E_I	39.5%	31.3%	37.3%
		Count	13	7	20
	EXPLORATIVE	% within style	65.0%	35.0%	100.0%
		% within E_I	30.2%	43.8%	33.9%
		Count	7	2	9
	METAPHORIC	% within style	77.8%	22.2%	100.0%
		% within E_I	16.3%	12.5%	15.3%
		Count	6	2	8
	RANDOM	% within style	75.0%	25.0%	100.0%
		% within E_I	14.0%	12.5%	13.6%
		Count	43	16	59
	Total	% within style	72.9%	27.1%	100.0%
		% within E_I	100.0%	100.0%	100.0%

TABLE 6.17 CHI-SQUARE : INTROVERSION/EXTRAVERSION AND STYLE

Chi-Square Test - One symbol MBTI groups

INTROVERSION (I)-EXTRAVERSION (E) and Cognitive Style

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	.971(a)	3	.808	.827
Likelihood Ratio	.951	3	.813	.845
Fisher's Exact Test	1.017			.881
N of Valid Cases	59			

a 2 cells (25.0%) have expected count less than 5. The minimum expected count is 2.17.

From tables 6.16 and 6.17 as well as the chi-square statistic, it is clear that there is no relationship between the MBTI one symbol groups (E-I) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP. (chi-square= 0.971, df = 3, p = .808).

TABLE 6.18 DESCRIPTIVE STATISTICS : INTUITION/SENSING AND STYLE

Crosstab - One symbol MBTI groups

INTUITION (N)- SENSING (S) and Cognitive Style

		N_S		Total
		N	S	
ANALYTICAL	Count	12	10	22
	% within style	54.5%	45.5%	100.0%
	% within N_S	35.3%	40.0%	37.3%
EXPLORATIVE	Count	11	9	20
	% within style	55.0%	45.0%	100.0%
	% within N_S	32.4%	36.0%	33.9%
METAPHORIC	Count	4	5	9
	% within style	44.4%	55.6%	100.0%
	% within N_S	11.8%	20.0%	15.3%
RANDOM	Count	7	1	8
	% within style	87.5%	12.5%	100.0%
	% within N_S	20.6%	4.0%	13.6%
Total	Count	34	25	59
	% within style	57.6%	42.4%	100.0%
	% within N_S	100.0%	100.0%	100.0%

TABLE 6.19 CHI-SQUARE : INTUITION/SENSING AND STYLE

Chi-Square Test - One symbol MBTI groups				
INTUITION (N)- SENSING (S) and Cognitive Style				
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	3.706(a)	3	.295	.309
Likelihood Ratio	4.178	3	.243	.273
Fisher's Exact Test	3.675			.305
N of Valid Cases	59			

a 3 cells (37.5%) have expected count less than 5. The minimum expected count is 3.39.

From tables 6.18 and 6.19 as well as the the chi-square statistic, it is clear that there is no relationship between the MBTI one symbol groups (N-S) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP. (chi-square= 3.706, df = 3, p = .309).

TABLE 6.20 DESCRIPTIVE STATISTICS : THINKING/FEELING AND STYLE

Crosstab - One symbol MBTI groups

THINKING (T)-FEELING (F) and Cognitive Style

		T_F		Total	
		F	T		
STYLE	ANALYTICAL	Count	1	21	22
		% within style	4.5%	95.5%	100.0%
		% within T_F	10.0%	42.9%	37.3%
	EXPLORATIVE	Count	6	14	20
		% within style	30.0%	70.0%	100.0%
		% within T_F	60.0%	28.6%	33.9%
	METAPHORIC	Count	2	7	9
		% within style	22.2%	77.8%	100.0%
		% within T_F	20.0%	14.3%	15.3%
RANDOM	Count	1	7	8	
	% within style	12.5%	87.5%	100.0%	
	% within T_F	10.0%	14.3%	13.6%	
Total	Count	10	49	59	
	% within style	16.9%	83.1%	100.0%	
	% within T_F	100.0%	100.0%	100.0%	

TABLE 6.21 CHI-SQUARE : THINKING/FEELING AND STYLE

Chi-Square Test - One symbol MBTI groups
THINKING (T)-FEELING (F) and Cognitive Style

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	5.115(a)	3	.164	.170
Likelihood Ratio	5.566	3	.135	.184
Fisher's Exact Test	5.172			.119
N of Valid Cases	59			

a 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.36.

From tables 6.20 and 6.21 as well as the the chi-square statistic, it is clear that there is no relationship between the MBTI one symbol groups (T-F) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP. (chi-square= 5.115, df = 3, p = .164).

TABLE 6.22 DESCRIPTIVE STATISTICS : JUDGING/PERCEIVING AND STYLE

Crosstab - One symbol MBTI groups

JUDGING (J)-PERCEIVING (P) and Cognitive Style

		J_P		Total	
		J	P		
STYLE	ANALYTICAL	Count	12	10	22
		% within style	54.5%	45.5%	100.0%
		% within J_P	37.5%	37.0%	37.3%
	EXPLORATIVE	Count	13	7	20
		% within style	65.0%	35.0%	100.0%
		% within J_P	40.6%	25.9%	33.9%
	METAPHORIC	Count	4	5	9
		% within style	44.4%	55.6%	100.0%
		% within J_P	12.5%	18.5%	15.3%
	RANDOM	Count	3	5	8
		% within style	37.5%	62.5%	100.0%
		% within J_P	9.4%	18.5%	13.6%
Total	Count	32	27	59	
	% within style	54.2%	45.8%	100.0%	
	% within J_P	100.0%	100.0%	100.0%	

TABLE 6.23 CHI-SQUARE : JUDGING/PERCEIVING AND STYLE

Chi-Square Test - One symbol MBTI groups				
JUDGING (J)-PERCEIVING (P) and Cognitive Style				
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	2.185(a)	3	.535	.534
Likelihood Ratio	2.203	3	.531	.534
Fisher's Exact Test	2.219			.534
N of Valid Cases	59			

a 4 cells (50.0%) have expected count less than 5. The minimum expected count is 3.66.

From tables 6.22 and 6.23 as well as the chi-square statistic, it is clear that there is no relationship between the MBTI one symbol groups (J-P) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP. (chi-square= 2.185, df = 3, p = .535).

TABLE 6.24 DESCRIPTIVE STATISTICS : TWO SYMBOL GROUPS AND STYLE

Crosstab – Two symbol MBTI groups									
(NP/NT SJ/ST/TJ/TP) and Cognitive Style									
								Total	
COGNITIVE STYLE	ANALYTICAL	Count	4	2	3	2	7	2	20
		% within style	20.0%	10.0%	15.0%	10.0%	35.0%	10.0%	100.0%
		% within Two symbols without I and E	40.0%	28.6%	27.3%	40.0%	46.7%	40.0%	37.7%
	EXPLORATIVE	Count	4	2	5	2	5	1	19
		% within	21.1%	10.5%	26.3%	10.5%	26.3%	5.3%	100.0%

	style							%
	% within							
	Two							
	symbols	40.0%	28.6%	45.5%	40.0%	33.3%	20.0%	35.8%
	without I							
	and E							
	Count	1	0	3	0	1	2	7
	% within							100.0
METAPHORIC	style	14.3%	.0%	42.9%	.0%	14.3%	28.6%	%
	% within							
	Two							
	symbols	10.0%	.0%	27.3%	.0%	6.7%	40.0%	13.2%
	Count	1	3	0	1	2	0	7
RANDOM	% within							100.0
	style	14.3%	42.9%	.0%	14.3%	28.6%	.0%	%
	% within							
	Two							
	symbols	10.0%	42.9%	.0%	20.0%	13.3%	.0%	13.2%
	without I							
	and E							
	Count	10	7	11	5	15	5	53
TOTAL	% within							100.0
	style	18.9%	13.2%	20.8%	9.4%	28.3%	9.4%	%
	% within							
	Two							
	symbols	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	without I	%	%	%	%	%	%	%
	and E							

TABLE 6.25 CHI-SQUARE : TWO SYMBOL GROUPS AND STYLE

Chi-Square Test – Two symbol MBTI groups groups (NP/NT SJ/ST/TJ/TP) and Cognitive Style						
Pearson Square	Chi-Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)		
Likelihood Ratio	15.194(a)	15	.438	.461		
Fisher's Exact Test	15.964	15	.384	.607		
N of Valid Cases	12.234			.641		
	53					
a 22 cells (91.7%) have expected count less than 5. The minimum expected count is .66.						

From tables 6.24 and 6.25 as well as the chi-square statistic, it is clear that there is no relationship between the MBTI two symbol groups (NP/NT/SJ/ST/TJ/TP) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP, (chi-square= 15.194, df = 15, p = .438).

TABLE 6.26 DESCRIPTIVE STATISTICS : THREE SYMBOL GROUPS AND STYLE

Crosstab – Three symbol MBTI groups (NFP NTJ NTP STJ) and Cognitive Style		NFP	NTJ	NTP	STJ	Total	
COGNITIVE STYLE	ANALYTICAL	Count	1	4	7	8	20
		% within style	5.0%	20.0%	35.0%	40.0%	100.0%
		% within Three symbols without I and E	20.0%	33.3%	41.2%	47.1%	39.2%
	EXPLORATIVE	Count	3	4	4	6	17
		% within style	17.6%	23.5%	23.5%	35.3%	100.0%
		% within Three symbols without I and E	60.0%	33.3%	23.5%	35.3%	33.3%
	METAPHORIC	Count	0	1	3	3	7
		% within style	.0%	14.3%	42.9%	42.9%	100.0%
		% within Three symbols without I and E	.0%	8.3%	17.6%	17.6%	13.7%
	RANDOM	Count	1	3	3	0	7
		% within style	14.3%	42.9%	42.9%	.0%	100.0%
		% within Three symbols without I and E	20.0%	25.0%	17.6%	.0%	13.7%
TOTAL	Count	5	12	17	17	51	
	% within style	9.8%	23.5%	33.3%	33.3%	100.0%	
	% within Three symbols without I and E	100.0%	100.0%	100.0%	100.0%	100.0%	

TABLE 6.27 CHI-SQUARE : THREE SYMBOL GROUPS AND STYLE

Chi-Square Test – Three symbol MBTI groups				
groups (NFP/ NTJ/ NTP/ STJ) and Cognitive Style				
Pearson Chi-Square	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Likelihood Ratio	7.536(a)	9	.581	.615
Fisher's Exact Test	10.256	9	.330	.472
N of Valid Cases	7.863			.534
	51			
a 12 cells (75.0%) have expected count less than 5. The minimum expected count is .69				

From tables 6.26 and 6.27 as well as the chi-square statistic, it is clear that there is no relationship between the MBTI three symbol groups (NFP/NTJ/NTP/STJ) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP, (chi-square= 7.536, df = 9, p = .581).

TABLE 6.28 DESCRIPTIVE STATISTICS : FOUR SYMBOL GROUPS AND STYLE

**Crosstab – Four symbol MBTI groups
(ENTJ/ ENTP/ ESTJ/ INTP/ ISTJ)- and Cognitive Style**

		FOUR					Total	
		ENTJ	ENTP	ESTJ	INTP	ISTJ		
STYLE	ANALYTICAL	Count	4	4	7	3	1	19
		% within style	21.1%	21.1%	36.8%	15.8%	5.3%	100.0%
		% within FOURN	36.4%	44.4%	50.0%	37.5%	33.3%	42.2%
	EXPLORATIVE	Count	3	2	4	2	2	13
		% within style	23.1%	15.4%	30.8%	15.4%	15.4%	100.0%
		% within FOURN	27.3%	22.2%	28.6%	25.0%	66.7%	28.9%
	METAPHORIC	Count	1	1	3	2	0	7
		% within style	14.3%	14.3%	42.9%	28.6%	.0%	100.0%
		% within FOURN	9.1%	11.1%	21.4%	25.0%	.0%	15.6%
RANDOM	Count	3	2	0	1	0	6	
	% within style	50.0%	33.3%	.0%	16.7%	.0%	100.0%	
	% within FOURN	27.3%	22.2%	.0%	12.5%	.0%	13.3%	
Total	Count	11	9	14	8	3	45	

% within style	24.4%	20.0%	31.1%	17.8%	6.7%	100.0%
% within Fourn	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE 6.29 CHI-SQUARE : FOUR SYMBOL GROUPS AND STYLE

Chi-Square Test – Four symbol MBTI groups (ENTJ/ ENTP/ ESTJ/ INTP/ ISTJ) and Cognitive Style

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	8.125(a)	12	.775	.820
Likelihood Ratio	9.962	12	.619	.801
Fisher's Exact Test	7.903			.836
N of Valid Cases	45			

a 19 cells (95.0%) have expected count less than 5. The minimum expected count is .40.

From tables 6.28 and 6.29 as well as the chi-square statistic, it is clear that there is no relationship between the MBTI four symbol groups (ENTJ / ENTP / INTP / ISTJ / ESTJ) and the Analytical, Explorative, Metaphoric and Random Cognitive styles as measured by the CPP, (chi-square= 8.125, df = 12, p = .775).

6.5.1 Summary of findings

The following section serves to highlight and summarise the findings of the Chi-Square tests of the relationship between the MBTI groups and the cognitive styles as defined by the CPP. Given that no significant relationships were found across any of the MBTI groups and the CPP cognitive styles, this section will highlight some of the previous research findings, as cited by a number of authors, which could have been supported by the current study.

- Individuals scoring high on the Judging preference of the MBTI were found to have a preference for controlled processing or a Reflective thinking style (Edwards, 2003). In relation to the CPP/MBTI relationship, this would manifest as a relationship between Judging on the MBTI and possibly a combined analytical-reflective thinking style on the CPP. The findings are unsupported.
- Burrows-Horton and Oakland (1997) cite research describing prominent cognitive styles exhibited by individuals displaying certain temperament types. Their research suggested the following:
 - SJ's employ a more concrete cognitive style and prefer to work with repetition and routine.
 - SP's tend to adopt styles that are more conducive to variety, action, and entertainment.
 - NT individuals tend to adopt more holistic and integrative styles that promote discovery and experimentation.
 - NF individuals tend more towards an experimental type style and prefer strategies that emphasise cooperation and personalised applications of learning.

Relative to the current study, the cited research could have manifested as a relationship between SJ individuals and a structured or analytical cognitive style, SP as well as NT and an integrative or holistic style and NF and a learning style. None of these relationships are supported in the current study.

- Boyatzis, Kolb and Mainemelis (2002) in their research, attempt to integrate cognitive, or learning styles as described by the Learning Styles Index (LSI) with MBTI types.

The LSI summarises styles and corresponding MBTI types in terms of the following:

- ***Diverging style*** – is characterised by learning abilities that are based on Concrete Experience (CE) and Reflective Observation (RO). People with this style are most effective at viewing concrete situations from many different points of view and perform better in situations that call for generation of ideas. Individuals with this style, tend to be F on the MBTI.

- ***Assimilating style*** - is characterised by learning abilities that are based on Abstract Conceptualisation (AC) and Reflective Observation (RO). People with this learning style tend to work with high levels of complexity and are effective at putting complex information into concise, logical form. Individuals with an assimilating style are less focused on people and more interested in ideas and abstract concepts. Individuals with this style, tend to be N on the MBTI.
- ***Converging style*** – is characterised by learning abilities that are based on Abstract Conceptualisation (AC) and Active Experimentation (AE). People with this learning style tend to be highly pragmatic and have the ability to find practical solutions to problems. They also tend to be highly effective at technical tasks. Individuals with this style, tend to be T on the MBTI.
- ***Accommodating style*** - is characterised by learning abilities that are based on Concrete Experience (CE) and Active Experimentation (AE). People with this learning style have the ability to learn from primarily “hands-on” experience and tend to be more intuitive, making decisions based on “gut” feelings rather than on logical analysis. Individuals with this style, tend to be N on the MBTI.

The Chi-Square tests of the relationship between the MBTI groups and the cognitive styles as defined by the CPP provide no findings that would support any of the above literature.

- Steiner and Gaskin (1998) also report on a number of studies in which they have attempted to link Kolb's Learning Styles to that of the MBTI preferences. Based on a synthesis of characteristics drawn from Kolb's theory and literature on the MBTI, they suggest the following:
 - *Convergers with learning style* preferences for abstract conceptualisation and active experimentation prefer S to I because of their discomfort with the complexity and chaos of holistic approaches.
 - *Convergers with abstract conceptualisation* prefer J to P because of their desire for action and because of their preference for abstract rather than concrete engagement with the world.
 - *Convergers with abstract conceptualisation* prefer T to F because of their interest in ideas and their disinterest in people which would also suggest a preference for I rather than E.

Holistically, the authors suggest that individuals whose dominant styles are abstract conceptualisation and active experimentation (convergers) are probably ISTJ types. This is once again, unsupported by the current study.

- Assimilators with learning style preferences for abstract conceptualisation and reflective observation, prefer I and T (Steiner & Gaskin, 1998).
- Assimilators with abstract conceptualisation prefer T over F because of their discomfort with people and their preference for logic and reason (Steiner & Gaskin, 1998).
- Assimilators with learning style preferences for abstract conceptualisation and reflective observation prefer N to S because they are comfortable with creating or seeing relations between ideas. They may also prefer J to P because of their interest in structure and control (Steiner & Gaskin, 1998).

In view of this, the authors suggest that individual's whose dominant styles are abstract conceptualisation and reflective observation (assimilators) are probably INTJ or INTP types. This is, unsupported by the current study.

- Divergers with learning style preferences for concrete experience and reflective observation prefer E to I and P to J because of their openness to the world, their adaptability, their comfort with gestalts and their lack of respect for convention (Steiner & Gaskin, 1998).
- Divergers with learning style preferences for concrete experience and reflective observation prefer F to T because of their enjoyment of people and because of their preference for abstract and possible resistance to logical order and structure (Steiner & Gaskin, 1998).

Therefore, individual's whose dominant learning styles are concrete experience and reflective observation (divergers) would probably be ENFP or ESFP types. This is, unsupported by the current study.

- Accommodators with learning style preferences for concrete experience and active experimentation prefer E to I because of their active, outward orientation. They also

prefer F to T because of their strong people orientation and their need for novelty rather than routine (Steiner & Gaskin, 1998).

- Accommodators with learning style preferences for concrete experience and active experimentation prefer S to N because they are focused on the present and tend to be action-oriented (Steiner & Gaskin, 1998).

Based on this interpretation, the authors suggest that individual's whose dominant learning styles are concrete experience and active experimentation (accommodators) are probably ESFP or ESFJ types. This is, unsupported by the current study.

- Grabowski and Jonassen (1993) report on the relationship between Kolb's Learning Styles and IE. They report that E is related to the concrete experience and active experimentation and I is related to the reflective observation learning style. They also relate cognitive tempo, which they define in terms of either an impulsive or a reflective cognitive style with I and E. Given this, E's are frequently characterised as active-oriented and impulsive, whereas I's are reflective-oriented. Finally, the authors also suggest that reflective individuals score higher on verbal ability and verbal abstraction in comparison to impulsives. Relative to the current study, the cited research could have manifested as a relationship between E individuals and an Impulsive style, and I individuals and a Reflective style. This is unsupported in the current study.

- Messick (1994) summarises the difference between an impulsive and a reflective thinking style in terms of cognitive tempo or individual consistency in the speed and accuracy with which alternative hypotheses are formulated and information processed under conditions of uncertainty. Messick suggests that impulsive individuals tend to respond quickly with the first seemingly reasonable answer, whereas reflective individuals tend to evaluate various possibilities before deciding. This, in relation to the CPP, would lend support to a possible relationship between I and a metaphoric style (which is largely a function of verbal abstraction). This is again, unsupported in the current study

- Isaksen, Lauer and Wilson (2003) report correlations between the MBTI as a measure of personality and the Kirton Adaptation-Innovation inventory as a measure of cognitive style. Kirton's measure includes a continuum from adaption to innovation which describes cognitive

styles that range from adaption (or fairly structured decision making and problem-solving) to innovation (which tends towards a more flexible, intuitive and creative decision making and problem-solving). The authors report a strong relationship between MBTI N and P types and Kirton's innovation, which, relative to the current study, would translate into a relationship between the more creative or right brain cognitive styles (integrative, holistic) and P on the MBTI. This is not the case in the current study.

- Yang and Lin (2004) provide a number of research findings indicating strong relationships between cognitive styles as defined by Sternberg's Theory of Mental Self Government and personality type as defined by the MBTI. Their results suggest that the genesis of thinking styles may partially be explained by the nature of the relationship between thinking styles and personality types. Sternberg (as cited in Yang & Lin, 2004) emphasised five dimensions and thirteen thinking styles that represent important stylistic aspects of intellectual functioning. They include the following:

1. Dimension one – function of Mental Self Government, including:
 - A legislative function - concerned with formulating ideas and creating rules.
 - An executive function - concerned with carrying out plans and implementing rules initiated by others.
 - A judicial function - concerned with comparing and evaluating ideas, rules, and procedures.
2. Dimension two – the form of mental self-government, including:
 - An Hierarchic style – concerned with prioritizing.
 - A Monarchic style - concerned with pursuing goals single-mindedly.
 - An Oligarchic style – concerned with having multiple goal pursuits.
 - An Anarchic style – concerned with taking a random approach to goals and problems.
3. Dimension three – the level of mental self-government, including:
 - Global style - indicating a preference for problems at a relatively high level of abstraction.
 - Local style – indicating a preference for problems that demand attention to details
4. Dimension four – the scope of mental self-government, including:
 - An Internal style - indicating a preference for tasks that allow one to work alone.

- An External style - indicating a preference for tasks that allow social interaction and collaboration.
5. Dimension five - leanings of mental self-government, including:
- A Liberal style – indicating a preference for tasks, projects, or situations which involve unfamiliarity and ambiguity and which require going beyond existing rules and procedures.
 - A Conservative style – indicating a preference for familiarity or situations and tasks that require adherence to existing rules.

The following correlations were established between personality type and cognitive thinking style :

- N types – positive relationship with legislative, judicial, anarchic, global, internal, external, and liberal, and a negative relationship with executive, and conservative.
- S types – positive relationship with executive, and conservative and a negative relationship between legislative, judicial, monarchic, anarchic, global, internal, external, and liberal.
- T types - significant positive correlation with legislative, executive, judicial, monarchic, hierarchical, local, internal, and liberal, and a negative relationship with oligarchic.
- F types - significant negative correlation with legislative, executive, judicial, monarchic, hierarchical, local, internal, and liberal, and a positive relationship with oligarchic.
- J types - significant positive correlation with monarchic, hierarchical, oligarchic, local, and conservative, and a negative relationship with legislative, anarchic, internal and liberal.
- P types - have significant negative correlation with executive, monarchic, hierarchical, oligarchic, local, and conservative, and a positive relationship with legislative, anarchic, internal, and liberal.

The above findings lend partial support to the possibility of a relationship between personality and cognitive style, which is unsupported by the current research study.

Zhang (2002) attempted to determine the relationship between thinking styles (as defined by Sternberg's theory of mental self government) and personality (as defined by Holland's Short-version Self-directed Search - SVSDS) by correlating results from each of the questionnaires. The findings suggested the following:

- A strong positive relationship between the social and enterprising scales of the SVSDS theory and the external style of Sternberg's Questionnaire.
- A negative relationship between the social and enterprising scales of the SVSDS theory and the internal thinking style of Sternberg's Questionnaire.
- A positive relationship between the social and enterprising scales of the SVSDS and the judicial thinking style of Sternberg's Questionnaire

Saddler-Smith (1999) suggests that the behaviors stemming from style are an expression of stable personality dimensions and cites research indicating a relationship between cognitive style and personality variables. Amongst these, statistically significant correlations between cognitive style and a number of personality variables, as measured by the 16 PF Questionnaire and the MBTI. For example, SN, JP (Myers Briggs Type Indicator), EI (Eysenck Personality Inventory), humble-assertive, conservative-experimenting, controlled-undisciplined, conscientious expedient, subdued independent, tender emotionality-alert poise, astute-forthright (16 PF Questionnaire). He concludes by stating that the studies support the notion that cognitive style is a correlate of personality.

When looked at in relation to the research findings, there is ample evidence to suggest a relationship between personality type and cognitive style. More specifically, there is ample evidence to suggest a relationship between the MBTI personality types and cognitive style. Despite this, however, the current study provides no supporting evidence.

6.6 CHAPTER SUMMARY

In this chapter the results of the empirical study were reported and discussed per statistical test (descriptive statistics, pairwise comparisons and Chi-square statistics). The results were then integrated to enable a better understanding of the relationship between cognition and personality.

CHAPTER SEVEN

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS.

7.1 INTRODUCTION

With reference to research methodology proposed in chapter one, the aim of this chapter is to present conclusions with regards to the research, to discuss possible limitations of this particular study and to provide recommendations for future research that is conducted within a similar field.

As set out in Chapter one, the research study was formulated in terms of primary theoretical aims, primary empirical aims and secondary aims. Chapter six will thus focus on integrating the research and drawing conclusions in terms of the identified aims.

7.2 CONCLUSIONS RELATING TO DEFINED AIMS

The following section expands upon and integrates the literature as it relates to both the theoretical as well as the empirical study aims.

7.2.1 Conclusions relating to the primary theoretical aims

With reference to the literature review for this research the following conclusions can be drawn:

7.2.1.1 Conceptualising Cognition

The first literature review objective was to conceptualise the term cognition. A comprehensive literature review incorporating an historical overview of cognitive psychology, a clarification of the concepts associated with cognitive psychology, and the integration of the various concepts and approaches was provided, indicating that the term cognition has evolved over a number of years but still remains fairly unclarified. Work by Pardo and Sternberg (1998) was cited in which an attempt was made to integrate the concepts and constructs by

utilising the term “intelligence” as a foundational concept. They proposed that the construct of intelligence is a useful, unifying theme for the study of cognition, albeit whilst recognising that different themes (information processing, working memory) highlight different aspects of cognitive psychology.

It can thus be concluded that whilst the term cognition remains somewhat vague and abstract, attempts have been (and will continue) to be made with regards to more fully defining the term. It can also be concluded that the literature review has contributed to the qualitative study in that it has provided the theoretical foundation for the analysis and interpretation of the empirical results. Thus, the first objective of the literature review has been addressed and answers to the first problem statement provided.

7.2.1.2 Conceptualising Personality

The second literature review objective was to conceptualise the term personality. A comprehensive literature review incorporating an historical overview of personality psychology, the concept of personality and general definitions of personality was provided indicating that in a similar vein to that of “cognition”, the term personality has also evolved over a number of years and has resulted in a number of competing frameworks and schools of thought. It was also concluded that despite evolving theories, little literature covers the development and history of personality type theory. In terms of this, (and in view of the utility of the MBTI in the current research study) personality was defined in terms of the Psychoanalytic school of thought which conceptualises behaviour and consciousness, or “personality” as the result of an ongoing compromise among numerous independently operating mental subsystems (Funder, 2001). Jung’s theory of type was discussed under the analytical psychology paradigm, with a focus on personality structure, dynamics and development. This was then integrated into an overview of his theory of personality types.

It can thus be concluded that whilst the general term personality remains somewhat vague and abstract, the term personality has a fairly solid foundation and conceptual framework when looked at in light of the psychoanalytic paradigm. It can also be concluded that the literature review has contributed to the qualitative study in that it has provided the theoretical

foundation for the analysis and interpretation of the empirical results. Thus, the second objective of the literature review has been addressed.

7.2.1.3 The relationship between cognition and personality

The third literature review objective was to determine whether a theoretical relationship exists between cognition and personality. A comprehensive literature review was provided, including a thorough overview of past research attempts that have been made in terms of integrating the concepts cognition and personality. A number of challenges facing a proposed integration was discussed and it was concluded that despite the fact that both disciplines (personality and cognition) developed within the context of individual differences research, it has been a difficult, and sometimes impossible feat to bring the two concepts together. Research was cited that discussed some of these limitations and concerns, amongst these, the most prominent being the issues of :

- Personality theory been aimed at developing an inclusive description of individuals whilst cognitive theory has aimed more at a differential description (Barrat, 1995).
- Personality being an ability measurement which is based on samples of relevant behaviour collected under maximal performance instructions and cognition being based mostly on questionnaires and rating scales where individuals judge and rate their own behaviour. (Borkenau, 2001)
- Intelligence being measured by a person's maximal performance whereas personality being judged on the basis of typical behaviour (Hofstee, 2001)

Despite this, however, the chapter is concluded with a number of research findings, particularly that by Grigorenko and Sternberg (1997) who conclude that cognitive styles represent a bridge between these two seemingly distinct areas. Isaksen, Lauer and Wilson (2003) furthermore, suggest that cognitive style is a concept on the borderline between personality and cognitive functioning and serves as a useful point of integration. A number of distinct theories of cognitive style are discussed and the MBTI as a measure of style rather

than personality, is discussed in relation to its predictive validity as an ability rather than a personality measurement.

The final conclusion in terms of the theoretical aim of determining whether a theoretical relationship exists between cognition (particularly those aspects of cognition as defined by the CPP) and personality (as defined by the MBTI) is that whilst cognitive style could be seen as a bridging concept, the MBTI is possibly misused as a cognitive, rather than a personality measurement in terms of attaining this outcome.

It can thus be concluded that the literature review has contributed to the qualitative study in that it too, has provided the theoretical foundation for the analysis and interpretation of the empirical results. Thus, the third objective of the literature review has been addressed.

7.2.2 Conclusions relating to empirical aims

With reference to the empirical aims for this research the following conclusions can be drawn:

7.2.2.1 The relationship between cognitive style and personality

For this section of the research, Chi-Square tests of the relationships between a variety of MBTI groups and Cognitive Style were performed. The following results were identified:

- The Chi-Square Test of the Relationship between Introversion/Extraversion and Cognitive Style revealed no statistically significant findings.
- The Chi-Square Test of the Relationship between Intuition/Sensing and Cognitive Style revealed no statistically significant findings.
- The Chi-Square Test of the Relationship between Thinking/Feeling and Cognitive Style revealed no statistically significant findings.
- The Chi-Square Test of the Relationship between Judging/Perceiving and Cognitive Style revealed no statistically significant findings.

- The Chi-Square Test of the Relationship between “Two”symbol MBTI groups (NP/NT SJ/ST/TJ/TP) and Cognitive Style revealed no statistically significant findings.
- The Chi-Square Test of the Relationship between “Three” symbol MBTI groups (NFP/ NTJ/ NTP/ STJ) and Cognitive Style revealed no statistically significant findings.
- The Chi-Square Test of the Relationship between “Four” symbol MBTI groups (ENTJ/ ENTP/ ESTJ/ INTP/ ISTJ) and Cognitive Style revealed no statistically significant findings.

Based on this, it can be concluded that there is insufficient evidence to suggest that a relationship exists between cognitive styles (as defined by the CPP) and personality (as defined by the MBTI). In light of this, however, the chapter includes a number of research studies that suggest that there is in fact a clear relationship between personality and cognition, some of which relate directly to studies in which the MBTI has been utilised as a personality measure. This certainly brings to light a number of questions regarding the current research findings and more specifically, the trend towards utilising cognitive and personality measures interchangeably in the context of selection and development. Given these findings, the question of whether findings on the MBTI are generalised to include cognitive abilities and cognitive style is in part, answered.

It can thus be concluded that whilst there is a significant amount of research to indicate that there is in fact a relationship between cognitive styles and personality, the current research findings do not support this. It can also be concluded that the empirical aim of determining whether a relationship exists between cognitive styles (i.e. a person’s general approach to problem solving – particularly in new and unfamiliar situations) and personality, has been achieved.

7.2.2.2 The relationship between cognitive processes and personality

For this section of the research, Pairwise Comparisons of the relationships between a number of MBTI groups and Cognitive Processing Competencies were performed. The following significant results were identified and have been discussed in more detail in Chapter Six.

- Extraverts outperform Introverts on Integration

- There is no evidence to suggest that individuals high on either Intuition or Sensing outperform one another on any of the 16 CPP dimensions.

- There is no evidence to suggest that individuals high on either Thinking or Feeling outperform one another on any of the 16 CPP dimensions.

- The significant differences that are reported across the sixteen CPP Dimensions and Judging – Perceiving dimensions of the MBTI occur on the dimensions CPP Current, Analytical, Integration, Complexity and Judgment. In other words, the current research seems to indicate that :
 - Judging individuals outperform Perceiving individuals on CPP current

 - Judging individuals outperform Perceiving individuals on analysis

 - Judging individuals outperform Perceiving individuals on integration

 - Judging individuals outperform Perceiving individuals on complexity

 - Judging individuals outperform Perceiving individuals on judgment

- There is no evidence to suggest that certain MBTI two group combinations outperform other groups on any of the 16 CPP dimensions.

- There is some evidence to suggest that individuals with an NTJ preference on the MBTI outperform those with an NTP preference on Integration.
- There is some evidence to suggest that individuals with an STJ preference on the MBTI outperform those with an NTP preference on Integration.
- There is some evidence to suggest that certain four symbol combination groups of the MBTI outperform other combination groups on the dimensions of CPP Current, Pragmatic, Integration and Use of Memory.
 - ENTJ individuals seem to outperform INTP individuals on CPP Current
 - ENTP individuals seem to outperform INTP individuals on Pragmatic
 - ESTJ individuals seem to outperform INTP individuals on Pragmatic
 - ENTJ individuals seem to outperform INTP individuals on Integration
 - ESTJ individuals seem to outperform INTP individuals on Integration
 - ENTJ individuals seem to outperform INTP individuals on the use of memory

It can thus be concluded that whilst there are a number of findings in the current research that do not correspond with what has been previously reported in the literature, there were sufficient statistically significant findings to suggest that there is some relationship between cognitive processes / competencies and personality. It can thus also be concluded that the empirical aim of determining whether a relationship exists between cognitive processes / competencies and personality has been achieved.

7.2.2.3 The relationship between work-related processing aspects and personality

For this section of the research, Pairwise Comparisons of the relationships between a variety of MBTI groups and Cognitive Processing Levels of work were performed. The following significant results were identified and have been discussed in more detail in Chapter Six.

- Judging individuals outperform Perceiving individuals on CPP current
- ENTJ individuals seem to outperform INTP individuals on CPP Current

It can thus be concluded that the empirical aim of determining whether a relationship exists between work-related processing aspects and personality has been achieved.

7.2.2.4 MBTI generalisations

When looked at in relation to the findings that are considered statistically significant, it can be concluded that in general, it would not seem that the MBTI is generalised to include cognitive abilities, but may in fact be generalised to include cognitive style. This is perhaps most important when viewed in relation to the MBTI descriptions as discussed in Chapter four, some of which are again, provided here:

- The MBTI is a measure of information processing style, often termed cognitive style (Leonard, Richard & Kowalski, 1999).
- The MBTI is a measure of cognitive style diversity (Cheng, Luckett & Schulz, 2003).
- The MBTI is a measure of cognitive style (Doyle et al. 1997).

In light of this, it is perhaps relevant to re-highlight the statement by Quenk and Hammer (as cited in Isaksen, Lauer & Wilson, 2003) that by specifying that the MBTI is a personality inventory, its misuse as a test of skills, abilities, cognitive constructs and cognitive styles would be discouraged.

7.2.4 Conclusions relating to the hypothesis

The research hypothesis was as follows:

- H0: there is no significant relationship between the constructs measured by the CPP and those measured by the MBTI.
- H1: there is a significant relationship between the constructs measured by the CPP and those measured by the MBTI.

The Null hypothesis is rejected based on the findings that there is some relationship between cognitive processes / competencies and personality as well as the findings that there is some relationship between work-related processing aspects and personality. It can thus be concluded that there is in fact a relationship between the constructs measured by the CPP and those measured by the MBTI (albeit in very limited areas).

7.3 LIMITATIONS

The present study has a number of limitations that temper the successes of the research, influence the outcomes and thus prompt improvements that future researchers may wish to consider. The limitations of the research are thus discussed with regards to the literature study as well as the empirical study.

With regards to the literature study, the following limitations were identified:

- There is a limited amount of research that has explicitly looked at the relationship between cognition and personality in general. From a more specific view, there is even less literature that has looked at the relationship between specific cognitive processes and personality type as defined by the MBTI. Whilst there seems to be a fair amount of literature that explores the relationship between cognitive styles and personality, this too is fairly limited in its scope.

- Much of the cited research explores cognitive style from a personality-centered (rather than a cognition centered) approach. The CPP defines cognitive style more in terms of cognition than personality, which has made comparison difficult.
- A large proportion of literature is based on the MBTI as a measure of style, rather than as a measure of personality. Again, this makes cross reference to the MBTI as a personality measure (as it has been utilised in this study) very difficult.
- Cognitive psychology, in comparison to personality psychology, is still a developing science. As a result, much of the available literature is based on new theories and foundational work that has not yet been empirically tested.
- Finally, the CPP is a relatively new cognitive assessment tool that is largely unmatched in its capacity to determine an individual's cognitive processing capacity. Comparative literature is thus difficult to come by. Also, much of the available literature that does in fact give an indication of processing capacity, is based on self report measures rather than actual ability. Again, this makes comparison difficult.

With regards to the empirical study, the following limitations were identified:

- Sample size : the sample is somewhat limited in terms of its power, which in turn, would have impacted on the overall findings.
- In terms of both the Pairwise comparisons and the Chi-Square statistics, only large enough groups could be utilised for the purposes of statistical analysis. In terms of the actual analysis, this translated into a fairly limited number of groups that could in fact be used for statistical calculations.
- The sample may be limited in terms of ecological validity. Given that the sample company is within the ambit of a specific industry as well as within the public sector, it may not be appropriate to extend the findings to other contexts.

- The sample was selected from one organisation. The weakness inherent in using a single organisation for any type of research is that it may not control for possible confounding variables peculiar to that organisation. As a result there is no assurance that extraneous variables have not systematically biased the results of the study and reduced the generalisability of the study.
- Much has been written about the difficulties and limitations of using ipsative measurement and forced choice response styles in the assessment of personality. Given this, the utility of the MBTI as an ipsative personality measurement (and specifically for research purposes), may be questionable. Furnham and Stringfield (1993) for example cite a number of criticism of the MBTI and the fact that its ipsative response format distorts data which in turn, causes psychometric shortcomings.
- Any personality measurement is dependent on a degree of self-insight on the part of the respondent. The degree of self-insight of the research sample is obviously unknown, which could have impacted on the reliability of the findings.
- Sample characteristics with regards to both the MBTI and the CPP were homogenic. All individuals included in the research were from the same discipline and most had a fairly high level of cognitive functioning. The high predominance of the ESTJ preference may also have skewed the findings.
- MBTI preferences were calculated in a fairly quantitative manner with little focus on the dominant and auxiliary functions. For example, extraverts use their dominant function mainly in their extraverted world. Introverts, on the other hand, use their dominant function mainly in their introverted world. Given the quantitative nature of this research, nuances in dominant and auxiliary functions may have been overlooked.
- One of the weaknesses of the MBTI according to Grigorenko and Sternberg (1997) is the presentation of type preferences as either/or categories whereas most personality theorists view personality traits as continuous, with individuals possessing more or less of each trait. The concern with presenting traits as either present or absent, is that it suggests a

finality to the results. In terms of interpretation, an individual's personality type is also often interpreted as an either-or, overlooking slight typology tendencies in different directions. As it relates to the research, obviously quantitative research would fail to take into consideration type combinations and would thus in essence, minimise results into categories. Again, in line with the point made above, slight nuances would most certainly be overlooked.

- Single psychometric measures were used to measure the personality and cognitive dimensions. The use of other assessment methodologies, particularly those more suitable to a personality-centered cognitive style paradigm, may be more useful.
- The sample group was not a very diverse representation of the South African context, this would, again, impact on the generalisability of the findings.

7.4 RECOMMENDATIONS

Against the backdrop of the conclusions and limitations, the following recommendations can be made with regards to future research:

- Future research in the field should be supported by larger sample sizes.
- Future research should be supported by a more representative sample, particularly in terms of ensuring large enough groups to perform statistical calculations along all of the various dimensions.
- Similar studies could be conducted over a broader spectrum of organisations to enable more generalisable results.
- The dominant and auxiliary functions as defined by the MBTI could be more carefully calculated and integrated into future research.

- Given that there is sufficient research to indicate that certain MBTI types are drawn to certain work environments, the research could be conducted in such a way as to ensure a representative sample of all of the possible MBTI combinations.
- Given that the MBTI is a personality measure and often picks up on an individuals' adapted behaviour in given contexts, additional questionnaires or measurements could be included that determine adapted as well as inherent behaviour. This would ensure that an accurate description of each individual profile would be obtained.
- In terms of a quantitative study, although no individual can be minimised to a categorical number, it may be more useful to utilise a personality measurement that could more easily be translated into numerical or quantitative data.

7.5 CHAPTER SUMMARY

In this chapter the conclusions with regards to the research were discussed in terms of both the theoretical as well as the empirical aims initially put forth. Possible limitations to the research were then listed, in terms of both the literature study as well as the empirical study. The chapter was concluded with possible recommendations for future research aiming to explore the relationship between cognition and personality.

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APPENDIX A

THE SIXTEEN PERSONALITY TYPES (Adapted from Myers and Myers, 1980)

ISTJ	ISFJ	INFJ	INTJ
<p>Quiet, serious, earn success by thoroughness and dependability. Practical, matter-of-fact, realistic, and responsible. Decide logically what should be done and work toward it steadily, regardless of distractions. Take pleasure in making everything orderly and organized---their work, their home, their life. Value traditions and loyalty.</p>	<p>Quiet, friendly, responsible, and conscientious. Committed and steady in meeting their obligations. Thorough, painstaking, and accurate. Loyal, considerate, notice and remember specifics about people who are important to them, concerned with how others feel. Strive to create an orderly and harmonious environment at work and at home.</p>	<p>Seek meaning and connection in ideas, relationships, and material possessions. Want to understand what motivates people and are insightful about others. Conscientious and committed to their firm values. Develop a clear vision about how best to serve the common good. Organized and decisive in implementing their vision.</p>	<p>Have original minds and great drive for implementing their ideas and achieving their goals. Quickly see patterns in external events and develop long-range explanatory perspectives. When committed, organize a job and carry it through. Skeptical and independent, have high standards of competence and performance---for themselves and others.</p>
ISTP	ISFP	INFP	INTP
<p>Tolerant and flexible, quiet observers until a problem appears, then act quickly to find workable solutions. Analyze what makes things work and readily get through large amounts of data to isolate the core of</p>	<p>Quiet, friendly, sensitive, and kind. Enjoy the present moment, what's going on around them. Like to have their own space and to work within their own time frame. Loyal and committed to their values and to people</p>	<p>Idealistic, loyal to their values and to people who are important to them. Want an external life that is congruent with their values. Curious, quick to see possibilities, can be catalysts for implementing ideas.</p>	<p>Seek to develop logical explanations for everything that interests them. Theoretical and abstract, interested more in ideas than in social interaction. Quiet, contained, flexible, and adaptable. Have unusual ability to</p>

practical problems. Interested in cause and effect, organize facts using logical principles, value efficiency.	who are important to them. Dislike disagreements and conflicts, do not force their opinions or values on others.	Seek to understand people and to help them fulfill their potential. Adaptable, flexible, and accepting unless a value is threatened.	focus in depth to solve problems in their area of interest. Skeptical, sometimes critical, always analytical.
ESTP	ESFP	ENFP	ENTP
Flexible and tolerant, they take a pragmatic approach focused on immediate results. Theories and conceptual explanations bore them---they want to act energetically to solve the problem. Focus on the here-and-now, spontaneous, enjoy each moment that they can be active with others. Enjoy material comforts and style. Learn best by doing.	Outgoing, friendly, and accepting. Exuberant lovers of life, people, and material comforts. Enjoy working with others to make things happen. Bring common sense and a realistic approach to their work, and make work fun. Flexible and spontaneous, adapt readily to new people and environments. Learn best by trying a new skill with other people.	Warmly enthusiastic and imaginative. See life as full of possibilities. Make connections between events and information very quickly, and confidently proceed based on the patterns they see. Want a lot of affirmation from others, and readily give appreciation and support. Spontaneous and flexible, often rely on their ability to improvise and their verbal fluency.	Quick, ingenious, stimulating, alert, and outspoken. Resourceful in solving new and challenging problems. Adept at generating conceptual possibilities and then analyzing them strategically. Good at reading other people. Bored by routine, will seldom do the same thing the same way, apt to turn to one new interest after another.
ESTJ	ESFJ	ENFJ	ENTJ
Practical, realistic, matter-of-fact. Decisive, quickly move to implement decisions. Organize projects and people to get things done, focus on getting	Warmhearted, conscientious, and cooperative. Want harmony in their environment, work with determination to establish it. Like to	Warm, empathetic, responsive, and responsible. Highly attuned to the emotions, needs, and motivations of others. Find potential in everyone, want to	Frank, decisive, assume leadership readily. Quickly see illogical and inefficient procedures and policies, develop and implement

<p>results in the most efficient way possible. Take care of routine details. Have a clear set of logical standards, systematically follow them and want other to also. Forceful in implementing their plans.</p>	<p>work with others to complete tasks accurately and on time. Loyal, follow through even in small matters. Notice what others need in their day-by-day lives and try to provide it. Want to be appreciated for who they are and for what they contribute.</p>	<p>help others fulfill their potential. May act as catalysts for individual and group growth. Loyal, responsive to praise and criticism. Sociable, facilitate others in a group, and provide inspiring leadership.</p>	<p>comprehensive systems to solve organisational problems. Enjoy long-term planning and goal setting. Usually well informed, well read, enjoy expanding their knowledge and passing it on to others. Forceful in presenting their ideas.</p>
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APPENDIX B

THE EFFECTS OF BIOGRAPHICAL VARIABLES ON THE MBTI FACTORS

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Squared	Eta
Intercept	Pillai's Trace	.953	179.701(a)	7.000	62.000	.000	.953
	Wilks' Lambda	.047	179.701(a)	7.000	62.000	.000	.953
	Hotelling's Trace	20.289	179.701(a)	7.000	62.000	.000	.953
	Roy's Largest Root	20.289	179.701(a)	7.000	62.000	.000	.953
Age	Pillai's Trace	.135	1.384(a)	7.000	62.000	.228	.135
	Wilks' Lambda	.865	1.384(a)	7.000	62.000	.228	.135
	Hotelling's Trace	.156	1.384(a)	7.000	62.000	.228	.135
	Roy's Largest Root	.156	1.384(a)	7.000	62.000	.228	.135
Gender	Pillai's Trace	.070	.666(a)	7.000	62.000	.700	.070
	Wilks' Lambda	.930	.666(a)	7.000	62.000	.700	.070
	Hotelling's Trace	.075	.666(a)	7.000	62.000	.700	.070
	Roy's Largest Root	.075	.666(a)	7.000	62.000	.700	.070
Education	Pillai's Trace	.324	1.108	21.000	192.000	.343	.108
	Wilks' Lambda	.706	1.096	21.000	178.581	.356	.110
	Hotelling's Trace	.375	1.083	21.000	182.000	.370	.111
	Roy's Largest Root	.210	1.919(b)	7.000	64.000	.081	.173
culture	Pillai's Trace	.332	1.137	21.000	192.000	.313	.111
	Wilks' Lambda	.693	1.160	21.000	178.581	.292	.115
	Hotelling's Trace	.409	1.181	21.000	182.000	.272	.120
	Roy's Largest Root	.305	2.785(b)	7.000	64.000	.014	.233
Gender Education *	Pillai's Trace	.346	1.191	21.000	192.000	.263	.115
	Wilks' Lambda	.689	1.180	21.000	178.581	.274	.117
	Hotelling's Trace	.404	1.166	21.000	182.000	.286	.119
	Roy's Largest Root	.203	1.860(b)	7.000	64.000	.091	.169
Gender culture *	Pillai's Trace	.419	1.483	21.000	192.000	.087	.140
	Wilks' Lambda	.632	1.473	21.000	178.581	.092	.142

		Hotelling's Trace	.504	1.457	21.000	182.000	.098	.144
		Roy's Largest Root	.275	2.512(b)	7.000	64.000	.024	.216
Education culture	*	Pillai's Trace	.963	1.205	63.000	476.000	.146	.138
		Wilks' Lambda	.327	1.238	63.000	355.296	.120	.148
		Hotelling's Trace	1.324	1.267	63.000	422.000	.094	.159
		Roy's Largest Root	.674	5.093(b)	9.000	68.000	.000	.403
Gender Education culture	*	Pillai's Trace	.641	1.145	42.000	402.000	.254	.107
	*	Wilks' Lambda	.492	1.142	42.000	294.258	.262	.111
		Hotelling's Trace	.787	1.131	42.000	362.000	.273	.116
		Roy's Largest Root	.344	3.293(b)	7.000	67.000	.005	.256

APPENDIX C

THE EFFECTS OF BIOGRAPHICAL VARIABLES ON THE CPP FACTORS

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Squared	Eta Squared
Intercept	Pillai's Trace	.805	13.438(a)	16.000	52.000	.000	.805	
	Wilks' Lambda	.195	13.438(a)	16.000	52.000	.000	.805	
	Hotelling's Trace	4.135	13.438(a)	16.000	52.000	.000	.805	
	Roy's Largest Root	4.135	13.438(a)	16.000	52.000	.000	.805	
Age	Pillai's Trace	.296	1.367(a)	16.000	52.000	.195	.296	
	Wilks' Lambda	.704	1.367(a)	16.000	52.000	.195	.296	
	Hotelling's Trace	.421	1.367(a)	16.000	52.000	.195	.296	
	Roy's Largest Root	.421	1.367(a)	16.000	52.000	.195	.296	
Gender	Pillai's Trace	.426	2.408(a)	16.000	52.000	.009	.426	
	Wilks' Lambda	.574	2.408(a)	16.000	52.000	.009	.426	
	Hotelling's Trace	.741	2.408(a)	16.000	52.000	.009	.426	
	Roy's Largest Root	.741	2.408(a)	16.000	52.000	.009	.426	
Education	Pillai's Trace	.928	1.512	48.000	162.000	.030	.309	
	Wilks' Lambda	.313	1.546	48.000	155.455	.024	.321	
	Hotelling's Trace	1.489	1.571	48.000	152.000	.021	.332	
	Roy's Largest Root	.790	2.666(b)	16.000	54.000	.004	.441	
culture	Pillai's Trace	.820	1.270	48.000	162.000	.138	.273	
	Wilks' Lambda	.370	1.286	48.000	155.455	.128	.282	
	Hotelling's Trace	1.230	1.299	48.000	152.000	.119	.291	
	Roy's Largest Root	.705	2.378(b)	16.000	54.000	.009	.413	
Gender * Education	Pillai's Trace	.853	1.340	48.000	162.000	.092	.284	
	Wilks' Lambda	.351	1.367	48.000	155.455	.079	.295	
	Hotelling's Trace	1.321	1.395	48.000	152.000	.067	.306	
	Roy's Largest Root	.806	2.721(b)	16.000	54.000	.003	.446	
Gender * culture	Pillai's Trace	.746	1.117	48.000	162.000	.301	.249	
	Wilks' Lambda	.406	1.145	48.000	155.455	.266	.259	
	Hotelling's Trace	1.108	1.170	48.000	152.000	.236	.270	
	Roy's Largest Root	.676	2.283(b)	16.000	54.000	.012	.403	
Education * culture	Pillai's Trace	2.193	1.208	144.000	540.000	.070	.244	
	Wilks' Lambda	.068	1.198	144.000	426.843	.086	.258	

		Hotelling's Trace	3.369	1.175	144.000	452.000	.109	.272
		Roy's Largest Root	.937	3.512(b)	16.000	60.000	.000	.484
Gender	*	Pillai's Trace	1.441	1.126	96.000	342.000	.223	.240
Education	*	Wilks' Lambda	.177	1.124	96.000	301.426	.231	.251
culture		Hotelling's Trace	2.143	1.124	96.000	302.000	.230	.263
		Roy's Largest Root	.929	3.310(b)	16.000	57.000	.000	.482

APPENDIX D

ONE SYMBOL GROUPS AND INTROVERSION/EXTRAVERSION

Pairwise Comparisons							
Dependent Variable	(I)	(J)	Mean	Std.	Sig.(a)	95%	Confidence
	E_I	E_I	Difference (I-J)	Error		Interval	for
						Lower	Upper
						Bound	Bound
CPP CURRENT	E	I	-.205(b,c)	.242	.401	-.690	.280
	I	E	.205(b,c)	.242	.401	-.280	.690
CPP POTENTIAL	E	I	-.232(b,c)	.266	.386	-.764	.300
	I	E	.232(b,c)	.266	.386	-.300	.764
PRAGMATIC	E	I	-.475(b,c)	.364	.198	-1.204	.255
	I	E	.475(b,c)	.364	.198	-.255	1.204
EXPLORATION	E	I	-.273(b,c)	.271	.317	-.815	.268
	I	E	.273(b,c)	.271	.317	-.268	.815
ANALYTICAL	E	I	-.759(b,c)	.569	.188	-1.899	.380
	I	E	.759(b,c)	.569	.188	-.380	1.899
RULE ORIENTATION	E	I	-.246(b,c)	.410	.551	-1.066	.575
	I	E	.246(b,c)	.410	.551	-.575	1.066
CATEGORISATION	E	I	.295(b,c)	.309	.344	-.324	.914
	I	E	-.295(b,c)	.309	.344	-.914	.324
INTEGRATION	E	I	-.676(b,c)	.338	.050	-1.352	.001
	I	E	.676(b,c)	.338	.050	-.001	1.352
COMPLEXITY	E	I	-.657(b,c)	.370	.081	-1.399	.084
	I	E	.657(b,c)	.370	.081	-.084	1.399
LOGICAL	E	I	-.551(b,c)	.449	.225	-1.451	.349
	I	E	.551(b,c)	.449	.225	-.349	1.451
VERBAL	E	I	-.575(b,c)	.408	.163	-1.391	.241
	I	E	.575(b,c)	.408	.163	-.241	1.391
USE OF MEMORY	E	I	-.589(b,c)	.388	.135	-1.366	.188
	I	E	.589(b,c)	.388	.135	-.188	1.366

MEMORY	E	I	-.111(b,c)	.388	.775	-.888	.666
STRATEGIES	I	E	.111(b,c)	.388	.775	-.666	.888
JUDGMENT	E	I	-.523(b,c)	.477	.277	-1.477	.431
	I	E	.523(b,c)	.477	.277	-.431	1.477
LEARNING 1	E	I	-.604(b,c)	.377	.115	-1.359	.151
	I	E	.604(b,c)	.377	.115	-.151	1.359
LEARNING 2	E	I	-.051(b,c)	.402	.899	-.857	.754
	I	E	.051(b,c)	.402	.899	-.754	.857

Based on estimated marginal means

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

APPENDIX E

ONE SYMBOL GROUPS AND INTUITION/SENSING

Pairwise Comparisons (N-S)							
Dependent Variable	(I)	(J)	Mean	Std.	Sig.(a)	95%	Confidence
	N_S	N_S	Difference	Error		Interval	for
			(I-J)			Difference(a)	
						Lower	Upper
						Bound	Bound
CPP CURRENT	N	S	-.181(b,c)	.212	.398	-.607	.245
	S	N	.181(b,c)	.212	.398	-.245	.607
CPP POTENTIAL	N	S	-.112(b,c)	.224	.618	-.563	.338
	S	N	.112(b,c)	.224	.618	-.338	.563
PRAGMATIC	N	S	.140(b,c)	.321	.665	-.505	.785
	S	N	-.140(b,c)	.321	.665	-.785	.505
EXPLORATION	N	S	.015(b,c)	.245	.951	-.477	.507
	S	N	-.015(b,c)	.245	.951	-.507	.477
ANALYTICAL	N	S	.461(b,c)	.507	.367	-.555	1.478
	S	N	-.461(b,c)	.507	.367	-1.478	.555
RULE ORIENTATION	N	S	-.079(b,c)	.324	.807	-.730	.571
	S	N	.079(b,c)	.324	.807	-.571	.730
CATEGORISATION	N	S	.255(b,c)	.248	.307	-.241	.752
	S	N	-.255(b,c)	.248	.307	-.752	.241
INTEGRATION	N	S	.143(b,c)	.266	.592	-.390	.676
	S	N	-.143(b,c)	.266	.592	-.676	.390
COMPLEXITY	N	S	.002(b,c)	.318	.995	-.636	.640
	S	N	-.002(b,c)	.318	.995	-.640	.636
LOGICAL	N	S	.062(b,c)	.371	.867	-.683	.807
	S	N	-.062(b,c)	.371	.867	-.807	.683
VERBAL	N	S	-.060(b,c)	.338	.861	-.739	.619
	S	N	.060(b,c)	.338	.861	-.619	.739
USE OF MEMORY	N	S	-.112(b,c)	.300	.711	-.713	.490
	S	N	.112(b,c)	.300	.711	-.490	.713

MEMORY	N	S	-.114(b,c)	.315	.718	-.746	.518
STRATEGIES	S	N	.114(b,c)	.315	.718	-.518	.746
JUDGMENT	N	S	-.138(b,c)	.392	.726	-.926	.649
	S	N	.138(b,c)	.392	.726	-.649	.926
LEARNING 1	N	S	-.124(b,c)	.308	.689	-.742	.494
	S	N	.124(b,c)	.308	.689	-.494	.742
LEARNING 2	N	S	.345(b,c)	.306	.264	-.268	.959
	S	N	-.345(b,c)	.306	.264	-.959	.268

Based on estimated marginal means

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

APPENDIX F

ONE SYMBOL GROUPS AND THINKING/FEELING

Pairwise Comparisons							
Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence	
	T_F	T_F				Interval for	
						Lower Bound	Upper Bound
CPP CURRENT	F	T	-.025(b,c)	.224	.912	-.472	.422
	T	F	.025(b,c)	.224	.912	-.422	.472
CPP POTENTIAL	F	T	-.066(b,c)	.245	.790	-.555	.424
	T	F	.066(b,c)	.245	.790	-.424	.555
PRAGMATIC	F	T	.284(b,c)	.363	.437	-.441	1.009
	T	F	-.284(b,c)	.363	.437	-1.009	.441
EXPLORATION	F	T	.190(b,c)	.275	.492	-.360	.740
	T	F	-.190(b,c)	.275	.492	-.740	.360
ANALYTICAL	F	T	-.040(b,c)	.557	.943	-1.155	1.074
	T	F	.040(b,c)	.557	.943	-1.074	1.155
RULE ORIENTATION	F	T	-.195(b,c)	.386	.616	-.968	.578
	T	F	.195(b,c)	.386	.616	-.578	.968
CATEGORISATION	F	T	-.172(b,c)	.310	.581	-.792	.448
	T	F	.172(b,c)	.310	.581	-.448	.792
INTEGRATION	F	T	-.046(b,c)	.315	.885	-.677	.585
	T	F	.046(b,c)	.315	.885	-.585	.677
COMPLEXITY	F	T	.214(b,c)	.360	.554	-.506	.933
	T	F	-.214(b,c)	.360	.554	-.933	.506
LOGICAL	F	T	-.299(b,c)	.394	.450	-1.087	.488
	T	F	.299(b,c)	.394	.450	-.488	1.087
VERBAL	F	T	-.176(b,c)	.413	.671	-1.002	.650
	T	F	.176(b,c)	.413	.671	-.650	1.002
USE OF MEMORY	F	T	.088(b,c)	.357	.805	-.625	.802
	T	F	-.088(b,c)	.357	.805	-.802	.625

MEMORY	F	T	-.137(b,c)	.386	.723	-.909	.634
STRATEGIES	T	F	.137(b,c)	.386	.723	-.634	.909
JUDGMENT	F	T	.493(b,c)	.432	.259	-.372	1.358
	T	F	-.493(b,c)	.432	.259	-1.358	.372
LEARNING 1	F	T	-.111(b,c)	.353	.753	-.818	.595
	T	F	.111(b,c)	.353	.753	-.595	.818
LEARNING 2	F	T	.368(b,c)	.379	.336	-.391	1.126
	T	F	-.368(b,c)	.379	.336	-1.126	.391

Based on estimated marginal means

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

APPENDIX G

ONE SYMBOL GROUPS AND JUDGING/PERCEIVING

Pairwise Comparisons							
Dependent Variable	(I)	(J)	Mean	Std.	Sig.(a)	95% Interval Difference(a)	Confidence for
	J_P	J_P	Difference (I- J)	Error			
						Lower Bound	Upper Bound
CPP CURRENT	J	P	-.479(*,b,c)	.219	.033	-.919	-.040
	P	J	.479(*,b,c)	.219	.033	.040	.919
CPP POTENTIAL	J	P	-.410(b,c)	.233	.084	-.877	.057
	P	J	.410(b,c)	.233	.084	-.057	.877
PRAGMATIC	J	P	-.222(b,c)	.346	.523	-.915	.471
	P	J	.222(b,c)	.346	.523	-.471	.915
EXPLORATION	J	P	-.350(b,c)	.263	.189	-.876	.177
	P	J	.350(b,c)	.263	.189	-.177	.876
ANALYTICAL	J	P	-1.130(*,b,c)	.502	.028	-2.136	-.125
	P	J	1.130(*,b,c)	.502	.028	.125	2.136
RULE ORIENTATION	J	P	-.451(b,c)	.368	.226	-1.187	.286
	P	J	.451(b,c)	.368	.226	-.286	1.187
CATEGORISATION	J	P	-.414(b,c)	.287	.155	-.990	.162
	P	J	.414(b,c)	.287	.155	-.162	.990
INTEGRATION	J	P	-.845(*,b,c)	.275	.003	-1.396	-.293
	P	J	.845(*,b,c)	.275	.003	.293	1.396
COMPLEXITY	J	P	-.765(*,b,c)	.334	.026	-1.435	-.095
	P	J	.765(*,b,c)	.334	.026	.095	1.435
LOGICAL	J	P	-.788(b,c)	.399	.053	-1.587	.011
	P	J	.788(b,c)	.399	.053	-.011	1.587
VERBAL	J	P	-.310(b,c)	.371	.407	-1.054	.434
	P	J	.310(b,c)	.371	.407	-.434	1.054
USE OF MEMORY	J	P	-.615(b,c)	.337	.074	-1.290	.061
	P	J	.615(b,c)	.337	.074	-.061	1.290

MEMORY	J	P	-.433(b,c)	.333	.199	-1.101	.235
STRATEGIES	P	J	.433(b,c)	.333	.199	-.235	1.101
JUDGMENT	J	P	-.922(*,b,c)	.403	.026	-1.729	-.115
	P	J	.922(*,b,c)	.403	.026	.115	1.729
LEARNING 1	J	P	-.645(b,c)	.333	.058	-1.312	.022
	P	J	.645(b,c)	.333	.058	-.022	1.312
LEARNING 2	J	P	-.240(b,c)	.355	.502	-.952	.472
	P	J	.240(b,c)	.355	.502	-.472	.952

Based on estimated marginal means

* The mean difference is significant at the .05 level.

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

APPENDIX H

TWO SYMBOL GROUPS ON CPP FACTORS

Pairwise Comparisons							
Dependent Variable	(I) Two symbols without I and E	(J) Two symbols without I and E	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
						Lower Bound	Upper Bound
CPP CURRENT	NP	NT	.317(b,c)	0.359	1	-0.83	1.464
		SJ	.119(b,c)	0.262	1	-0.718	0.957
		ST	.735(b,c)	0.344	0.616	-0.364	1.834
		TJ	.349(b,c)	0.244	1	-0.431	1.13
		TP	.338(b,c)	0.336	1	-0.736	1.412
	NT	NP	-.317(b,c)	.359	1.000	-1.464	.830
		SJ	-.198(b,c)	.346	1.000	-1.306	.909
		ST	.417(b,c)	.403	1.000	-.872	1.707
		TJ	.032(b,c)	.345	1.000	-1.072	1.135
		TP	.020(b,c)	.413	1.000	-1.301	1.341
	SJ	NP	-.119(b,c)	.262	1.000	-.957	.718
		NT	.198(b,c)	.346	1.000	-.909	1.306
		ST	.616(b,c)	.331	1.000	-.444	1.675
		TJ	.230(b,c)	.239	1.000	-.535	.995
		TP	.219(b,c)	.331	1.000	-.841	1.278
	ST	NP	-.735(b,c)	.344	.616	-1.834	.364
		NT	-.417(b,c)	.403	1.000	-1.707	.872
		SJ	-.616(b,c)	.331	1.000	-1.675	.444
		TJ	-.386(b,c)	.329	1.000	-1.438	.666
		TP	-.397(b,c)	.400	1.000	-1.676	.882
	TJ	NP	-.349(b,c)	.244	1.000	-1.130	.431
		NT	-.032(b,c)	.345	1.000	-1.135	1.072
		SJ	-.230(b,c)	.239	1.000	-.995	.535
		ST	.386(b,c)	.329	1.000	-.666	1.438
		TP	-.011(b,c)	.316	1.000	-1.023	1.000
	TP	NP	-.338(b,c)	.336	1.000	-1.412	.736
		NT	-.020(b,c)	.413	1.000	-1.341	1.301
		SJ	-.219(b,c)	.331	1.000	-1.278	.841
ST		.397(b,c)	.400	1.000	-.882	1.676	
TJ		.011(b,c)	.316	1.000	-1.000	1.023	
CPP POTENTIAL	NP	NT	.324(b,c)	.440	1.000	-1.082	1.730
		SJ	.048(b,c)	.321	1.000	-.978	1.074
		ST	.956(b,c)	.421	.462	-.391	2.303
		TJ	.336(b,c)	.299	1.000	-.621	1.292
		TP	.255(b,c)	.412	1.000	-1.061	1.571
	NT	NP	-.324(b,c)	.440	1.000	-1.730	1.082
		SJ	-.276(b,c)	.424	1.000	-1.633	1.081

	ST	.632(b,c)	.494	1.000	-.948	2.212
	TJ	.012(b,c)	.423	1.000	-1.340	1.364
	TP	-.069(b,c)	.506	1.000	-1.688	1.550
	NP	-.048(b,c)	.321	1.000	-1.074	.978
	NT	.276(b,c)	.424	1.000	-1.081	1.633
SJ	ST	.908(b,c)	.406	.497	-.390	2.206
	TJ	.288(b,c)	.293	1.000	-.650	1.225
	TP	.207(b,c)	.406	1.000	-1.092	1.505
	NP	-.956(b,c)	.421	.462	-2.303	.391
	NT	-.632(b,c)	.494	1.000	-2.212	.948
ST	SJ	-.908(b,c)	.406	.497	-2.206	.390
	TJ	-.620(b,c)	.403	1.000	-1.910	.669
	TP	-.701(b,c)	.490	1.000	-2.269	.866
	NP	-.336(b,c)	.299	1.000	-1.292	.621
	NT	-.012(b,c)	.423	1.000	-1.364	1.340
TJ	SJ	-.288(b,c)	.293	1.000	-1.225	.650
	ST	.620(b,c)	.403	1.000	-.669	1.910
	TP	-.081(b,c)	.388	1.000	-1.321	1.159
	NP	-.255(b,c)	.412	1.000	-1.571	1.061
	NT	.069(b,c)	.506	1.000	-1.550	1.688
TP	SJ	-.207(b,c)	.406	1.000	-1.505	1.092
	ST	.701(b,c)	.490	1.000	-.866	2.269
	TJ	.081(b,c)	.388	1.000	-1.159	1.321
PRAGMATIC	NT	-.105(b,c)	.572	1.000	-1.935	1.725
	SJ	-.013(b,c)	.418	1.000	-1.349	1.323
NP	ST	.607(b,c)	.548	1.000	-1.146	2.360
	TJ	.131(b,c)	.389	1.000	-1.114	1.377
	TP	-.469(b,c)	.536	1.000	-2.182	1.245
	NP	.105(b,c)	.572	1.000	-1.725	1.935
	SJ	.092(b,c)	.552	1.000	-1.674	1.859
NT	ST	.712(b,c)	.643	1.000	-1.344	2.768
	TJ	.237(b,c)	.550	1.000	-1.524	1.997
	TP	-.364(b,c)	.659	1.000	-2.471	1.743
	NP	.013(b,c)	.418	1.000	-1.323	1.349
	NT	-.092(b,c)	.552	1.000	-1.859	1.674
SJ	ST	.620(b,c)	.528	1.000	-1.070	2.310
	TJ	.144(b,c)	.382	1.000	-1.076	1.365
	TP	-.456(b,c)	.529	1.000	-2.146	1.234
	NP	-.607(b,c)	.548	1.000	-2.360	1.146
	NT	-.712(b,c)	.643	1.000	-2.768	1.344
ST	SJ	-.620(b,c)	.528	1.000	-2.310	1.070
	TJ	-.476(b,c)	.525	1.000	-2.154	1.203
	TP	-1.076(b,c)	.638	1.000	-3.116	.964
TJ	NP	-.131(b,c)	.389	1.000	-1.377	1.114
	NT	-.237(b,c)	.550	1.000	-1.997	1.524
	SJ	-.144(b,c)	.382	1.000	-1.365	1.076
	ST	.476(b,c)	.525	1.000	-1.203	2.154

EXPLORATION	TP	TP	-.600(b,c)	.505	1.000	-2.214	1.013
		NP	.469(b,c)	.536	1.000	-1.245	2.182
		NT	.364(b,c)	.659	1.000	-1.743	2.471
		SJ	.456(b,c)	.529	1.000	-1.234	2.146
		ST	1.076(b,c)	.638	1.000	-.964	3.116
		TJ	.600(b,c)	.505	1.000	-1.013	2.214
	NP	NT	.065(b,c)	.463	1.000	-1.417	1.547
		SJ	-.011(b,c)	.338	1.000	-1.093	1.071
		ST	.463(b,c)	.444	1.000	-.956	1.883
		TJ	.326(b,c)	.315	1.000	-.683	1.334
		TP	-.030(b,c)	.434	1.000	-1.418	1.357
	NT	NP	-.065(b,c)	.463	1.000	-1.547	1.417
		SJ	-.076(b,c)	.447	1.000	-1.507	1.354
		ST	.398(b,c)	.521	1.000	-1.267	2.063
		TJ	.260(b,c)	.446	1.000	-1.165	1.686
		TP	-.095(b,c)	.534	1.000	-1.802	1.611
	SJ	NP	.011(b,c)	.338	1.000	-1.071	1.093
		NT	.076(b,c)	.447	1.000	-1.354	1.507
		ST	.474(b,c)	.428	1.000	-.894	1.843
		TJ	.337(b,c)	.309	1.000	-.652	1.325
TP		-.019(b,c)	.428	1.000	-1.388	1.349	
ST	NP	-.463(b,c)	.444	1.000	-1.883	.956	
	NT	-.398(b,c)	.521	1.000	-2.063	1.267	
	SJ	-.474(b,c)	.428	1.000	-1.843	.894	
	TJ	-.138(b,c)	.425	1.000	-1.497	1.221	
	TP	-.494(b,c)	.517	1.000	-2.146	1.158	
TJ	NP	-.326(b,c)	.315	1.000	-1.334	.683	
	NT	-.260(b,c)	.446	1.000	-1.686	1.165	
	SJ	-.337(b,c)	.309	1.000	-1.325	.652	
	ST	.138(b,c)	.425	1.000	-1.221	1.497	
	TP	-.356(b,c)	.409	1.000	-1.663	.951	
TP	NP	.030(b,c)	.434	1.000	-1.357	1.418	
	NT	.095(b,c)	.534	1.000	-1.611	1.802	
	SJ	.019(b,c)	.428	1.000	-1.349	1.388	
	ST	.494(b,c)	.517	1.000	-1.158	2.146	
	TJ	.356(b,c)	.409	1.000	-.951	1.663	
ANALYTICAL	NP	NT	.197(b,c)	.922	1.000	-2.750	3.145
		SJ	.603(b,c)	.673	1.000	-1.549	2.754
		ST	1.564(b,c)	.883	1.000	-1.260	4.387
		TJ	.626(b,c)	.627	1.000	-1.380	2.632
		TP	-.433(b,c)	.863	1.000	-3.193	2.327
	NT	NP	-.197(b,c)	.922	1.000	-3.145	2.750
		SJ	.405(b,c)	.890	1.000	-2.440	3.251
		ST	1.366(b,c)	1.036	1.000	-1.946	4.679
		TJ	.429(b,c)	.887	1.000	-2.407	3.264
		TP	-.630(b,c)	1.061	1.000	-4.025	2.764

		NP	-.603(b,c)	.673	1.000	-2.754	1.549
		NT	-.405(b,c)	.890	1.000	-3.251	2.440
	SJ	ST	.961(b,c)	.851	1.000	-1.761	3.683
		TJ	.023(b,c)	.615	1.000	-1.942	1.989
		TP	-1.035(b,c)	.851	1.000	-3.758	1.688
		NP	-1.564(b,c)	.883	1.000	-4.387	1.260
		NT	-1.366(b,c)	1.036	1.000	-4.679	1.946
	ST	SJ	-.961(b,c)	.851	1.000	-3.683	1.761
		TJ	-.938(b,c)	.845	1.000	-3.641	1.766
		TP	-1.996(b,c)	1.028	.927	-5.283	1.290
		NP	-.626(b,c)	.627	1.000	-2.632	1.380
		NT	-.429(b,c)	.887	1.000	-3.264	2.407
	TJ	SJ	-.023(b,c)	.615	1.000	-1.989	1.942
		ST	.938(b,c)	.845	1.000	-1.766	3.641
		TP	-1.059(b,c)	.813	1.000	-3.658	1.541
		NP	.433(b,c)	.863	1.000	-2.327	3.193
		NT	.630(b,c)	1.061	1.000	-2.764	4.025
	TP	SJ	1.035(b,c)	.851	1.000	-1.688	3.758
		ST	1.996(b,c)	1.028	.927	-1.290	5.283
		TJ	1.059(b,c)	.813	1.000	-1.541	3.658
RULE		NT	.422(b,c)	.674	1.000	-1.735	2.579
ORIENTATION		SJ	-.089(b,c)	.492	1.000	-1.664	1.485
	NP	ST	.532(b,c)	.646	1.000	-1.535	2.598
		TJ	.491(b,c)	.459	1.000	-.977	1.959
		TP	.243(b,c)	.632	1.000	-1.777	2.263
		NP	-.422(b,c)	.674	1.000	-2.579	1.735
		SJ	-.512(b,c)	.651	1.000	-2.594	1.571
	NT	ST	.110(b,c)	.758	1.000	-2.315	2.534
		TJ	.069(b,c)	.649	1.000	-2.006	2.144
		TP	-.179(b,c)	.777	1.000	-2.663	2.305
		NP	.089(b,c)	.492	1.000	-1.485	1.664
		NT	.512(b,c)	.651	1.000	-1.571	2.594
	SJ	ST	.621(b,c)	.623	1.000	-1.371	2.613
		TJ	.580(b,c)	.450	1.000	-.858	2.019
		TP	.332(b,c)	.623	1.000	-1.660	2.325
		NP	-.532(b,c)	.646	1.000	-2.598	1.535
		NT	-.110(b,c)	.758	1.000	-2.534	2.315
	ST	SJ	-.621(b,c)	.623	1.000	-2.613	1.371
		TJ	-.041(b,c)	.619	1.000	-2.019	1.938
		TP	-.289(b,c)	.752	1.000	-2.694	2.116
		NP	-.491(b,c)	.459	1.000	-1.959	.977
		NT	-.069(b,c)	.649	1.000	-2.144	2.006
	TJ	SJ	-.580(b,c)	.450	1.000	-2.019	.858
		ST	.041(b,c)	.619	1.000	-1.938	2.019
		TP	-.248(b,c)	.595	1.000	-2.150	1.654
	TP	NP	-.243(b,c)	.632	1.000	-2.263	1.777
		NT	.179(b,c)	.777	1.000	-2.305	2.663

	SJ	-.332(b,c)	.623	1.000	-2.325	1.660
	ST	.289(b,c)	.752	1.000	-2.116	2.694
	TJ	.248(b,c)	.595	1.000	-1.654	2.150
	NT	.760(b,c)	.534	1.000	-.946	2.466
	SJ	.399(b,c)	.389	1.000	-.846	1.645
	ST	.961(b,c)	.511	1.000	-.674	2.595
	TJ	.769(b,c)	.363	.641	-.392	1.930
	TP	.631(b,c)	.500	1.000	-.966	2.229
	NP	-.760(b,c)	.534	1.000	-2.466	.946
	SJ	-.361(b,c)	.515	1.000	-2.008	1.286
	ST	.201(b,c)	.600	1.000	-1.717	2.118
	TJ	.009(b,c)	.513	1.000	-1.632	1.651
	TP	-.129(b,c)	.614	1.000	-2.094	1.836
	NP	-.399(b,c)	.389	1.000	-1.645	.846
	NT	.361(b,c)	.515	1.000	-1.286	2.008
	ST	.561(b,c)	.493	1.000	-1.014	2.137
	TJ	.370(b,c)	.356	1.000	-.768	1.508
	TP	.232(b,c)	.493	1.000	-1.344	1.808
	NP	-.961(b,c)	.511	1.000	-2.595	.674
	NT	-.201(b,c)	.600	1.000	-2.118	1.717
	SJ	-.561(b,c)	.493	1.000	-2.137	1.014
	TJ	-.191(b,c)	.489	1.000	-1.756	1.374
	TP	-.329(b,c)	.595	1.000	-2.231	1.573
	NP	-.769(b,c)	.363	.641	-1.930	.392
	NT	-.009(b,c)	.513	1.000	-1.651	1.632
	SJ	-.370(b,c)	.356	1.000	-1.508	.768
	ST	.191(b,c)	.489	1.000	-1.374	1.756
	TP	-.138(b,c)	.470	1.000	-1.643	1.367
	NP	-.631(b,c)	.500	1.000	-2.229	.966
	NT	.129(b,c)	.614	1.000	-1.836	2.094
	SJ	-.232(b,c)	.493	1.000	-1.808	1.344
	ST	.329(b,c)	.595	1.000	-1.573	2.231
	TJ	.138(b,c)	.470	1.000	-1.367	1.643
	NT	.867(b,c)	.456	1.000	-.592	2.326
	SJ	.501(b,c)	.333	1.000	-.564	1.566
	ST	1.220(b,c)	.437	.138	-.178	2.618
	TJ	.899(b,c)	.310	.107	-.094	1.892
	TP	.706(b,c)	.427	1.000	-.660	2.072
	NP	-.867(b,c)	.456	1.000	-2.326	.592
	SJ	-.366(b,c)	.440	1.000	-1.774	1.042
	ST	.354(b,c)	.513	1.000	-1.286	1.993
	TJ	.032(b,c)	.439	1.000	-1.371	1.436
	TP	-.160(b,c)	.525	1.000	-1.840	1.520
	NP	-.501(b,c)	.333	1.000	-1.566	.564
	NT	.366(b,c)	.440	1.000	-1.042	1.774
	ST	.719(b,c)	.421	1.000	-.628	2.067
	TJ	.398(b,c)	.304	1.000	-.575	1.371

		TP	.206(b,c)	.421	1.000	-1.142	1.553
		NP	-1.220(b,c)	.437	.138	-2.618	.178
		NT	-.354(b,c)	.513	1.000	-1.993	1.286
	ST	SJ	-.719(b,c)	.421	1.000	-2.067	.628
		TJ	-.321(b,c)	.418	1.000	-1.659	1.017
		TP	-.514(b,c)	.509	1.000	-2.140	1.113
		NP	-.899(b,c)	.310	.107	-1.892	.094
		NT	-.032(b,c)	.439	1.000	-1.436	1.371
	TJ	SJ	-.398(b,c)	.304	1.000	-1.371	.575
		ST	.321(b,c)	.418	1.000	-1.017	1.659
		TP	-.193(b,c)	.402	1.000	-1.479	1.094
		NP	-.706(b,c)	.427	1.000	-2.072	.660
		NT	.160(b,c)	.525	1.000	-1.520	1.840
	TP	SJ	-.206(b,c)	.421	1.000	-1.553	1.142
		ST	.514(b,c)	.509	1.000	-1.113	2.140
		TJ	.193(b,c)	.402	1.000	-1.094	1.479
		NT	.465(b,c)	.590	1.000	-1.421	2.350
		SJ	.291(b,c)	.430	1.000	-1.085	1.668
	NP	ST	1.160(b,c)	.565	.737	-.646	2.966
		TJ	.694(b,c)	.401	1.000	-.589	1.978
		TP	.465(b,c)	.552	1.000	-1.300	2.231
		NP	-.465(b,c)	.590	1.000	-2.350	1.421
		SJ	-.174(b,c)	.569	1.000	-1.994	1.647
		ST	.695(b,c)	.663	1.000	-1.424	2.814
	NT	TJ	.230(b,c)	.567	1.000	-1.584	2.044
		TP	.001(b,c)	.679	1.000	-2.171	2.172
		NP	-.291(b,c)	.430	1.000	-1.668	1.085
		NT	.174(b,c)	.569	1.000	-1.647	1.994
	SJ	ST	.869(b,c)	.545	1.000	-.873	2.610
		TJ	.403(b,c)	.393	1.000	-.854	1.661
		TP	.174(b,c)	.545	1.000	-1.568	1.916
		NP	-1.160(b,c)	.565	.737	-2.966	.646
		NT	-.695(b,c)	.663	1.000	-2.814	1.424
	ST	SJ	-.869(b,c)	.545	1.000	-2.610	.873
		TJ	-.466(b,c)	.541	1.000	-2.195	1.264
		TP	-.694(b,c)	.657	1.000	-2.797	1.408
		NP	-.694(b,c)	.401	1.000	-1.978	.589
		NT	-.230(b,c)	.567	1.000	-2.044	1.584
	TJ	SJ	-.403(b,c)	.393	1.000	-1.661	.854
		ST	.466(b,c)	.541	1.000	-1.264	2.195
		TP	-.229(b,c)	.520	1.000	-1.892	1.434
		NP	-.465(b,c)	.552	1.000	-2.231	1.300
		NT	-.001(b,c)	.679	1.000	-2.172	2.171
	TP	SJ	-.174(b,c)	.545	1.000	-1.916	1.568
		ST	.694(b,c)	.657	1.000	-1.408	2.797
		TJ	.229(b,c)	.520	1.000	-1.434	1.892
LOGICAL	NP	NT	.438(b,c)	.593	1.000	-1.459	2.336

	SJ	.320(b,c)	.433	1.000	-1.065	1.705
	ST	1.399(b,c)	.568	.300	-.418	3.217
	TJ	.345(b,c)	.404	1.000	-.946	1.636
	TP	.410(b,c)	.556	1.000	-1.367	2.187
	NP	-.438(b,c)	.593	1.000	-2.336	1.459
	SJ	-.118(b,c)	.573	1.000	-1.950	1.714
	ST	.961(b,c)	.667	1.000	-1.171	3.094
	TJ	-.093(b,c)	.571	1.000	-1.919	1.732
	TP	-.028(b,c)	.683	1.000	-2.214	2.157
	NP	-.320(b,c)	.433	1.000	-1.705	1.065
	NT	.118(b,c)	.573	1.000	-1.714	1.950
	ST	1.079(b,c)	.548	.877	-.673	2.832
	TJ	.025(b,c)	.396	1.000	-1.241	1.290
	TP	.090(b,c)	.548	1.000	-1.663	1.843
	NP	-1.399(b,c)	.568	.300	-3.217	.418
	NT	-.961(b,c)	.667	1.000	-3.094	1.171
	SJ	-1.079(b,c)	.548	.877	-2.832	.673
	TJ	-1.054(b,c)	.544	.936	-2.795	.686
	TP	-.989(b,c)	.661	1.000	-3.105	1.126
	NP	-.345(b,c)	.404	1.000	-1.636	.946
	NT	.093(b,c)	.571	1.000	-1.732	1.919
	SJ	-.025(b,c)	.396	1.000	-1.290	1.241
	ST	1.054(b,c)	.544	.936	-.686	2.795
	TP	.065(b,c)	.523	1.000	-1.608	1.738
	NP	-.410(b,c)	.556	1.000	-2.187	1.367
	NT	.028(b,c)	.683	1.000	-2.157	2.214
	SJ	-.090(b,c)	.548	1.000	-1.843	1.663
	ST	.989(b,c)	.661	1.000	-1.126	3.105
	TJ	-.065(b,c)	.523	1.000	-1.738	1.608
VERBAL	NT	1.179(b,c)	.513	.433	-.461	2.818
	SJ	.132(b,c)	.374	1.000	-1.065	1.329
	ST	1.475(b,c)	.491	.082	-.096	3.045
	TJ	.413(b,c)	.349	1.000	-.703	1.529
	TP	1.022(b,c)	.480	.629	-.514	2.557
	NP	-1.179(b,c)	.513	.433	-2.818	.461
	SJ	-1.047(b,c)	.495	.647	-2.630	.536
	ST	.296(b,c)	.576	1.000	-1.547	2.139
	TJ	-.766(b,c)	.493	1.000	-2.343	.812
	TP	-.157(b,c)	.590	1.000	-2.045	1.731
	NP	-.132(b,c)	.374	1.000	-1.329	1.065
	NT	1.047(b,c)	.495	.647	-.536	2.630
	ST	1.343(b,c)	.473	.124	-.171	2.857
	TJ	.281(b,c)	.342	1.000	-.812	1.375
	TP	.890(b,c)	.474	1.000	-.625	2.405
	NP	-1.475(b,c)	.491	.082	-3.045	.096
	NT	-.296(b,c)	.576	1.000	-2.139	1.547
	SJ	-1.343(b,c)	.473	.124	-2.857	.171

		TJ	-1.062(b,c)	.470	.475	-2.565	.442
		TP	-.453(b,c)	.572	1.000	-2.281	1.375
		NP	-.413(b,c)	.349	1.000	-1.529	.703
		NT	.766(b,c)	.493	1.000	-.812	2.343
	TJ	SJ	-.281(b,c)	.342	1.000	-1.375	.812
		ST	1.062(b,c)	.470	.475	-.442	2.565
		TP	.609(b,c)	.452	1.000	-.837	2.055
		NP	-1.022(b,c)	.480	.629	-2.557	.514
		NT	.157(b,c)	.590	1.000	-1.731	2.045
	TP	SJ	-.890(b,c)	.474	1.000	-2.405	.625
		ST	.453(b,c)	.572	1.000	-1.375	2.281
		TJ	-.609(b,c)	.452	1.000	-2.055	.837
		NT	.437(b,c)	.600	1.000	-1.480	2.355
		SJ	-.129(b,c)	.438	1.000	-1.529	1.270
	NP	ST	1.110(b,c)	.574	.948	-.727	2.946
		TJ	.728(b,c)	.408	1.000	-.576	2.033
		TP	.473(b,c)	.561	1.000	-1.322	2.269
		NP	-.437(b,c)	.600	1.000	-2.355	1.480
		SJ	-.567(b,c)	.579	1.000	-2.418	1.284
	NT	ST	.672(b,c)	.674	1.000	-1.483	2.827
		TJ	.291(b,c)	.577	1.000	-1.553	2.136
		TP	.036(b,c)	.690	1.000	-2.172	2.244
		NP	.129(b,c)	.438	1.000	-1.270	1.529
		NT	.567(b,c)	.579	1.000	-1.284	2.418
	SJ	ST	1.239(b,c)	.554	.496	-.532	3.010
		TJ	.858(b,c)	.400	.606	-.421	2.137
		TP	.603(b,c)	.554	1.000	-1.169	2.374
		NP	-1.110(b,c)	.574	.948	-2.946	.727
		NT	-.672(b,c)	.674	1.000	-2.827	1.483
	ST	SJ	-1.239(b,c)	.554	.496	-3.010	.532
		TJ	-.381(b,c)	.550	1.000	-2.140	1.377
		TP	-.636(b,c)	.668	1.000	-2.774	1.501
		NP	-.728(b,c)	.408	1.000	-2.033	.576
		NT	-.291(b,c)	.577	1.000	-2.136	1.553
	TJ	SJ	-.858(b,c)	.400	.606	-2.137	.421
		ST	.381(b,c)	.550	1.000	-1.377	2.140
		TP	-.255(b,c)	.529	1.000	-1.946	1.436
		NP	-.473(b,c)	.561	1.000	-2.269	1.322
		NT	-.036(b,c)	.690	1.000	-2.244	2.172
	TP	SJ	-.603(b,c)	.554	1.000	-2.374	1.169
		ST	.636(b,c)	.668	1.000	-1.501	2.774
		TJ	.255(b,c)	.529	1.000	-1.436	1.946
		NT	.652(b,c)	.580	1.000	-1.203	2.507
		SJ	.068(b,c)	.423	1.000	-1.286	1.422
	NP	ST	.502(b,c)	.556	1.000	-1.275	2.279
		TJ	.521(b,c)	.395	1.000	-.741	1.783
		TP	.192(b,c)	.543	1.000	-1.545	1.929

USE OF MEMORY

MEMORY STRATEGIES

JUDGMENT	NT	NP	-.652(b,c)	.580	1.000	-2.507	1.203
		SJ	-.584(b,c)	.560	1.000	-2.374	1.207
		ST	-.150(b,c)	.652	1.000	-2.235	1.934
		TJ	-.131(b,c)	.558	1.000	-1.915	1.654
		TP	-.460(b,c)	.668	1.000	-2.596	1.676
	SJ	NP	-.068(b,c)	.423	1.000	-1.422	1.286
		NT	.584(b,c)	.560	1.000	-1.207	2.374
		ST	.434(b,c)	.536	1.000	-1.279	2.147
		TJ	.453(b,c)	.387	1.000	-.784	1.690
		TP	.124(b,c)	.536	1.000	-1.590	1.838
	ST	NP	-.502(b,c)	.556	1.000	-2.279	1.275
		NT	.150(b,c)	.652	1.000	-1.934	2.235
		SJ	-.434(b,c)	.536	1.000	-2.147	1.279
		TJ	.019(b,c)	.532	1.000	-1.682	1.721
		TP	-.310(b,c)	.647	1.000	-2.378	1.758
	TJ	NP	-.521(b,c)	.395	1.000	-1.783	.741
		NT	.131(b,c)	.558	1.000	-1.654	1.915
		SJ	-.453(b,c)	.387	1.000	-1.690	.784
		ST	-.019(b,c)	.532	1.000	-1.721	1.682
		TP	-.329(b,c)	.511	1.000	-1.965	1.307
TP	NP	-.192(b,c)	.543	1.000	-1.929	1.545	
	NT	.460(b,c)	.668	1.000	-1.676	2.596	
	SJ	-.124(b,c)	.536	1.000	-1.838	1.590	
	ST	.310(b,c)	.647	1.000	-1.758	2.378	
	TJ	.329(b,c)	.511	1.000	-1.307	1.965	
NP	NT	.600(b,c)	.774	1.000	-1.876	3.077	
	SJ	.344(b,c)	.565	1.000	-1.463	2.152	
	ST	.861(b,c)	.742	1.000	-1.511	3.233	
	TJ	.862(b,c)	.527	1.000	-.823	2.547	
	TP	.016(b,c)	.725	1.000	-2.303	2.335	
NT	NP	-.600(b,c)	.774	1.000	-3.077	1.876	
	SJ	-.256(b,c)	.747	1.000	-2.646	2.135	
	ST	.261(b,c)	.870	1.000	-2.522	3.044	
	TJ	.261(b,c)	.745	1.000	-2.121	2.643	
	TP	-.584(b,c)	.892	1.000	-3.436	2.267	
SJ	NP	-.344(b,c)	.565	1.000	-2.152	1.463	
	NT	.256(b,c)	.747	1.000	-2.135	2.646	
	ST	.517(b,c)	.715	1.000	-1.770	2.804	
	TJ	.517(b,c)	.516	1.000	-1.134	2.169	
	TP	-.329(b,c)	.715	1.000	-2.616	1.959	
ST	NP	-.861(b,c)	.742	1.000	-3.233	1.511	
	NT	-.261(b,c)	.870	1.000	-3.044	2.522	
	SJ	-.517(b,c)	.715	1.000	-2.804	1.770	
	TJ	.001(b,c)	.710	1.000	-2.270	2.272	
	TP	-.845(b,c)	.863	1.000	-3.606	1.915	
TJ	NP	-.862(b,c)	.527	1.000	-2.547	.823	
	NT	-.261(b,c)	.745	1.000	-2.643	2.121	

	SJ	-.517(b,c)	.516	1.000	-2.169	1.134
	ST	-.001(b,c)	.710	1.000	-2.272	2.270
	TP	-.846(b,c)	.683	1.000	-3.030	1.338
	NP	-.016(b,c)	.725	1.000	-2.335	2.303
	NT	.584(b,c)	.892	1.000	-2.267	3.436
TP	SJ	.329(b,c)	.715	1.000	-1.959	2.616
	ST	.845(b,c)	.863	1.000	-1.915	3.606
	TJ	.846(b,c)	.683	1.000	-1.338	3.030
	NT	.481(b,c)	.602	1.000	-1.443	2.405
	SJ	-.051(b,c)	.439	1.000	-1.455	1.354
NP	ST	.967(b,c)	.576	1.000	-.876	2.810
	TJ	.592(b,c)	.409	1.000	-.718	1.901
	TP	.144(b,c)	.563	1.000	-1.657	1.946
	NP	-.481(b,c)	.602	1.000	-2.405	1.443
	SJ	-.532(b,c)	.581	1.000	-2.389	1.326
NT	ST	.486(b,c)	.676	1.000	-1.677	2.648
	TJ	.111(b,c)	.579	1.000	-1.740	1.962
	TP	-.337(b,c)	.693	1.000	-2.552	1.879
	NP	.051(b,c)	.439	1.000	-1.354	1.455
	NT	.532(b,c)	.581	1.000	-1.326	2.389
SJ	ST	1.018(b,c)	.556	1.000	-.759	2.795
	TJ	.642(b,c)	.401	1.000	-.641	1.925
	TP	.195(b,c)	.556	1.000	-1.582	1.973
	NP	-.967(b,c)	.576	1.000	-2.810	.876
	NT	-.486(b,c)	.676	1.000	-2.648	1.677
ST	SJ	-1.018(b,c)	.556	1.000	-2.795	.759
	TJ	-.375(b,c)	.552	1.000	-2.140	1.389
	TP	-.822(b,c)	.671	1.000	-2.968	1.323
	NP	-.592(b,c)	.409	1.000	-1.901	.718
	NT	-.111(b,c)	.579	1.000	-1.962	1.740
TJ	SJ	-.642(b,c)	.401	1.000	-1.925	.641
	ST	.375(b,c)	.552	1.000	-1.389	2.140
	TP	-.447(b,c)	.531	1.000	-2.144	1.250
	NP	-.144(b,c)	.563	1.000	-1.946	1.657
	NT	.337(b,c)	.693	1.000	-1.879	2.552
	SJ	-.195(b,c)	.556	1.000	-1.973	1.582
	ST	.822(b,c)	.671	1.000	-1.323	2.968
	TJ	.447(b,c)	.531	1.000	-1.250	2.144
LEARNING 2	NT	-.091(b,c)	.665	1.000	-2.217	2.035
	SJ	.072(b,c)	.485	1.000	-1.480	1.624
NP	ST	1.436(b,c)	.637	.477	-.600	3.473
	TJ	.504(b,c)	.452	1.000	-.943	1.950
	TP	.344(b,c)	.622	1.000	-1.646	2.335
NT	NP	.091(b,c)	.665	1.000	-2.035	2.217
	SJ	.163(b,c)	.642	1.000	-1.889	2.215
	ST	1.527(b,c)	.747	.751	-.862	3.917
	TJ	.595(b,c)	.639	1.000	-1.450	2.640

SJ	TP	.435(b,c)	.765	1.000	-2.013	2.884
	NP	-.072(b,c)	.485	1.000	-1.624	1.480
	NT	-.163(b,c)	.642	1.000	-2.215	1.889
	ST	1.364(b,c)	.614	.513	-.599	3.328
	TJ	.432(b,c)	.443	1.000	-.986	1.850
ST	TP	.272(b,c)	.614	1.000	-1.692	2.236
	NP	-1.436(b,c)	.637	.477	-3.473	.600
	NT	-1.527(b,c)	.747	.751	-3.917	.862
	SJ	-1.364(b,c)	.614	.513	-3.328	.599
	TJ	-.933(b,c)	.610	1.000	-2.882	1.017
TJ	TP	-1.092(b,c)	.741	1.000	-3.462	1.278
	NP	-.504(b,c)	.452	1.000	-1.950	.943
	NT	-.595(b,c)	.639	1.000	-2.640	1.450
	SJ	-.432(b,c)	.443	1.000	-1.850	.986
	ST	.933(b,c)	.610	1.000	-1.017	2.882
TP	TP	-.159(b,c)	.586	1.000	-2.034	1.715
	NP	-.344(b,c)	.622	1.000	-2.335	1.646
	NT	-.435(b,c)	.765	1.000	-2.884	2.013
	SJ	-.272(b,c)	.614	1.000	-2.236	1.692
	ST	1.092(b,c)	.741	1.000	-1.278	3.462
	TJ	.159(b,c)	.586	1.000	-1.715	2.034

Based on estimated marginal means

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

APPENDIX I

THREE SYMBOL GROUPS ON CPP FACTORS

Pairwise Comparisons								
Dependent Variable	(I) Four symbol combinations without I and E	(J) Four symbol combinations without I and E	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)		
						Lower Bound	Upper Bound	
CPP CURRENT	NFP	NTJ	.389(b,c)	0.32	4	1	-0.522	1.301
		NTP	-.223(b,c)	.318	1.000		-1.120	.674
		STJ	.062(b,c)	.307	1.000		-.802	.927
	NTJ	NFP	-.389(b,c)	.324	1.000		-1.301	.522
		NTP	-.613(b,c)	.231	.076		-1.265	.040
		STJ	-.327(b,c)	.216	.844		-.937	.283
	NTP	NFP	.223(b,c)	.318	1.000		-.674	1.120
		NTJ	.613(b,c)	.231	.076		-.040	1.265
		STJ	.285(b,c)	.204	1.000		-.289	.860
	STJ	NFP	-.062(b,c)	.307	1.000		-.927	.802
		NTJ	.327(b,c)	.216	.844		-.283	.937
		NTP	-.285(b,c)	.204	1.000		-.860	.289
CPP POTENTIAL	NFP	NTJ	.096(b,c)	.397	1.000		-1.023	1.216
		NTP	-.390(b,c)	.391	1.000		-1.490	.711
		STJ	-.168(b,c)	.377	1.000		-1.229	.893
	NTJ	NFP	-.096(b,c)	.397	1.000		-1.216	1.023
		NTP	-.486(b,c)	.284	.582		-1.287	.315
		STJ	-.265(b,c)	.266	1.000		-1.013	.484
	NTP	NFP	.390(b,c)	.391	1.000		-.711	1.490
		NTJ	.486(b,c)	.284	.582		-.315	1.287
		STJ	.222(b,c)	.250	1.000		-.484	.927
	STJ	NFP	.168(b,c)	.377	1.000		-.893	1.229
		NTJ	.265(b,c)	.266	1.000		-.484	1.013
		NTP	-.222(b,c)	.250	1.000		-.927	.484
PRAGMATIC	NFP	NTJ	.287(b,c)	.555	1.000		-1.278	1.851
		NTP	.138(b,c)	.546	1.000		-1.401	1.677
		STJ	.585(b,c)	.526	1.000		-.898	2.069
	NTJ	NFP	-.287(b,c)	.555	1.000		-1.851	1.278

		NTP	-.149(b,c)	.397	1.000	-1.269	.971	
		STJ	.299(b,c)	.371	1.000	-.748	1.346	
	NTP	NFP	-.138(b,c)	.546	1.000	-1.677	1.401	
		NTJ	.149(b,c)	.397	1.000	-.971	1.269	
		STJ	.448(b,c)	.350	1.000	-.538	1.434	
		STJ	NFP	-.585(b,c)	.526	1.000	-2.069	.898
			NTJ	-.299(b,c)	.371	1.000	-1.346	.748
	NTP		-.448(b,c)	.350	1.000	-1.434	.538	
EXPLORATION	NFP	NTJ	.267(b,c)	.454	1.000	-1.013	1.548	
		NTP	.087(b,c)	.447	1.000	-1.172	1.347	
		STJ	.437(b,c)	.431	1.000	-.777	1.651	
		NTJ	NFP	-.267(b,c)	.454	1.000	-1.548	1.013
			NTP	-.180(b,c)	.325	1.000	-1.096	.736
	STJ		.170(b,c)	.304	1.000	-.687	1.026	
	NTP	NFP	-.087(b,c)	.447	1.000	-1.347	1.172	
		NTJ	.180(b,c)	.325	1.000	-.736	1.096	
		STJ	.350(b,c)	.286	1.000	-.457	1.157	
	STJ	NFP	-.437(b,c)	.431	1.000	-1.651	.777	
		NTJ	-.170(b,c)	.304	1.000	-1.026	.687	
		NTP	-.350(b,c)	.286	1.000	-1.157	.457	
		NFP	NTJ	-.452(b,c)	.927	1.000	-3.063	2.160
			NTP	-1.581(b,c)	.911	.557	-4.150	.988
			STJ	-.136(b,c)	.879	1.000	-2.613	2.340
NTJ		NFP	.452(b,c)	.927	1.000	-2.160	3.063	
		NTP	-1.129(b,c)	.663	.592	-2.998	.740	
		STJ	.315(b,c)	.620	1.000	-1.432	2.063	
	NTP	NFP	1.581(b,c)	.911	.557	-.988	4.150	
		NTJ	1.129(b,c)	.663	.592	-.740	2.998	
		STJ	1.444(b,c)	.584	.114	-.202	3.091	
STJ	NFP	.136(b,c)	.879	1.000	-2.340	2.613		
	NTJ	-.315(b,c)	.620	1.000	-2.063	1.432		
	NTP	-1.444(b,c)	.584	.114	-3.091	.202		
	NFP	NTJ	-.247(b,c)	.591	1.000	-1.913	1.420	
		NTP	-.699(b,c)	.581	1.000	-2.337	.940	
		STJ	-.394(b,c)	.561	1.000	-1.974	1.186	
RULE ORIENTATION	NTJ	NFP	.247(b,c)	.591	1.000	-1.420	1.913	
		NTP	-.452(b,c)	.423	1.000	-1.644	.740	
		STJ	-.147(b,c)	.396	1.000	-1.262	.968	
	NTP	NFP	.699(b,c)	.581	1.000	-.940	2.337	
		NTJ	.452(b,c)	.423	1.000	-.740	1.644	
		STJ	.305(b,c)	.373	1.000	-.745	1.355	
	STJ	NFP	.394(b,c)	.561	1.000	-1.186	1.974	
		NTJ	.147(b,c)	.396	1.000	-.968	1.262	
		NTP	-.305(b,c)	.373	1.000	-1.355	.745	
CATEGORISATION	NFP	NTJ	.346(b,c)	.461	1.000	-.953	1.644	
		NTP	-.443(b,c)	.453	1.000	-1.720	.834	
		STJ	.029(b,c)	.437	1.000	-1.202	1.260	

		NFP	-.346(b,c)	.461	1.000	-1.644	.953
	NTJ	NTP	-.788(b,c)	.330	.138	-1.717	.141
		STJ	-.317(b,c)	.308	1.000	-1.186	.552
	NTP	NFP	.443(b,c)	.453	1.000	-.834	1.720
		NTJ	.788(b,c)	.330	.138	-.141	1.717
		STJ	.471(b,c)	.290	.688	-.347	1.290
	STJ	NFP	-.029(b,c)	.437	1.000	-1.260	1.202
		NTJ	.317(b,c)	.308	1.000	-.552	1.186
		NTP	-.471(b,c)	.290	.688	-1.290	.347
		NTJ	.072(b,c)	.410	1.000	-1.082	1.226
	NFP	NTP	-.889(b,c)	.403	.209	-2.024	.246
		STJ	-.010(b,c)	.388	1.000	-1.105	1.084
		NFP	-.072(b,c)	.410	1.000	-1.226	1.082
	NTJ	NTP	-	0.29			
		STJ	.961(*,b,c)	3	0.015	-1.787	-0.135
		NFP	-.082(b,c)	.274	1.000	-.855	.690
INTEGRATION		NTP	.889(b,c)	.403	.209	-.246	2.024
	NTP	NTJ	.961(*,b,c)	.293	.015	.135	1.787
		STJ	.878(*,b,c)	.258	.011	.151	1.606
		NFP	.010(b,c)	.388	1.000	-1.084	1.105
	STJ	NTJ	.082(b,c)	.274	1.000	-.690	.855
		NTP	-	0.25			
		NTP	.878(*,b,c)	8	0.011	-1.606	-0.151
		NTJ	.049(b,c)	5	1	-1.599	1.698
	NFP	NTP	-.842(b,c)	.575	.918	-2.464	.779
		STJ	-.059(b,c)	.555	1.000	-1.622	1.504
		NFP	-.049(b,c)	.585	1.000	-1.698	1.599
COMPLEXITY	NTJ	NTP	-.892(b,c)	.418	.247	-2.071	.288
		STJ	-.109(b,c)	.391	1.000	-1.211	.994
		NFP	.842(b,c)	.575	.918	-.779	2.464
	NTP	NTJ	.892(b,c)	.418	.247	-.288	2.071
		STJ	.783(b,c)	.369	.250	-.256	1.822
		NFP	.059(b,c)	.555	1.000	-1.504	1.622
	STJ	NTJ	.109(b,c)	.391	1.000	-.994	1.211
		NTP	-.783(b,c)	.369	.250	-1.822	.256
		NTJ	-.923(b,c)	.632	.924	-2.703	.857
	NFP	NTP	-1.632(b,c)	.621	.080	-3.383	.119
		STJ	-.842(b,c)	.599	1.000	-2.530	.846
		NFP	.923(b,c)	.632	.924	-.857	2.703
	NTJ	NTP	-.709(b,c)	.452	.761	-1.983	.565
		STJ	.081(b,c)	.423	1.000	-1.110	1.272
LOGICAL		NFP	1.632(b,c)	.621	.080	-.119	3.383
	NTP	NTJ	.709(b,c)	.452	.761	-.565	1.983
		STJ	.790(b,c)	.398	.336	-.332	1.912
		NFP	.842(b,c)	.599	1.000	-.846	2.530
	STJ	NTJ	-.081(b,c)	.423	1.000	-1.272	1.110
		NTP	-.790(b,c)	.398	.336	-1.912	.332

VERBAL	NFP	NTJ	-.523(b,c)	.669	1.000	-2.409	1.363
		NTP	-1.436(b,c)	.658	.221	-3.291	.419
		STJ	-1.001(b,c)	.634	.748	-2.789	.787
	NTJ	NFP	.523(b,c)	.669	1.000	-1.363	2.409
		NTP	-.913(b,c)	.479	.395	-2.263	.436
		STJ	-.478(b,c)	.448	1.000	-1.740	.783
	NTP	NFP	1.436(b,c)	.658	.221	-.419	3.291
		NTJ	.913(b,c)	.479	.395	-.436	2.263
		STJ	.435(b,c)	.422	1.000	-.754	1.623
	STJ	NFP	1.001(b,c)	.634	.748	-.787	2.789
		NTJ	.478(b,c)	.448	1.000	-.783	1.740
		NTP	-.435(b,c)	.422	1.000	-1.623	.754
USE OF MEMORY	NFP	NTJ	.506(b,c)	.503	1.000	-.913	1.925
		NTP	-.195(b,c)	.495	1.000	-1.591	1.200
		STJ	.212(b,c)	.477	1.000	-1.133	1.558
	NTJ	NFP	-.506(b,c)	.503	1.000	-1.925	.913
		NTP	-.701(b,c)	.360	.364	-1.717	.314
		STJ	-.294(b,c)	.337	1.000	-1.243	.656
	NTP	NFP	.195(b,c)	.495	1.000	-1.200	1.591
		NTJ	.701(b,c)	.360	.364	-.314	1.717
		STJ	.408(b,c)	.317	1.000	-.487	1.302
	STJ	NFP	-.212(b,c)	.477	1.000	-1.558	1.133
		NTJ	.294(b,c)	.337	1.000	-.656	1.243
		NTP	-.408(b,c)	.317	1.000	-1.302	.487
MEMORY STRATEGIES	NFP	NTJ	.494(b,c)	.492	1.000	-.893	1.881
		NTP	-.469(b,c)	.484	1.000	-1.833	.895
		STJ	-.226(b,c)	.467	1.000	-1.541	1.089
	NTJ	NFP	-.494(b,c)	.492	1.000	-1.881	.893
		NTP	-.963(b,c)	.352	.061	-1.956	.029
		STJ	-.720(b,c)	.329	.219	-1.648	.208
	NTP	NFP	.469(b,c)	.484	1.000	-.895	1.833
		NTJ	.963(b,c)	.352	.061	-.029	1.956
		STJ	.243(b,c)	.310	1.000	-.631	1.117
	STJ	NFP	.226(b,c)	.467	1.000	-1.089	1.541
		NTJ	.720(b,c)	.329	.219	-.208	1.648
		NTP	-.243(b,c)	.310	1.000	-1.117	.631
JUDGMENT	NFP	NTJ	.998(b,c)	.652	.816	-.839	2.834
		NTP	.049(b,c)	.641	1.000	-1.757	1.856
		STJ	.665(b,c)	.618	1.000	-1.077	2.406
	NTJ	NFP	-.998(b,c)	.652	.816	-2.834	.839
		NTP	-.949(b,c)	.466	.303	-2.263	.366
		STJ	-.333(b,c)	.436	1.000	-1.562	.896
	NTP	NFP	-.049(b,c)	.641	1.000	-1.856	1.757
		NTJ	.949(b,c)	.466	.303	-.366	2.263
		STJ	.616(b,c)	.411	.864	-.542	1.773
	STJ	NFP	-.665(b,c)	.618	1.000	-2.406	1.077
		NTJ	.333(b,c)	.436	1.000	-.896	1.562

LEARNING 1	NFP	NTP	-.616(b,c)	.411	.864	-1.773	.542
		NTJ	.061(b,c)	.563	1.000	-1.526	1.649
		STJ	-.266(b,c)	.534	1.000	-1.771	1.240
	NTJ	NFP	-.061(b,c)	.563	1.000	-1.649	1.526
		NTP	-.959(b,c)	.403	.142	-2.095	.177
		STJ	-.327(b,c)	.377	1.000	-1.389	.735
	NTP	NFP	.898(b,c)	.554	.692	-.664	2.459
		NTJ	.959(b,c)	.403	.142	-.177	2.095
		STJ	.632(b,c)	.355	.509	-.368	1.633
	STJ	NFP	.266(b,c)	.534	1.000	-1.240	1.771
		NTJ	.327(b,c)	.377	1.000	-.735	1.389
		NTP	-.632(b,c)	.355	.509	-1.633	.368
LEARNING 2	NFP	NTJ	-.046(b,c)	.617	1.000	-1.785	1.693
		NTP	-.311(b,c)	.607	1.000	-2.022	1.399
		STJ	.221(b,c)	.585	1.000	-1.428	1.870
	NTJ	NFP	.046(b,c)	.617	1.000	-1.693	1.785
		NTP	-.265(b,c)	.442	1.000	-1.510	.979
		STJ	.267(b,c)	.413	1.000	-.896	1.431
	NTP	NFP	.311(b,c)	.607	1.000	-1.399	2.022
		NTJ	.265(b,c)	.442	1.000	-.979	1.510
		STJ	.533(b,c)	.389	1.000	-.564	1.629
	STJ	NFP	-.221(b,c)	.585	1.000	-1.870	1.428
		NTJ	-.267(b,c)	.413	1.000	-1.431	.896
		NTP	-.533(b,c)	.389	1.000	-1.629	.564

Based on estimated marginal means

* The mean difference is significant at the .05 level.

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).

APPENDIX J

FOUR SYMBOL GROUPS ON CPP FACTORS

Pairwise Comparisons							
Dependent Variable	(I) four symbols	(J) four symbols	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
						Lower Bound	Upper Bound
CPP CURRENT	ENTJ	ENTP	-.347(b,c)	.271	1.000	-1.221	.528
		INTP	-1.069(*,b,c)	.296	.022	-2.023	-.114
		ISTJ	-.205(b,c)	.328	1.000	-1.262	.852
		ESTJ	-.330(b,c)	.235	1.000	-1.087	.427
	ENTP	ENTJ	.347(b,c)	.271	1.000	-.528	1.221
		INTP	-.722(b,c)	.306	.308	-1.709	.266
		ISTJ	.142(b,c)	.317	1.000	-.879	1.163
		ESTJ	.017(b,c)	.242	1.000	-.761	.796
	INTP	ENTJ	1.069(*,b,c)	.296	.022	.114	2.023
		ENTP	.722(b,c)	.306	.308	-.266	1.709
		ISTJ	.864(b,c)	.357	.270	-.286	2.013
		ESTJ	.739(b,c)	.277	.162	-.153	1.631
	ISTJ	ENTJ	.205(b,c)	.328	1.000	-.852	1.262
		ENTP	-.142(b,c)	.317	1.000	-1.163	.879
		INTP	-.864(b,c)	.357	.270	-2.013	.286
		ESTJ	-.125(b,c)	.302	1.000	-1.097	.847
	ESTJ	ENTJ	.330(b,c)	.235	1.000	-.427	1.087
		ENTP	-.017(b,c)	.242	1.000	-.796	.761
		INTP	-.739(b,c)	.277	.162	-1.631	.153
		ISTJ	.125(b,c)	.302	1.000	-.847	1.097
CPP POTENTIAL	ENTJ	ENTP	-.235(b,c)	.353	1.000	-1.373	.903
		INTP	-.900(b,c)	.385	.320	-2.142	.342
		ISTJ	-.160(b,c)	.427	1.000	-1.536	1.216
		ESTJ	-.222(b,c)	.306	1.000	-1.207	.763
	ENTP	ENTJ	.235(b,c)	.353	1.000	-.903	1.373
		INTP	-.665(b,c)	.399	1.000	-1.950	.620
		ISTJ	.075(b,c)	.412	1.000	-1.254	1.404
		ESTJ	.013(b,c)	.314	1.000	-1.000	1.027
INTP	ENTJ	.900(b,c)	.385	.320	-.342	2.142	

		ENTP	.665(b,c)	.399	1.000	-.620	1.950
		ISTJ	.740(b,c)	.464	1.000	-.757	2.236
		ESTJ	.678(b,c)	.360	.771	-.483	1.839
		ENTJ	.160(b,c)	.427	1.000	-1.216	1.536
	ISTJ	ENTP	-.075(b,c)	.412	1.000	-1.404	1.254
		INTP	-.740(b,c)	.464	1.000	-2.236	.757
		ESTJ	-.062(b,c)	.393	1.000	-1.327	1.203
		ENTJ	.222(b,c)	.306	1.000	-.763	1.207
	ESTJ	ENTP	-.013(b,c)	.314	1.000	-1.027	1.000
		INTP	-.678(b,c)	.360	.771	-1.839	.483
		ISTJ	.062(b,c)	.393	1.000	-1.203	1.327
		ENTP	.264(b,c)	.323	1.000	-.777	1.304
		INTP	-.983(b,c)	.352	.125	-2.119	.152
	ENTJ	ISTJ	.243(b,c)	.390	1.000	-1.015	1.501
		ESTJ	.295(b,c)	.280	1.000	-.606	1.196
		ENTJ	-.264(b,c)	.323	1.000	-1.304	.777
		INTP	-1.247(*,b,c)	.365	.033	-2.422	-.072
	ENTP	ISTJ	-.020(b,c)	.377	1.000	-1.236	1.195
		ESTJ	.032(b,c)	.288	1.000	-.895	.958
		ENTJ	.983(b,c)	.352	.125	-.152	2.119
		ENTP	1.247(*,b,c)	.365	.033	.072	2.422
	INTP	ISTJ	1.226(b,c)	.425	.102	-.142	2.595
		ESTJ	1.279(*,b,c)	.329	.012	.217	2.340
		ENTJ	-.243(b,c)	.390	1.000	-1.501	1.015
		ENTP	.020(b,c)	.377	1.000	-1.195	1.236
	ISTJ	INTP	-1.226(b,c)	.425	.102	-2.595	.142
		ESTJ	.052(b,c)	.359	1.000	-1.105	1.209
		ENTJ	-.295(b,c)	.280	1.000	-1.196	.606
		ENTP	-.032(b,c)	.288	1.000	-.958	.895
	ESTJ	INTP	-1.279(*,b,c)	.329	.012	-2.340	-.217
		ISTJ	-.052(b,c)	.359	1.000	-1.209	1.105
		ENTP	-.017(b,c)	.371	1.000	-1.214	1.180
		INTP	-.810(b,c)	.405	.618	-2.116	.495
	ENTJ	ISTJ	-.127(b,c)	.449	1.000	-1.575	1.320
		ESTJ	.104(b,c)	.322	1.000	-.932	1.141
		ENTJ	.017(b,c)	.371	1.000	-1.180	1.214
	ENTP	INTP	-.794(b,c)	.419	.756	-2.145	.558

		ISTJ	-.110(b,c)	.434	1.000	-1.508	1.287	
		ESTJ	.121(b,c)	.331	1.000	-.945	1.187	
	INTP	ENTJ	.810(b,c)	.405	.618	-.495	2.116	
		ENTP	.794(b,c)	.419	.756	-.558	2.145	
		ISTJ	.683(b,c)	.488	1.000	-.891	2.257	
		ESTJ	.915(b,c)	.379	.273	-.306	2.136	
	ISTJ	ENTJ	.127(b,c)	.449	1.000	-1.320	1.575	
		ENTP	.110(b,c)	.434	1.000	-1.287	1.508	
		INTP	-.683(b,c)	.488	1.000	-2.257	.891	
		ESTJ	.231(b,c)	.413	1.000	-1.099	1.562	
	ESTJ	ENTJ	-.104(b,c)	.322	1.000	-1.141	.932	
		ENTP	-.121(b,c)	.331	1.000	-1.187	.945	
		INTP	-.915(b,c)	.379	.273	-2.136	.306	
		ISTJ	-.231(b,c)	.413	1.000	-1.562	1.099	
ANALYTICAL	ENTJ	ENTP	-.274(b,c)	.820	1.000	-2.917	2.370	
		INTP	-2.099(b,c)	.895	.314	-4.984	.785	
		ISTJ	.765(b,c)	.992	1.000	-2.432	3.961	
		ESTJ	.314(b,c)	.710	1.000	-1.974	2.603	
	ENTP	ENTJ	.274(b,c)	.820	1.000	-2.370	2.917	
		INTP	-1.825(b,c)	.926	.653	-4.810	1.159	
		ISTJ	1.039(b,c)	.958	1.000	-2.049	4.126	
		ESTJ	.588(b,c)	.730	1.000	-1.766	2.942	
	INTP	ENTJ	2.099(b,c)	.895	.314	-.785	4.984	
		ENTP	1.825(b,c)	.926	.653	-1.159	4.810	
		ISTJ	2.864(b,c)	1.079	.167	-.612	6.340	
		ESTJ	2.414(b,c)	.837	.103	-.283	5.110	
	ISTJ	ENTJ	-.765(b,c)	.992	1.000	-3.961	2.432	
		ENTP	-1.039(b,c)	.958	1.000	-4.126	2.049	
		INTP	-2.864(b,c)	1.079	.167	-6.340	.612	
		ESTJ	-.450(b,c)	.912	1.000	-3.389	2.488	
	ESTJ	ENTJ	-.314(b,c)	.710	1.000	-2.603	1.974	
		ENTP	-.588(b,c)	.730	1.000	-2.942	1.766	
		INTP	-2.414(b,c)	.837	.103	-5.110	.283	
		ISTJ	.450(b,c)	.912	1.000	-2.488	3.389	
	RULE ORIENTATION	ENTJ	ENTP	-.477(b,c)	.500	1.000	-2.088	1.135
			INTP	-.918(b,c)	.546	1.000	-2.677	.840
			ISTJ	-.287(b,c)	.605	1.000	-2.235	1.662

		ESTJ	-.262(b,c)	.433	1.000	-1.657	1.133
		ENTJ	.477(b,c)	.500	1.000	-1.135	2.088
	ENTP	INTP	-.442(b,c)	.565	1.000	-2.261	1.377
		ISTJ	.190(b,c)	.584	1.000	-1.692	2.072
		ESTJ	.214(b,c)	.445	1.000	-1.221	1.649
	INTP	ENTJ	.918(b,c)	.546	1.000	-.840	2.677
		ENTP	.442(b,c)	.565	1.000	-1.377	2.261
		ISTJ	.632(b,c)	.657	1.000	-1.487	2.751
		ESTJ	.656(b,c)	.510	1.000	-.988	2.300
	ISTJ	ENTJ	.287(b,c)	.605	1.000	-1.662	2.235
		ENTP	-.190(b,c)	.584	1.000	-2.072	1.692
		INTP	-.632(b,c)	.657	1.000	-2.751	1.487
		ESTJ	.024(b,c)	.556	1.000	-1.767	1.815
	ESTJ	ENTJ	.262(b,c)	.433	1.000	-1.133	1.657
		ENTP	-.214(b,c)	.445	1.000	-1.649	1.221
		INTP	-.656(b,c)	.510	1.000	-2.300	.988
		ISTJ	-.024(b,c)	.556	1.000	-1.815	1.767
	ENTJ	ENTP	-.660(b,c)	.407	1.000	-1.973	.653
		INTP	-1.002(b,c)	.445	.377	-2.434	.431
		ISTJ	.404(b,c)	.493	1.000	-1.184	1.991
		ESTJ	-.508(b,c)	.353	1.000	-1.645	.629
	ENTP	ENTJ	.660(b,c)	.407	1.000	-.653	1.973
		INTP	-.342(b,c)	.460	1.000	-1.824	1.141
		ISTJ	1.064(b,c)	.476	.391	-.470	2.597
		ESTJ	.152(b,c)	.363	1.000	-1.017	1.321
CATEGORISATION	INTP	ENTJ	1.002(b,c)	.445	.377	-.431	2.434
		ENTP	.342(b,c)	.460	1.000	-1.141	1.824
		ISTJ	1.406(b,c)	.536	.178	-.321	3.132
		ESTJ	.494(b,c)	.416	1.000	-.846	1.833
	ISTJ	ENTJ	-.404(b,c)	.493	1.000	-1.991	1.184
		ENTP	-1.064(b,c)	.476	.391	-2.597	.470
		INTP	-1.406(b,c)	.536	.178	-3.132	.321
		ESTJ	-.912(b,c)	.453	.602	-2.371	.547
	ESTJ	ENTJ	.508(b,c)	.353	1.000	-.629	1.645
		ENTP	-.152(b,c)	.363	1.000	-1.321	1.017
		INTP	-.494(b,c)	.416	1.000	-1.833	.846
		ISTJ	.912(b,c)	.453	.602	-.547	2.371

INTEGRATION	ENTJ	ENTP	-.379(b,c)	.402	1.000	-1.676	.917
		INTP	-1.695(*,b,c)	.439	.013	-3.109	-.281
		ISTJ	-.143(b,c)	.486	1.000	-1.711	1.424
		ESTJ	-.004(b,c)	.348	1.000	-1.126	1.119
	ENTP	ENTJ	.379(b,c)	.402	1.000	-.917	1.676
		INTP	-1.315(b,c)	.454	.100	-2.779	.148
		ISTJ	.236(b,c)	.470	1.000	-1.278	1.750
		ESTJ	.376(b,c)	.358	1.000	-.778	1.530
	INTP	ENTJ	1.695(*,b,c)	.439	.013	.281	3.109
		ENTP	1.315(b,c)	.454	.100	-.148	2.779
		ISTJ	1.552(b,c)	.529	.093	-.153	3.256
		ESTJ	1.691(*,b,c)	.410	.007	.369	3.014
	ISTJ	ENTJ	.143(b,c)	.486	1.000	-1.424	1.711
		ENTP	-.236(b,c)	.470	1.000	-1.750	1.278
		INTP	-1.552(b,c)	.529	.093	-3.256	.153
		ESTJ	.140(b,c)	.447	1.000	-1.301	1.580
ESTJ	ENTJ	.004(b,c)	.348	1.000	-1.119	1.126	
	ENTP	-.376(b,c)	.358	1.000	-1.530	.778	
	INTP	-1.691(*,b,c)	.410	.007	-3.014	-.369	
	ISTJ	-.140(b,c)	.447	1.000	-1.580	1.301	
COMPLEXITY	ENTJ	ENTP	-.284(b,c)	.492	1.000	-1.870	1.302
		INTP	-1.405(b,c)	.537	.180	-3.136	.325
		ISTJ	.120(b,c)	.595	1.000	-1.798	2.038
		ESTJ	-.037(b,c)	.426	1.000	-1.410	1.336
	ENTP	ENTJ	.284(b,c)	.492	1.000	-1.302	1.870
		INTP	-1.121(b,c)	.556	.596	-2.912	.669
		ISTJ	.404(b,c)	.575	1.000	-1.448	2.256
		ESTJ	.247(b,c)	.438	1.000	-1.166	1.659
	INTP	ENTJ	1.405(b,c)	.537	.180	-.325	3.136
		ENTP	1.121(b,c)	.556	.596	-.669	2.912
		ISTJ	1.526(b,c)	.647	.306	-.560	3.611
		ESTJ	1.368(b,c)	.502	.144	-.250	2.986
	ISTJ	ENTJ	-.120(b,c)	.595	1.000	-2.038	1.798
		ENTP	-.404(b,c)	.575	1.000	-2.256	1.448
		INTP	-1.526(b,c)	.647	.306	-3.611	.560
		ESTJ	-.158(b,c)	.547	1.000	-1.920	1.605
ESTJ	ENTJ	.037(b,c)	.426	1.000	-1.336	1.410	

		ENTP	-.247(b,c)	.438	1.000	-1.659	1.166
		INTP	-1.368(b,c)	.502	.144	-2.986	.250
		ISTJ	.158(b,c)	.547	1.000	-1.605	1.920
		ENTP	-.088(b,c)	.543	1.000	-1.838	1.662
	ENTJ	INTP	-1.375(b,c)	.592	.330	-3.283	.534
		ISTJ	.338(b,c)	.656	1.000	-1.778	2.453
		ESTJ	.165(b,c)	.470	1.000	-1.350	1.679
		ENTJ	.088(b,c)	.543	1.000	-1.662	1.838
	ENTP	INTP	-1.286(b,c)	.613	.511	-3.262	.689
		ISTJ	.426(b,c)	.634	1.000	-1.617	2.469
		ESTJ	.253(b,c)	.483	1.000	-1.305	1.811
		ENTJ	1.375(b,c)	.592	.330	-.534	3.283
	INTP	ENTP	1.286(b,c)	.613	.511	-.689	3.262
		ISTJ	1.712(b,c)	.714	.282	-.588	4.013
		ESTJ	1.539(b,c)	.554	.129	-.246	3.324
		ENTJ	-.338(b,c)	.656	1.000	-2.453	1.778
	ISTJ	ENTP	-.426(b,c)	.634	1.000	-2.469	1.617
		INTP	-1.712(b,c)	.714	.282	-4.013	.588
		ESTJ	-.173(b,c)	.603	1.000	-2.118	1.771
		ENTJ	-.165(b,c)	.470	1.000	-1.679	1.350
	ESTJ	ENTP	-.253(b,c)	.483	1.000	-1.811	1.305
		INTP	-1.539(b,c)	.554	.129	-3.324	.246
		ISTJ	.173(b,c)	.603	1.000	-1.771	2.118
VERBAL		ENTP	-.416(b,c)	.536	1.000	-2.145	1.312
	ENTJ	INTP	-1.207(b,c)	.585	.548	-3.092	.679
		ISTJ	-.394(b,c)	.648	1.000	-2.483	1.696
		ESTJ	-.448(b,c)	.464	1.000	-1.944	1.048
		ENTJ	.416(b,c)	.536	1.000	-1.312	2.145
	ENTP	INTP	-.791(b,c)	.606	1.000	-2.742	1.161
		ISTJ	.023(b,c)	.626	1.000	-1.996	2.041
		ESTJ	-.032(b,c)	.478	1.000	-1.570	1.507
		ENTJ	1.207(b,c)	.585	.548	-.679	3.092
	INTP	ENTP	.791(b,c)	.606	1.000	-1.161	2.742
		ISTJ	.813(b,c)	.705	1.000	-1.459	3.086
		ESTJ	.759(b,c)	.547	1.000	-1.004	2.522
	ISTJ	ENTJ	.394(b,c)	.648	1.000	-1.696	2.483
		ENTP	-.023(b,c)	.626	1.000	-2.041	1.996

		INTP	-.813(b,c)	.705	1.000	-3.086	1.459
		ESTJ	-.054(b,c)	.596	1.000	-1.975	1.867
	ESTJ	ENTJ	.448(b,c)	.464	1.000	-1.048	1.944
		ENTP	.032(b,c)	.478	1.000	-1.507	1.570
		INTP	-.759(b,c)	.547	1.000	-2.522	1.004
		ISTJ	.054(b,c)	.596	1.000	-1.867	1.975
			ENTP	-.320(b,c)	.444	1.000	-1.751
	ENTJ	INTP	-1.498(b,c)	.484	.066	-3.059	.063
		ISTJ	-.103(b,c)	.537	1.000	-1.833	1.627
		ESTJ	-.327(b,c)	.384	1.000	-1.566	.911
	ENTP	ENTJ	.320(b,c)	.444	1.000	-1.111	1.751
		INTP	-1.177(b,c)	.501	.312	-2.793	.438
		ISTJ	.218(b,c)	.519	1.000	-1.453	1.889
		ESTJ	-.007(b,c)	.395	1.000	-1.281	1.267
USE OF MEMORY	INTP	ENTJ	1.498(b,c)	.484	.066	-.063	3.059
		ENTP	1.177(b,c)	.501	.312	-.438	2.793
		ISTJ	1.395(b,c)	.584	.287	-.486	3.277
		ESTJ	1.171(b,c)	.453	.193	-.289	2.630
	ISTJ	ENTJ	.103(b,c)	.537	1.000	-1.627	1.833
		ENTP	-.218(b,c)	.519	1.000	-1.889	1.453
		INTP	-1.395(b,c)	.584	.287	-3.277	.486
		ESTJ	-.225(b,c)	.494	1.000	-1.815	1.366
	ESTJ	ENTJ	.327(b,c)	.384	1.000	-.911	1.566
		ENTP	.007(b,c)	.395	1.000	-1.267	1.281
INTP		-1.171(b,c)	.453	.193	-2.630	.289	
ISTJ		.225(b,c)	.494	1.000	-1.366	1.815	
MEMORY STRATEGIES	ENTJ	ENTP	-.875(b,c)	.343	.206	-1.980	.230
		INTP	-1.071(b,c)	.374	.108	-2.276	.135
		ISTJ	-.839(b,c)	.415	.590	-2.175	.497
		ESTJ	-.694(b,c)	.297	.318	-1.651	.262
	ENTP	ENTJ	.875(b,c)	.343	.206	-.230	1.980
		INTP	-.195(b,c)	.387	1.000	-1.443	1.052
		ISTJ	.036(b,c)	.400	1.000	-1.254	1.327
		ESTJ	.181(b,c)	.305	1.000	-.803	1.165
	INTP	ENTJ	1.071(b,c)	.374	.108	-.135	2.276
		ENTP	.195(b,c)	.387	1.000	-1.052	1.443
		ISTJ	.232(b,c)	.451	1.000	-1.221	1.684

		ESTJ	.376(b,c)	.350	1.000	-.751	1.503
		ENTJ	.839(b,c)	.415	.590	-.497	2.175
	ISTJ	ENTP	-.036(b,c)	.400	1.000	-1.327	1.254
		INTP	-.232(b,c)	.451	1.000	-1.684	1.221
		ESTJ	.145(b,c)	.381	1.000	-1.083	1.373
	ESTJ	ENTJ	.694(b,c)	.297	.318	-.262	1.651
		ENTP	-.181(b,c)	.305	1.000	-1.165	.803
		INTP	-.376(b,c)	.350	1.000	-1.503	.751
		ISTJ	-.145(b,c)	.381	1.000	-1.373	1.083
		ENTP	-.700(b,c)	.590	1.000	-2.602	1.202
	ENTJ	INTP	-1.345(b,c)	.644	.521	-3.420	.730
		ISTJ	-.455(b,c)	.714	1.000	-2.755	1.844
		ESTJ	-.347(b,c)	.511	1.000	-1.994	1.299
	ENTP	ENTJ	.700(b,c)	.590	1.000	-1.202	2.602
		INTP	-.645(b,c)	.666	1.000	-2.792	1.503
		ISTJ	.245(b,c)	.689	1.000	-1.976	2.466
		ESTJ	.353(b,c)	.526	1.000	-1.340	2.047
	INTP	ENTJ	1.345(b,c)	.644	.521	-.730	3.420
		ENTP	.645(b,c)	.666	1.000	-1.503	2.792
		ISTJ	.890(b,c)	.776	1.000	-1.611	3.390
		ESTJ	.998(b,c)	.602	1.000	-.942	2.938
	ISTJ	ENTJ	.455(b,c)	.714	1.000	-1.844	2.755
		ENTP	-.245(b,c)	.689	1.000	-2.466	1.976
		INTP	-.890(b,c)	.776	1.000	-3.390	1.611
		ESTJ	.108(b,c)	.656	1.000	-2.006	2.222
	ESTJ	ENTJ	.347(b,c)	.511	1.000	-1.299	1.994
		ENTP	-.353(b,c)	.526	1.000	-2.047	1.340
		INTP	-.998(b,c)	.602	1.000	-2.938	.942
		ISTJ	-.108(b,c)	.656	1.000	-2.222	2.006
LEARNING 1		ENTP	-.633(b,c)	.475	1.000	-2.165	.899
	ENTJ	INTP	-1.420(b,c)	.519	.141	-3.091	.252
		ISTJ	-.438(b,c)	.575	1.000	-2.290	1.415
		ESTJ	-.291(b,c)	.412	1.000	-1.618	1.035
	ENTP	ENTJ	.633(b,c)	.475	1.000	-.899	2.165
		INTP	-.787(b,c)	.537	1.000	-2.516	.943
		ISTJ	.195(b,c)	.555	1.000	-1.594	1.984
		ESTJ	.342(b,c)	.423	1.000	-1.023	1.706

LEARNING 2	INTP	ENTJ	1.420(b,c)	.519	.141	-.252	3.091
		ENTP	.787(b,c)	.537	1.000	-.943	2.516
		ISTJ	.982(b,c)	.625	1.000	-1.032	2.996
		ESTJ	1.128(b,c)	.485	.326	-.435	2.691
	ISTJ	ENTJ	.438(b,c)	.575	1.000	-1.415	2.290
		ENTP	-.195(b,c)	.555	1.000	-1.984	1.594
		INTP	-.982(b,c)	.625	1.000	-2.996	1.032
		ESTJ	.146(b,c)	.528	1.000	-1.556	1.849
	ESTJ	ENTJ	.291(b,c)	.412	1.000	-1.035	1.618
		ENTP	-.342(b,c)	.423	1.000	-1.706	1.023
		INTP	-1.128(b,c)	.485	.326	-2.691	.435
		ISTJ	-.146(b,c)	.528	1.000	-1.849	1.556
	ENTJ	ENTP	-.254(b,c)	.617	1.000	-2.243	1.735
		INTP	-.357(b,c)	.673	1.000	-2.527	1.813
		ISTJ	.854(b,c)	.746	1.000	-1.551	3.259
		ESTJ	.257(b,c)	.534	1.000	-1.464	1.979
	ENTP	ENTJ	.254(b,c)	.617	1.000	-1.735	2.243
		INTP	-.103(b,c)	.697	1.000	-2.349	2.142
		ISTJ	1.108(b,c)	.721	1.000	-1.215	3.430
		ESTJ	.511(b,c)	.550	1.000	-1.260	2.282
INTP	ENTJ	.357(b,c)	.673	1.000	-1.813	2.527	
	ENTP	.103(b,c)	.697	1.000	-2.142	2.349	
	ISTJ	1.211(b,c)	.811	1.000	-1.404	3.826	
	ESTJ	.614(b,c)	.630	1.000	-1.414	2.643	
ISTJ	ENTJ	-.854(b,c)	.746	1.000	-3.259	1.551	
	ENTP	-1.108(b,c)	.721	1.000	-3.430	1.215	
	INTP	-1.211(b,c)	.811	1.000	-3.826	1.404	
	ESTJ	-.597(b,c)	.686	1.000	-2.807	1.614	
ESTJ	ENTJ	-.257(b,c)	.534	1.000	-1.979	1.464	
	ENTP	-.511(b,c)	.550	1.000	-2.282	1.260	
	INTP	-.614(b,c)	.630	1.000	-2.643	1.414	
	ISTJ	.597(b,c)	.686	1.000	-1.614	2.807	

Based on estimated marginal means

* The mean difference is significant at the .05 level.

a Adjustment for multiple comparisons: Bonferroni.

b An estimate of the modified population marginal mean (I).

c An estimate of the modified population marginal mean (J).