

Performance of Xhosa-speaking Adults on the Rey-Osterrieth Complex Figure Test:

An extension of a prior South African normative database

By

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ABSTRACT

The aim of the study was to develop preliminary normative indications for the Rey-Osterrieth Complex figure test (ROCF). The ROCF was administered in English on the performance of Xhosa-speaking, unskilled workers ($N=40$), from the Eastern Cape Province. As a mode of collecting data, the research study made use of convenience sampling which ultimately led to snowball sampling. The ROCF was administered and scored according to Rey Osterrieth's initial standardised administration instructions (Meyers & Meyers, 1995a). For all trials of the ROCF (Copy, Immediate and Delayed Recall), a score of 0-2 points were allocated to each of the 18 structural elements of the figure. The total scores were calculated out of 36, as originally defined by Osterrieth. There was no statistically significant difference in performance for the quality of education for any of the ROCF test trials ($p \geq 0.05$ in all instances). Similarly, no significant difference is indicated for the Copy and Immediate Recall (IR) trial for sex indications, whilst the Delayed Recall (DR) trial shows statistically significant differences. Age effects appeared to have an influence on test performance on all ROCF test trials, as a significant difference was identified for all instances. Descriptively and statistically, the present local sample's mean performance was compared to a demographically equivalent local study (de Kock's study, which the present study is doing an extension on) and non-local normative studies. The results indicate the need for culturally-relevant South African psychological assessment measures. It also emphasises the importance of making a psychological measure more applicable and relevant to a specific context. Consideration of socio-cultural factors for norm purposes is strongly recommended by this study.

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LIST OF ACRONYMS

ROCF.....	Rey-Osterrieth Complex Figure Test
USA.....	United States of America
UK.....	United Kingdom
DET.....	Department of Education and Training
CT.....	Copy Trial
IR.....	Immediate Recall
DR.....	Delayed Recall
WAIS-III.....	Wechsler Adult Intelligence Scale-Third Edition
WISC-IV.....	Wechsler Intelligence Scale for Children-IV
IQ.....	Intelligence quotient
NATED.....	National Assembly Training and Education
SC.....	Senior Certificate

Chapter 1

1.1 Introduction

The purpose of this study was to obtain preliminary normative data for a relatively disadvantaged Xhosa-speaking young adult demographic of the Eastern Cape Province on the neuropsychological test called the Rey-Osterrieth Complex Figure test (ROCF). The ROCF neuropsychological test is designed to investigate six broad domains of functioning which are outlined in a variety of core neuropsychological tests. These main domains of functioning include: Visual and Verbal memory, Hand-Motor function, Attention, Visual Perception, and Language and Executive Function (Strauss et al., 2006). The sample has a history of education of a poor quality and no exposure to a higher quality of education. Therefore, for the purposes of the present study, those schools placed in township areas will be referred to as “DET” schools. The present study is an extension of Heinrich Karl Theodor de Kock, who conducted a study on preliminary normative indications for Xhosa-speaking unskilled workers on the ROCF test at Rhodes University. The two studies have a relatively similar sample. The difference is that the present study consists of 40 participants (18 females and 22 males), stratified into two age groups, ranging from 19-20 years and 30-40 years. De Kock’s (2012) study consisted of 33 participants (21 females and 12 males), stratified into two age groups, ranging from 18-29 years and 30-40 years. The two local studies form part of a sequence of cross-cultural research conducted locally and internationally (Andrews, Shuttleworth-Edwards & Radloff, 2012; Fike, Knoetze, Gaylard, & Radloff, 2013, Meyers & Meyers, 1995; Mitrushina et al., 2005; Lezak., 2004; Pienaar et al., 2016).

1.2. Purpose of the study

Currently in South Africa, there are many psychological tests being utilised that do not have norms, which are appropriate for South Africa’s diverse population. The ROCF is a widely used test in neuropsychological assessment. Nevertheless, there is a lack of research into its utility and suitability and there are no localised norms available for its use. In response to this, South African research on the ROCF by De Kock (2012) was conducted. ROCF test performance can only be interpreted and be

considered meaningful if compared to demographically equivalent norms (Mitrushina et al., 2005). The study administered the test on a small sample (non-clinical sample of 33 black Xhosa speaking South African participants; 21 female and 12 male) and collected norms that are relatively lenient in comparison to the European and Westernised norms (t –test analysis compared the South African norms with the European and Westernised norms and the significant difference of $p=000^*$ was found in all instances).

As an extension to De Kock's study, the present study made use of a larger sample procedure and the results indicated by the study contributes to research conducted on the development of normative indications. Normative indications for black Eastern Cape Xhosa speaking people from a background of disadvantaged education is a very pressing matter since this group is discriminated against the easiest when it comes to measurement due to their disadvantaged history, especially in terms of education. This ethnic group is also faced with a lot of disadvantages, one of those being the unpleasant schooling infrastructure in South Africa (Walker, Batchelor et al., 2009; Shuttleworth-Edwards, 2010; Modisaotsile, 2012; Foxcroft & Roodt, 2013).

1.3. Focus and aims of the study

This study is concerned with establishing appropriate cross-cultural normative indications to be used with the Rey-Osterrieth Complex Figure Test in South Africa. This will assist in exposing dangers associated with the absence of appropriate cross-cultural norms when using the ROCF test for the assessment of educationally disadvantaged people in South Africa, thus advancing the suitability of psychological assessment cross-culturally in South Africa. Therefore, the study focuses on assessing the performance of a non-clinical population of Xhosa first language participants with Grade 11 or Matriculation from previously disadvantaged DET schools, on the ROCF test.

1.4 Hypotheses

The above discussions generated the following hypotheses concerning the performance of non-clinical Xhosa speaking adults, with the highest level of education of between Grade 11 and 12 received in traditionally black township schools. The hypotheses are projected as follows:

H1. The use of westernised psychological norms on the South African population is enormous and available normative data on western populations renders higher levels and a more advantaged quality of education. It is mainly hypothesised that the mean scores of all three ROCF trials (Copy, IR and DR) will be significantly lower than that of international participants of equivalent age and level of education presented in Mitrushina et al. (2005) Meta-analysis (see in Subsection 2.6.2.2).

H2. Based on conflicting views on the quality of education (see Section 2.3.1), when evaluating the effects of the quality of education on test performance, it is hypothesised that there will be a significant difference present in the local sample's performance between rural and urban schooling backgrounds for all three trials of the ROCF test (Copy, IR, DR).

H3. Based on literature noted on age effects (see Subsection 2.6.4.1), it is hypothesised that a significant difference will be present in the local sample's performance for all three trials of the ROCF test (Copy, IR and DR).

H4. With limited literature discussing the significant effect of the sex of participants (see Subsection 2.6.4.2), the present study hypothesised that there will be no significant sex effects present in the local sample's performance for all three trials of the ROCF test (Copy, IR and DR).

1.5 Thesis Preview

Various chapters of this research project will provide some critical insight into those aspects regarding the history of psychological assessment in South Africa that have contributed towards this field's controversial status today (Laher & Cockcroft,

2014). It will also identify positive contributions of psychological assessment that have facilitated South Africa's movement towards a more just and equitable society (Laher & Cockcroft, 2014). Socio-cultural considerations as well as the different categories of norming outlined in psychological assessment will be discussed. Lastly, attention will be given to the elucidation of the ROCF test and to the neuropsychological paradigm.

The Thesis will be structured as follows:

An introduction of the present study focusing on psychological assessment measures in South Africa is presented in chapter one. The purpose, aim, focus and hypotheses of the present study are also highlighted in this chapter. Chapter two will focus on literature grounded on the history of testing in South Africa and the establishment of norms for different populations. Chapter three will describe the methodology and research design utilised by the present study. While chapter four presents findings from the data gathered. Chapter five presents the discussions, recommendations and limitations of the present study.

1.6 Chapter Summary

Chapter one provides an introduction to the study focusing specifically on the relevance of psychological assessments in the South African diverse context. It also highlights the purpose and aims of the present study. Lastly, chapter one generated hypotheses according to the discussions elucidated from the brief background information presented at the beginning of the chapter.

Chapter 2

Literature Review

2.1 Introduction

The chapter provides a brief history of psychological assessment in South Africa. Thereafter the concept of socio-cultural factors influencing test performance together with Norm considerations and Neuropsychological assessment will be discussed. Chapter two concludes with a discussion on the ROCF and the domains of functioning it measures.

2.2 Historical overview of psychological assessment in South Africa

The need for valid and reliable psychological tests in South Africa's multicultural context is well recognised. In South Africa, psychological assessments are considered a necessary tool for equality and the efficient management of personal development (Plug, 1996). Claasen (1997) remarks that the introduction of psychological assessment originates from South Africa's colonial heritage. Psychological assessment in South Africa developed as an area characterised by an unequal distribution of resources based on racial groups [Blacks, Colours, Indians and Whites] (Foxcroft & Roodt, 2013). Classen (1997) asserts that the administration of psychological tests in South Africa cannot be disassociated from the country's political, economic and social history. Undoubtedly, any justification of the history of psychological assessment in South Africa requires to effectively argue the large influence apartheid policies had on test development and test use in South Africa (Nzimande, 1995). In order to do that, one needs to briefly discuss South Africa's history as well as the history of psychological assessment before, during and after apartheid.

In 1948, the National Party, regarded as the dominant political party at the time in South Africa, introduced a system of racial segregation called 'apartheid'. Apartheid ensured the social, economic and political privilege for white South Africans, whilst black South Africans (referred to as non-whites) were denied access to basic material resources, opportunities and freedom (Heuchert, Parker, Stumpf & Myburgh, 2000). These divisions and policies created further social separation within the black

population. South African Indians had a higher socio-economic status, followed by coloureds, whilst the black population was the most severely suppressed. The populations of Indians and coloureds had better access to infrastructure and basic resources such as water, electricity and housing, whilst the black South African population were denied many of these basic needs. The Black population was forced to accept an identity controlled by a series of policies that separated and subjected them to underprivileged areas. The areas set aside for the black population were very small, with little or no infrastructure, resulting in further oppression of this particular population group (Heuchert et al., 2000).

As a result of this economic suppression, inferior education and the denial of sufficient resources meant that the black populations were subjected to unfair and biased practices through psychological testing. According to Classen (1997) psychological testing came to South Africa through Britain, and the development of psychological tests in South Africa followed the same pattern as the United States of America (USA). However, there are differences in their development. Notably, South African tests were developed in a context of the unequal distribution of resources as a result of apartheid policies. Sehlapelo and Terre Blanche (1996) assert that tests were used in South Africa to determine who would gain access to economic and educational opportunities.

During apartheid, employment was preferably given to white individuals and an employment reservation policy was developed to ensure jobs for white educated South Africans. Psychometric testing and psychological assessment was misused to support these policies. For example, tests that were developed and standardised on educated white South Africans were administered to uneducated or poorly educated black South Africans. They were also used to indicate the superiority of the white intellect over the black intellect; this was done to justify the logic of the apartheid system. Scheepers (1974) asserts that urban subjects, when compared with rural subjects, had a slightly greater differentiated intellect, with education being the largest influence in the differentiation process. This practice led to the general mistrust of psychological assessment, especially among the black South African population (Foxcroft & Davies, 2008; Nzimande, 1995; Sehlapelo & Terreblanche, 1996).

Huysamen (2002) is of the same view and argues that, originally, psychological assessments in South Africa commenced with White test participants in mind. These tests emerged separately for Afrikaans and English-speaking groups and excluded the speakers of African Languages, which is the majority population group (Claasen, 1997). According to Abrahams and Mauer (1999, p. 76), members of historically disadvantaged Groups in South Africa had suffered similar patterns of discrimination as had minority groups in the United States of America, in so far as:

- They tend to be unfamiliar with the material used in the Psychological Test.
- Psychological tests measured different constructs from those which they had been designed and standardised for, and
- All groups in the multicultural society are not adequately represented in the standardisation samples used to derive norm tables.

2.2.1 Misuse of Psychological Assessments in South Africa

Post-apartheid, major changes were experienced in the field of psychological assessments in South Africa. This happened after fair and democratic elections were held in 1994. This major movement brought about ideas of social equality, adjustment and adaptation of psychological assessments (e.g. through adjusting test procedures or using a language that the testee understands while using standard protocols). However, the Apartheid era left a huge gap between fair and unfair use of psychological assessment. Participants undergoing administration are still subjected to the misuse and unfair practices of psychological assessments. This can also be related to impact of test results on populations where foreign norms are being used. The harsh reality and consequence of the Apartheid era is that inequality is a reality to most South African black people. This has also results to unfair interpretation of results on populations where foreign norms were being used and the full potential of participants was not taken into consideration.

Misuse of psychological assessments in SA can be associated with one of the major dynamics faced by SA, poverty. According to the National Education Infrastructure Management System [NEIMS] (2011), because of poverty a majority of SA learners receive a poor quality of education in schools lacking basic facilities. Modisaotsile (2012) emphasises that the quality of education in the former DET/ township schools

has worsened in many instances since democratization and this may have contributed to some additional fall off in IQ test performance at this later point in time. Clearly these contextual issues have an influence on the development of IQ and causes educational disparities within SA population, that currently cuts across racial boundaries (Shuttleworth-Edward et al. 2011). Another component of misuse of psychological assessment is evident in a study conducted by Shuttleworth-Edwards and others in 2011, on WAIS-IV Normative Indications for Educationally Disadvantaged African First Language Individuals. The study asserts that the components of language render conventional methods of test adaptation very difficult. It is significant to retain the internationally relevant and competency of the Wechsler IQ test rather than embarking on a totally new test construction and to conduct the test in English ((Wechsler, 2014). This is understandable because constructing new tests in SA is expensive considering the past imbalances that need to be rectified, using money. This however, does not make the psychological assessment process easier or less unfair for those participants administered in a language that they do not understand.

Taking into account and acknowledging discourses challenging relevant psychological assessment in South Africa, such positive contributions facilitated by the field of psychological assessment cannot be ignored. There has been a handful of contributions to the psychological assessment field in South Africa. Amongst many significant contributions, the work of Simon Biesheuvel (1943, 1954) outlined by Laher and Crockcroft (2014), whose early work focused on investigating potential unfair problems in association with cross-cultural assessment, is deemed as important. He places emphasis on the significance of the influence that home environment, schooling, nutrition and other factors have on cognitive test performance in multicultural societies. Whilst developing discussions around that, Biesheuvel introduced the idea of adaptability testing to South Africa with the development of the General Adaptability Test Battery (Foxcroft & Roodt, 2013). According to Foxcroft and Roodt (2013) test adaptation refers to the process of making a psychological measure more applicable and relevant to a specific context, whilst holding on to the original meaning of the measure. These adapted test batteries were used for more equitable and fair means of testing Black people on their potential work capacity. This was an important contribution towards fair and equitable testing amongst race groups in light of South Africa's discriminatory historical landscape.

Another major contribution to psychological assessment was one made by the new Constitution of the Republic of South Africa. Van de Vijver and Rothmann (2004) contended that since the first Democratic elections in 1994, South Africa has been governed by a new constitution which advocates for basic human rights and equality. Changes brought by the new constitution had a major influence on psychological assessment. Demands on appropriate and relevant psychological tests and their usage were placed in the view of public attention. According to Owen (1991) and Maree (2000), the majority of South Africans regard the use of separate tests for different cultural groups as unacceptable. Sibaya, Hlongwane and Makunga (1996) express concerns about the relevance and effectiveness of psychological assessments used in South Africa. A question arises as to whether construct-irrelevant variance due to factors such as language deficiencies or cultural factors, rather than a poor standing on the construct of interest, accounts for poor performance of some groups (Huysamen, 2002). Discussions on the development of relevant psychological assessments in South Africa have emerged with a view to offering possible solutions. Shuttleworth-Edwards et al. (2014) is of the assertion that more culturally-relevant new tests should be developed. Research should also be conducted on existing non-westernised tests in order to ensure that the meaning of a derived test performance can be understood (Shuttleworth-Edwards et al., 2014). Thus, South African psychologists have decided to use some of the Westernised test instruments, mostly from the USA or United Kingdom (UK) in combination with locally-derived norms (Classen, Knynauw, Paterson & Mathe, 2001). The availability of such norms is asserted to be of significance to the field of psychological assessment in South Africa.

2.3 Socio-cultural considerations

2.3.1 Quality and Level of Education

Dotson, Triolo, Evans and Zonderman (2008) are of the cautions that whilst normative studies frequently distinguish groups based on variable such as age, sex and race, none of the currently updated studies have reported norms based on literacy. The researchers are surprised by this, given the well-documented impact of literacy on cognitive performance (e.g. Ardila, Ostrosky-Solis, Rosseli & Gomez, 2000; Manly, Byrd, Touradji, Sanchez & Stern, 2004). Illiteracy is associated with poor cognitive performance, even after controlling for the effect of years of education (Manly

et al., 2002, 2004), and literacy has been found to better predict cognitive performance over years of education (Byrd, Jacobs, Hilton, Stern & Manly, 2005). Different factors are been attributed to the difference in cognitive performance between literate and illiterate individuals: "...it has been suggested that heuristics, which are associated with the development of test-taking strategies, are acquired when one learns to read" (Byrd, et al., 2005, p. 2).

In addition, differences in cognitive abilities between educated and uneducated individuals have been attributed to intervening variables such as poverty and low socioeconomic status, which are associated with less cognitively stimulating environments and disorders of the nervous system (Ardila et al., 2000). The application for cognitive test ability from one ethnic group to another, without appropriate standardisation is well recognised and is highly problematic for diagnosis, placement and everyday life situations in South Africa (Ardila, 1995; Ardila & Moreno, 2001). According to Shuttleworth-Edwards, Kemp, Rust, Minrhead Hartsman and Radloff (2004), during the time of globalisation and the rapid movement of previously disadvantaged individuals to urbanised conditions, there was a marked variation of the socio-cultural features within ethnic groups. These socio-cultural influences encompassed a number of closely interrelated variables that are difficult to separate, including the quality and level of education, acculturation and language. These socio-cultural features have a variety of effects on cognitive performance.

According to Laher and Cockcroft (2014), since 2014, South Africa is into its 20th year since the 1994 elections that marked the official end of apartheid and led South Africa into a Democratic Government. During this time, the Discipline of Psychology has marked significant changes, several which relate to the sub-discipline of psychological assessment. Therefore, in order to better understand the milestones developed in relation to psychological assessment, the challenges faced by the diverse racial and ethnic groups that were developed under the apartheid government such as non-white population groups such as blacks, coloureds, Indians and Asians need to be understood. Challenges such as not having the privilege to obtain a high quality of education, that was available to the White population of the same generation, are of critical importance in understanding the differences in neuro-cognitive function tests such as the ROCF (Boone, Victor, Wen, Rozani & Ponton, 2007).

The history of South Africa and psychological assessment has had a great impact on the South African education system. It is of the view that “Apartheid in South Africa and the relation between education and wealth have generally meant poorer learners in South Africa perform worse academically” (Spaull, 2013, p. 6). Although apartheid ended years ago, schools which served primarily White learners under the apartheid regime remain functional (although now racially mixed), whilst the majority of those which served Black learners remain dysfunctional and unable to provide the necessary resources and literacy skills to learners. This has resulted in a generational cycle of poverty where children inherit the social standing of their parents or caregivers, irrespective of their own abilities or effort (Spaull, 2013). The quality and level of education are important factors that influence individual performance on neuropsychological tests (Ardila et al., 2000; Hooren et al., 2007; Shuttleworth-Edwards, 2004; Strauss, Sherman & Spreen, 2006). Quality of education is regarded as being either high (i.e. having an advantaged education) or low (i.e. having a disadvantaged educational background) (Lowin, 2012). Woff (2014) gives explanation that being a disadvantaged person in South Africa can be interpreted in different ways, but commonly, it means bad health, low income and/ or unemployment and poor housing. Therefore, having a disadvantaged education can be attributed to being disadvantaged in South Africa.

The level of education in the South African context is traditionally defined as the total number of years of education an individual has completed, based on the number of years it generally takes to complete a particular grade/level of education (Shuttleworth-Edwards et al., 2004). Nell (2000) asserts that it is within the formal education setting that individuals learn to hold a pencil and to purposefully ignore external distractions in order to complete a task in a specific manner. Nell (1999) places emphasis on this and further states that “in a developing country, setting schooling alone is a crude indicator because it says nothing about those aspects of schooling quality that are taken for granted in western settings” (p. 133).

The level of teacher training and the extent and quality of resources such as heating, electricity, desks, writing and reading materials, and laboratory facilities can be questioned (Nell, 1999). It is expressed that “With its mixed developed-developing country status, and history of racial discrimination, South Africa exemplifies this factor

of educational discrepancy” (Donnelly, 2001, p. 15). Prior to the lifting of the discriminatory Apartheid political system in 1991, black learners under the Department of Education and Training (DET) had access to between 5% and 25% of the resources which the white learners were guaranteed (Claasen et al., 2001). This considerable inequality in educational systems and its potential detrimental effects on cognitive test performance for black versus white South Africans cannot be disregarded. Since 1991, there has been an increase in the number of black learners (typically of higher socio-economic status in urban settings) who have accessed a better quality private or equivalent state ex-model C education. Within the black population group alone, therefore, the acculturation variable of quality of education must be expected to yield significant differences on cognitive testing (Shuttleworth-Edwards et al, 2001).

During the apartheid era, the Department of Education and Training (DET) also known as Bantu Education was a schooling system which educated the majority of Black South Africans (Classen et al, 2001). According to Rakometsi (2008), Bantu Education was solely designed to “deprive the most vulnerable sector of the population, the African child, of obtaining a modern, free and enlightened education”. In South Africa, before 1955, education for all races was under Provincial Administrations. Until 1948, all races received equal education. When the National government came into power, the educational system that was used by the Provincial Administrations was thought to be unsuitable. This resulted in drastic changes having taken places due to the apartheid’s influence on the system. It was decided that each race group should have its own system of education and a special curriculum was developed, based on this new idea of a supposedly suitable education system. The learner’s mother tongue became the medium of expression and instruction at the Primary school level. Major changes started taking place and among those affected were the Mission schools who, for years, had been involved in admirable work in the education of black learners, and were now forced to use the Bantu Education System (Rakometsi, 2008).

Rehman (2008) further states that, according to the new Bantu system, black education was the least financed and could not educate the whole population. In the Eastern Cape, before the system was put into place the majority of the population was able to read and write but after the Bantu system came into play, the results became

considerably worse (Rehman, 2008). Despite the desire to rectify past imbalances caused by the Apartheid system, the detrimental effects of the substandard DET schooling system remained measurable in psychological test performance (Andrews, Shuttleworth-Edwards & Radloff, 2012; Fike, Knoetze, Shuttleworth-Edwards & Radloff, 2012). Based on a study conducted by Shuttleworth-Edwards, Kemp et al. (2004) the performance of black South African learners that were historically exposed to Model C education, on the Weschler Adult Intelligence Scale- Third Edition (WAIS-III) was equivalent to American population norms. However, learners who were from the same demographic area and educated in former DET schools achieved 20 to 30 IQ points lower. It is important to note that the outcome was replicated in a subsequent refinement of the original WAIS-III study and in respect of the Weschler Intelligence Scale for Children-Fourth Edition (WISC-IV) (Shuttleworth-Edwards, Gayland, & Radloff, 2013; Shuttleworth-Edwards, Van der Merwe, Van Tonder & Radloff, 2013). The same findings were replicated in a study using the WAIS-IV (Pienaar, Shuttleworth-Edwards, Klopper & Radloff, 2016). Essential to this body of research, it is evident that detrimental effects associated with a relatively poor quality of education were noticeable for both verbal and non-verbal tests. On the other hand, the study found an equivalent performance of the Digit Symbol-Incidental learning subtest for both groups.

The above mentioned researchers converse that the level, the quantity and quality of education for the most part contributes significantly to differences in cognitive test results. However, there may be exceptional culturally independent instances, such as those associated with the incidental visual learning test (De Kock, 2012). Mitrushina et al. (2005) asserts that it cannot be assumed that international normative indications for all neuropsychological instruments are indiscriminately applicable to local demographic groups, especially concerning previously disadvantaged population groups (Andrews et al, 2012; Fike et al, 2012; Shuttleworth-Edwards et al., 2004; Shuttleworth- Jordan, 1996).

2.3.2 Acculturation

One of the socio-cultural variables that has an influence on test performance is acculturation. This is particularly relevant in a South African context where the population was previously segregated and educated separately on the grounds of racial differences. Donnelly (2001) asserts that the “apartheid structure of ‘separate development’ was dissolved with the advent of democracy, and increasing shifts towards integration, urbanisation and westernisation have resulted” (p. 11). The increased need for cognitive testing in this diverse population makes demands for culturally relevant test usage. Whereas there has, in the past, been pressure to abandon tests developed in North America and UK for fear that they are culturally irrelevant, new discourses about understanding test performance, adjusting and standardising such measures appropriately came to the fore (Claasen et al ., 2001). Manly et al. (1998) defines acculturation in terms of “the level at which an individual participates in the value, language and practices of his or her own ethnic community versus those of the dominant culture” (p. 292).

If one considers that most neuropsychological measures originate from the predominant North American and European cultures, the extent to which a person has been acculturated to this dominant western culture determines their measured neuropsychological test performance. It follows that members of the same racial group may have been exposed to expansively differing degrees of acculturation, and may therefore not possess equivalent socio-cultural characteristics (Gasquoine, 2001; Manly et al, 2000). Acculturation has played an important role in South Africa, especially around the 1980's where Private schools in South Africa become increasingly multi-racial and for that reason, a reasonable amount of non-Caucasians were exposed to advantaged education. From 1991, former Model C schools became multi-racial and former (Department of Education) schools were no longer restricted as they had been during apartheid (Gaylard, 2005). The above discussion acknowledges the crucial issues around socio-cultural variables and test performance. Furthermore, the change in test performance in South Africa is increasingly emphasised as more and more non-white populations are exposed to better education.

Nell (2000) explains that the importance in test taking, or what he refers to as “test-wiseness” (p.64), depends primarily upon adequate exposure to the testing environment and following appropriate rules and procedures of the test taking criterion. Specifically, with the testing environment, Nell (2000) asserts that test takers who are not “test wise” may, for example, not realise the importance of accuracy and response speed. According to De Kock (2012), such test participants may not be conscious of the demands that the task requires of them. To the administrator, these test takers could appear to be demotivated or resistant. Nell (2000) asserts that if the influence of acculturation to the test taking environment is not present in the test taker, test performance would more readily reflect a deficit in “test-wiseness” than actual cognitive ability.

2.3.3 Language

Language is also among many socio-cultural variables which have an influence on test performance. Gollnick and Chinn (2006) define language as a “vehicle for communication, a means of shaping cultural and personal identity, and a way of socialising an individual into a cultural group” (p. 1). With language, one transforms, modifies and shapes much of one’s cognition. Through language, one gains a sense of time and as a result, one acquires the ability to describe events temporarily removed to reflect on the past and anticipate the future. It is also purported that “language is a preferred performatory medium, nowhere more than in western civilization” (Gollnick & Chinn, 2006, p.2).

Bachman and Palmer (2010) assert that the real world in which assessments are administered is “often unpredictable” and “includes” many uncertainties and conflicts, and is constantly changing (p.2). One of those unpredictable uncertainties that administrators are faced with is the use of language during administration. According to Gardiner (2008), language is not only about reaching a specific goal or getting something done. In South Africa, language carries cultural value and histories. It shapes the thought processes of individuals towards understanding the world. In South Africa, current language policies are focused around maintaining the home language (also referred to as mother tongue) whilst providing access to the effective

use of at least one additional language (Gardiner, 2008). Although English is the predominantly used language in educational and commercial environments, only 10% of South Africa's population utilise it as a home language (Ngonini, 2004).

English is perceived to be essential to certain kinds of further education, employment and a privileged status. Many people, including those in rural areas, want to learn English and be fluent in it (Ngonini, 2004). However, given the high levels of illiteracy among adults and the infrequent exposure to languages such as English at fluent and competent levels, rural children have little opportunity to live, think and work in a language environment beyond that of their mother tongue (Ngonini, 2004). The Nelson Mandela Foundation (NMF) (2005), one amongst the significant voices regarding the views of the relevance of language, agrees that language plays an important role in test administration and asserts that it is essential that all individuals (including urban and rural individuals) receive a deep skill in one language, preferably their own language, before learning another. Being able to learn and communicate in another language (e.g. English) could make it easier for them to perform optimally in cognitive ability tests.

2.4 Norm considerations

In acknowledging the inequality of past South African psychological practice and in an attempt to correct its discrimination, the present mental health policy states that appropriate norms are required in assessment (Freeman & Pillay, 1997). A well-known method for interpreting psychological scores is a normative one, in which an individual's score is compared to another in the same measure. It is explained that "The distribution of scores obtained by the individual is termed a norm. A norm is therefore the distribution of scores obtained from a standardisation" (Moerdyk, 2009, p. 59). This clearly implies that psychologists must be able to rationalise the use of any particular instrument and norms (Watts, 2008). Mitrushina, Boone and D'Elia (2005) assert that test results are only meaningful if compared to a demographically similar population. In order for the test taker to make sense of test performance, in both a diagnostic as well as an "absolute" sense (Meyers & Meyers, 1995, p. 39), the results should be considered in relation to the average performance of the population within which the test taker falls.

Traditionally, normative indications have been stratified in terms of age, sex, educational level, ethnicity, language, handedness and IQ (Strauss, Sherman & Spreen, 2006). Foxcroft and Roodt (2005) posit that, at present, appropriate normative indications are not available for large sections of the population. This poses a problem when attempting to interpret South African test performance with only European and American norms available. ROCF test performance can only be interpreted, and be considered meaningful, if compared to demographically equivalent norms (Mitrushina et al., 2005). When designing a test battery, it is vital to consider the functional modalities that must be covered; however, another crucial factor in the selection of which tests to use is the availability of normative data (Mitrushina et al., 2005). Nell (1999) is of the view that, whilst for many tests there are plentiful norms available, “good norms are indeed rare” (p. 94). To Strauss et al. (2006), it is most important to know the specific characteristics of any normative dataset.

Clear and extensive demographic information about the sample should be detailed as fully as possible, including information about geographic location. The inclusion and exclusion criteria for the sample should also be fully outlined. The test(s) should be uniformly administered in a standardised format and scored according to clear quality control measures (Nell, 1999). Strauss et al. (2006) point out that the selection of appropriate normative data is as important as the selection of which tests to use. The current thinking is that norms should either reflect the general population as far as it is possible or that norms should be as closely aligned to the demographic profile of the person being tested, in as far as it is possible. Which norms to choose must depend on the purpose of testing, for example, where the goal is to gather the strengths and weaknesses of an individual, to plan specific treatments or to assess the extent of disability, the individual must be compared to the best matched demographic subgroup available (Strauss et al, 2006).

There are various challenges associated with the selection of appropriate normative datasets for clinical use. For example, there may be alternative sets of norms available for comparison with a particular test, and this can result in dramatically different interpretations (Andrews & Shuttleworth-Edwards, 2008). Norms can be outdated or badly researched (Strauss et al., 2006). Norms are also scarce and may be difficult to find as they may be embedded within clinical studies in the literature

(Mitrushina et al., 2005). Tests are often developed and normed in Europe or the USA, and this presents a particular problem from a socio-cultural perspective when applying these norms to other contexts. Thus, these challenges must be carefully considered.

It is of importance to note that the potential cost of comparing test results against incorrect normative data is high as it may lead to faulty conclusions being drawn (false positive or false negative diagnoses) (Andrew & Shuttleworth-Edwards, 2008). In practical terms, deficits may be over- or underestimated, thus leading to incorrect and possibly even damaging interventions, placements, and treatment plans. Individuals may fall just above or just under specified cut-offs that determine whether they qualify for specific types of financial compensation, rehabilitation, or placement in a particular facility (Strauss et al., 2006). Incorrect judgments based on the interpretation of neuropsychological tests may negatively impact upon an individual's life and have a negative ripple effect on the lives of those associated with the neuropsychological test subject. The American Psychological Association's Code of Ethics demands that psychologists assume the ethical responsibility for selecting the most applicable norms for a particular individual and make special mention of the demographic factors that must be considered in such a selection (Mitrushina et al., 1999). This viewpoint is also stated in the Health Professions Council of South Africa's Rules of Conduct pertaining specifically to Psychologists (HPCSA, 2008).

There are two different categories of norms outlined in psychological assessment literature, both of which have been applied for norming purposes within the South African context, including: (1) population-based norms (standardisation data), and (2) demographically focused within-group norms (Mitrushina et al., 2005; Strauss et al., 2006). Population-based norms are generally representative of the population in a country. These norms are based on large samples that have a fair representation of the population distribution in terms of demographic variables of sex, race group and geographical region, as established on the basis of the most recent data. In contrast to population-based norms, demographically focused within-group norms are specifically not designed to be generally representative of the entire countrywide population. Rather, these norms represent a nominated subgroup of the population as closely as possible, in terms of highly delineated demographic variables, and are derived from much smaller samples (Mitrushina et al., 2005; Strauss et al., 2006). The

current study will focus on the development of within-group norming indicators for the ROCF test for a Xhosa-speaking group of adults who possess a disadvantaged educational background.

In a previous study conducted by De Kock (2012) on the normative indications for the Rey-Osterrieth Complex Figure Test, a within-group norm procedure was utilised to stratify a sample. The sample was stratified into two age groups (18-29 and 30-40 years). Both sex and level of education were equally distributed within these age groupings. Within-sample statistical comparisons indicated no significant effect pertaining to the sex of candidates in all three trials (Copy, IR or DR). Similarly, no significant age effect was present in the Copy trial. Significant age effects were observed for both recall trials (IR and DR). The local sample's mean performance was descriptively and statistically compared to demographically equivalent non-local normative studies (De Kock, 2012). Excluding an uneducated Columbian sample's performance, the local sample performed significantly lower than all other available normative populations.

Lastly, the local sample performed significantly lower than scores derived from a meta-analysis of normative indications in respect of educationally advantaged westernised groups for all three trials ($p = .000$ in all instances). These results assert the crucial need for, and use of, culturally appropriate normative datasets in contemporary South African psychological assessments. Equally, these findings serve to highlight the significant influence of the quality of education on cognitive test performance, as it is seen as a critical socio-cultural variable that needs to be taken into consideration for norming purposes (De Kock, 2012). Within-group norming is attributed to establishing norms per cultural group; this type of norming is claimed to be effective and beneficial as research suggests that diagnostic accuracy is limited by comparing individual scores to populations that are diverse (Ardila, 1995).

2.5 Neuropsychological Assessment

Lezak, Howieson and Loring (2004) assert that Neuropsychological assessment is concerned with the way people behave and is also involved in the

investigation of psychological and behavioural signs of brain dysfunction. Such investigations typically answer questions about the existing cognitive status of a person for placement purposes, assists in providing a differential diagnosis, or indicates the extent of cognitive impairment due to known neuropathology (Andrew & Shuttleworth-Edwards, 2008). Part of this assessment process is the careful choice, motivated from the clinical history, of internationally recognised, standardised, reliable and well-researched neuropsychological tests from those available in the field (Mitrushina et al., 2005). Such tests are used as a means of further investigation in order to gain important information about the client's neurocognitive status.

The results retrieved from these tests play a pivotal role in building a logical picture of a person in which the clinical judgments and recommendations will be based. It is important to note that even with appropriate and well-matched norms available, test results may be interpreted in different ways because a test never taps exclusively into one cognitive function, but always requires different skills for completion (Rios, Perianez, & Munoz-Cespedes, 2004). Therefore, a complete neuropsychological assessment typically comprises a number of neurocognitive tests that tap into a range of domains of functioning (Andrew & shuttleworth-Edwards, 2008). A neuropsychological test battery that is carefully selected is considered an important part of neuropsychological assessment and would include tasks grouped under broad cognitive domains of function. It is explained that "In every case, neurocognitive tests measure more than one cognitive function; there are subtle variations both in how the authors of the seminal neuropsychological texts conceptualise the broad functional modalities, and in which modalities particular tests are placed" (Andrew & Shuttlewrth-Edwards, 2008, p. 2). For example, Groth-Marnat (2000), Heilman & Valenstein (2003), Lezak et al. (2004), Mitrushina et al. (2005), Strauss, Sherman & Spreen (2006) conventionally identify distinct functional domains . These functional domains are Visual and Verbal memory, Hand-Motor function, Attention, Visual Perception, and Language and Executive Function. The Rey-Osterrieth Complex Figure Test is conceptualised as a test of Memory, Attention, visuo-construction ability and Executive Functioning (Mitrushina et al., 2005; Lezak et al., 2004). Therefore, it is evident that the authors (Mitrushina et al., 2005; Lezak et al., 2004) emphasise an approach to neuropsychological assessment that aims to collect a broad spectrum of information in order to answer the assessment question

appropriately, by conducting a collection of tests that tap into each domain of functioning. The different domains of functioning examined by the neuropsychology test battery ROCF will be discussed below.

2.5.1 Domains of functioning

2.5.1.1 Visual Memory. According to Eng, Chen and Jiangy (2005), visual working memory makes reference to an individual's ability to be able to hold visual information in mind for a few seconds. The connection between memory and vision is a particularly interesting domain of research because it concerns both the processes of memory and the nature of the stored representations (Luck & Hollingworth, 2008). Research on visual and working memory does not only seek to understand the nature of storing information, but also to characterise working memory capacity and shape models of visual working memory (Brady, Konkle, Alvarez, 2011). Vogel, Woodman and Steven (2001) support the view and include that the "basic unit of this capacity is often considered to be a single object" (p. 32). For example, when asked to remember both the colours and the orientations of particular objects, people perform as well as when asked to remember only the colours or only the orientations of those particular objects, even though the former task required the individual to remember more features (Vogel, Woodman & Steven, 2001). One of the most important aspects measured by the Rey-Osterrieth Complex figure is visual memory (Davis, Field, Anderson & Pestell, 2011) and this domain of function is required in everyday life in order to enhance regular functioning.

2.5.1.2 Attention. Lezak et al. (2004) explain that a deficit in attention would be marked by "distractibility or impaired ability to engage in focused behaviour, regardless of the inpatient's intention" (p. 349). Ponsford (2000) recommends that administrators should consider a few aspects of attention within neuropsychological assessment. These include "i) visuospatial orientation and shifting attention; ii) alertness, vigilance or the ability to maintain attention; iii) selective or focused attention; and iv) working memory" (p. 359). Attention is referred to as the process that, at a given moment, enhances some information and inhibits other information. The enhancement enables one to select some information for further processing, and the inhibition enables one to set some information aside (Dijksterhuts, Chartrand &

Aarts, 2007). Although one has an understanding of what it means to “pay attention” to an object or event, the study of attention has a long history in cognitive psychology, filled with debate and disagreement. Some have suggested that “everyone knows what attention is” (p.104).

Outlined in Franconert and Simons (2003), other researchers are of the view that “no one knows what attention is” (Pashler, 1998). For example, Moray (1970) proposed six different meanings of the term “attention”, whereas Posner and Boies (1971) suggest that attention has three components: orienting to sensory events, detecting signals for focused processing, and maintaining a vigilant or alert state. Still others have used terms such as “arousal”, “effort”, “capacity”, “perceptual set”, “control”, and “consciousness” as synonymous for the process of attention. Adding to the difficulty is the problem of designing and carrying out careful and systematic studies of attention for the very reason that attention selection appears to occur so naturally and effortlessly and that it is difficult to pin down experimentally. However, there is broad agreement that attention involves selecting some information for further processing and inhibiting other information from receiving further processing (Franconert & Simons, 2003). The above-mentioned authors define attention differently; nevertheless they all postulate that attention is a very significant domain of function required in everyday functioning and for human development.

2.5.1.3 Visuo-construction Ability. Visuospatial Constructive cognition refers to the ability to see an image as a set of parts and then to construct a copy (replica) of the original from these parts (Genet, 1999). Human beings are diverse and their ability to perform these visuospatial constructive abilities differs, as some individuals draw extremely well and others cannot draw at all. Fernando, Chaid, Butcher and Mckay (2003) postulate that the Rey-Osterrieth Complex Figure (ROCF) copy phase is a measure of the visuospatial constructional ability whilst the recall phase of the task evaluates an individual’s ability with encoding complex visual information into longer-term storage and then recalling this information at a later time. Hubley and Jassal (2006) are in agreement with the above statement and assert that there are a number of situations in which the ROCF can be administered to measure an individual’s visuospatial constructional ability.

2.5.1.4 Executive Functioning. Executive functioning is vital in everyday life as these functions enable people to interact and engage successfully in independent, purposive, self-serving behaviour. Lezak (1995) outlines that this involves the “how and whether a person goes about doing something” (p.42). As such, this functioning advance gradually, and in middle childhood, it significantly improves (Louw & Louw, 2014). Cognitive functioning deals with one’s intelligence, whereas executive functioning deals with the way in which one does things (Lezak, 1995). Executive functions include the ability for planning, cognitive fluency and judgement involved in everyday life. The ROCF can be used not only for the assessment of the visuo-constructive ability and visual working memory, but also for executive functions (Stuss & Levine, 2002).

2.6 Rey-Osterrieth Complex Figure Test

2.6.1 Introduction

The Rey Osterrieth Complex Figure Test (ROCF) was developed as a diagnostic instrument by a clinician, Andre Rey. Meyers and Meyers (1995) asserts that the ROCF requires a test taker to draw an image which comprises of three trials (Copying trial, Immediate Trial and the Delayed Trial). The ROCF test does not require a test taker to replicate a perfect image; it is, however, essential to note that people with brain injuries or other neuro-cognitive deficiencies struggle to copy and recall the different elements of the complex image (Mitrushina et al., 2005). The complex image consist of 18 different structural elements, each scored separately (Lezak et al., 2004). For a number of years, the ROCF test and its scoring system has been interpreted in various ways (Strauss, Sherman & Spreen, 2006). Nevertheless, the standard or ROCF version remains widely researched (Meyers & Meyers, 1995).

2.6.2 Administration and Scoring

Knight (2003) asserts that the administration of the ROCF is undemanding and uncomplicated. The administrator provides the participant with a blank, unlined A4 page, a variety of coloured pens, preferably black, blue, green, pink, red and purple, accompanied by a copy of the complex figure test to be copied. The participant is given

different colour pencils interchangeably and switched after specific time periods. He/She is requested to reproduce the complex figure onto the unlined, blank A4 page, placed in front of him/her (CT). When the participant has completed the first trial of the task, everything is taken away. Immediately (in 3 minutes' time) the participant is provided with a new unlined, blank A4 page and a regular pencil and is requested to reproduce the complex figure image, this time without being provided with a copy of the complex figure to copy from.

The participant is requested to recall what he/she had just reproduced 3 minutes ago (Mitrushina et al., 2005). The instructions are as follows: "copy this drawing as well as you can. Make sure you do not leave out anything" (p. 242) (IR). No time limit is provided but the time spent drawing the image is observed. After 40 minutes, the administrator provides the participant with a third unlined, blank A4 page and is requested to reproduce the complex figure test for the last time (DR) (Mitrushina et al., 2005). The ROCF is noted to be scored both quantitatively and qualitatively (Strauss, Sherman and Spreen, 2006). However, according to Meyers and Meyers (1995a) the ROCF has the most widely researched quantitative scoring system. There are various scoring systems used for the ROCF test; these systems determine the inclusion and accuracy of the reproduction of each design element of the ROCF and the scoring system assigns points for the inclusion of each small detail in the ROCF (Smith et al., 2005).

2.6.2.1 Scoring criteria. Lezak (1983) evaluated Osterrieth's scoring criteria. Osterrieth (1944) elucidated 18 components of the complex picture and assigned point values of 0 to 2 to each component depending upon the degree to which the components are accurately drawn and positioned. Osterrieth assessed organisational structure in the context of seven different procedural types. Waber and Holmes (1986) explain that Osterrieth's criteria provides "a basis for comparing a child's performance to that of the normal group, but it is insensitive to aspects of the production that may be of considerable theoretical significance" (p. 265). Precisely, Waber and Holmes (1985) argue that Osterrieth's criterion lacks "(1) a valid and reliable method for assessing parameters that are most relevant for neuropsychological diagnosis; and (2) detailed developmental descriptive data" (p. 265).

Waber and Holmes (1985, 1986) and Bennett-Levy (1984) proposed details of alternative scoring systems. In order to analyse detail, Waber and Holmes (1985, 1986) categorized the ROCF design into the smallest line segments possible and empirically assessed each part as to accuracy, intersections, alignments, and direction of implementation. Using this method, inter-rater reliability was calculated at 95%. Additionally, the drawings were evaluated for goodness of organisation accuracy. The organization rating was based on a 5-point scale ranging from “poor (1) to excellent (5). Style rating included four categories: (a) part-oriented, (b) exterior configuration/anterior part-oriented; (c) exterior part-oriented/interior configurational; and (d) configurational” (p.266).

Bigler (1988) and Bigler, Rose, Schultz, Harris, Hall and Harris (1989) utilised methods outlined by Denman (1984) to score the ROCF, where a maximum score of 72 may be achieved. Two references were provided in the literature: "Denman, S. B. (1984). *Denman Neuropsychology Memory Scale* [italics added], Charleston, SC: Privately published" (Bigler. 1988, p. 295), and "Denman S. B. (1984). *Manual for the Denman Neuropsychology Memory Scale* and Charleston, SC: Privately published" (Bigler et al., 1989, p. 280). No further direction regarding the scoring method was offered. Levine, Warach, Benowitz and Calvanio (1986) did not specify the scoring criteria used on the ROCF. These researchers integrated ratings on the ROCF with ratings on other tests to develop an overall severity rating for stroke victims. Loring, Lee and Meador (1988) scored the copy production in accordance with Osterrieth's (1944) 18-point detail rating only for the purpose of excluding patients from the study who did not achieve a certain score. Recall productions were also scored according to Osterrieth's (1944) 18-point detail rating, but this yielded no significant differences. Loring et al. (1988) developed a new qualitative rating focusing on distortion and misplacement errors. With this rating system, significant differences were found between right and left temporal lobe epilepsy patients, with patients with right temporal epilepsy exhibiting a greater number of errors.

The present study will make one aware of the most frequently used and considerably researched quantitative scoring system, which is arguably the ROCF (Meyers & Meyers, 1995). This scoring system is utilised by the “commercially available Rey-Osterrieth Complex Figure Test manufactured by Psychological

Assessment Resources” (De Kock, 2012, P.20). The first step in scoring the ROCF is awarding the test taker points for the ability to accurately produce each of the 18 components of the complex image. In each trial, the administrators observe the manner in which the test taker approaches the task provided to him/her (Strauss, Sherman & Spreen, 2006). Taylor (1998) developed traditional guidelines for scoring the ROCF in which the scoring system consists of 18 certain traits of the figure. Each of these traits are then evaluated according to a two-point scale.

The two points are granted if the trait of the ROCF is placed and reproduced correctly. Only one point is remove provided if the trait reproduced is distorted, incomplete but placed properly, or complete but placed poorly; a 0.5 point is credited when the trait is distorted or incomplete and placed poorly. Zero is given when the trait is absent or not recognised (Caffarra, Vezzadini, Zonato, Copelli & Venneri, 2003). Osterrieth (1944) observed seven distinct types of procedural styles associated to the drawing of the ROCF (Table 1). Further qualitative information may include: time taken, pressure of pencil on paper, concentration or motivation observed in the asking of questions pertaining to the task (De Kock, 2012).

Table 1. Osterrieth (1944) Rey Complex Figure Procedural Types

I	Subject begins drawing the large central rectangle and detail is added in relation to it.
II	Subject begins with a detail attached to the central rectangle, or with a subsection of the central rectangle, completes the rectangle and adds remaining detail in relation to the rectangle.
III	Subject begins by drawing the overall contour of the figure without explicit differentiation of the central rectangle and then adds the internal details.
IV	Subject juxtaposes details one by one without an organising structure.
V	Subject copies discrete parts of the drawing without any semblance of organisation.
VI	Subject substitutes the drawing of a similar object such as a boat or house. The drawing is an unrecognisable scrawl.

Note. As cited by Lezak et al., 2004

2.6.2.2 Meta-analytic findings. Gallagher and Burke (2007) remark that because of the variance in administration and scoring systems, meta-analytical studies

on the ROCF are few and far between. Outlined in De Kock (2012) a meta-analysis on all available normative studies of the ROCF was performed by Mitrushina et al. (2005). The use of a standard 36 point scoring system was a central parameter for the meta-analyses, which therefore incorporated the above-mentioned Meyers and Meyers' (1995) approach. Nine studies were included in this analysis, with a total sample size of 1340 for the Copy trial, 1086 for the Immediate Recall trial and 1056 for the Delayed Recall trial. It is essential to note that this analysis focuses primarily upon the mean performance of the three trials and does not mention organisational strategy. Within these studies, Mitrushina et al. (2005) investigated the relationship between age and mean test performance (as indicated in Table 2).

Table 2. Meta-analytical Predicted Mean Scores of ROCF, by Age-Copy. IR and

DR

Age	Copy		Immediate Recall		Delayed Recall	
	M	SD	M	SD	M	SD
22-24	35.04	1.10	24.92	4.87	25.18	6.67
25-29	34.99	1.39	24.82	5.49	24.87	6.67
30-34	34.88	1.70	24.58	6.07	24.41	6.67
35-39	34.69	2.01	24.18	6.55	23.85	6.67
40-44	34.43	2.32	23.64	6.93	23.17	6.67
45-49	34.11	2.64	22.95	7.19	22.38	6.67

Note. Mean (M) and Standard Deviations (SD) represents scores out of 36 using the Standard and ROCF scoring system. On the basis of a regression of SDs on age, the SD for the aggregate sample is used with all age groups (Mitrushina et al., 2005, p. 792).

Using regression analyses, Mitrushina et al. (2005) found that age had a significant effect upon all three trials' performance. On the other hand, they observed that sex did not consistently significantly influence mean performance. An additional analysis was conducted by Mitrushina et al. (2005), utilising the same parameters. They sought to investigate the effect of education on test performance. As with sex, it was noted that education did not have a consistently significant effect on test performance. Nevertheless, large variances in the studies were observed, which attributed to external factors not mentioned by the researcher (De Kock, 2012).

2.6.2.3. Colour Pencils. The manner in which the procedure is approached by the participant is assessed through the use of different colour pencils. This is part of

the original procedural method set forth by Osterreith (Lezak, 1983). According to Lezak (1983) changing and controlling the order in which colour pencils are used enables the examiner to determine the approach and sequence with which each element of the drawing is completed. Lezak (1983) described the use of colour pencils but also explained that some examiners keep a detailed record of the subject's copying sequence by reproducing the performance and numbering each unit in the order that it is drawn. Bigler et al. (1989) and Loring et al. (1988) reported that standard administration of the ROCF was performed according to Lezak (1983). Although this is interpreted as meaning the use of colour pencils, it remains unclear as Lezak (1983) described both methods. Bennett-Levy (1984) and Klicpera (1983) used one pencil and relied on the examiner's observation to appraise the procedural method. Levine et al. (1986), Bigler (1988), and Crosson and Wiens (1988) did not specify this element of the procedure. Waber and Holmes (1985) offered a detailed description of the use of colour pencils:

When the tester signalled to the children to start, they were to pick up a designated colour pencil and begin to copy the design. When told to switch, they would put down that pencil and continue drawing with the next colour designated. This procedure continued until all the colours had been used. The time limit for each colour was 60seconds for kindergarten and first grade children, 45seconds for second to sixth graders, and 30seconds for seventh and eighth graders. The red pencil was always used last since red was thought to be a more salient colour than the others, and the order of presentation of the other four colours was randomised for each classroom group. (p. 267).

2.6.3 Neuropsychological Characteristics

Psychometrically, the ROCF comprises three separate trials (Copy trial, Immediate Recall trial and Delayed Recall trial). Knight (2003) emphasises the significance of these trials and asserts that they examine different domains of function. It is, therefore, essential to look at the three trials and discourses related to them.

2.6.31 Copying Trial (CT). The first trial in the ROCF administration process, known as the copying trial, taps into attention and visuo-constructional ability. A great

deal of spatial organisational ability is also required in order for the trial to be carried out successfully (Lezak, Howieson & Loring, 2004). The above-mentioned abilities are crucial as they enhance functioning and improve one's ability to function in daily life. Mervis, Robinson and John (1999) assert that the daily functions that are taken for granted, such as recognising faces, drawing, buttoning shirts, making a bed and putting furniture together, to name a few, are measured in the first trial. Lu, Boone, Cozolino and Mitchell (2003) assert that these abilities are very important in everyday functioning as impairment can have a devastating effect on simple daily functions.

2.6.3.2 Immediate Recall Trial (IR). The second trial measures whether an individual is able to store information received in their short term memory and immediately retrieve that information from memory. Individuals who are not able to recall the image immediately might be associated with the inability to recall and have difficulty remembering what he/she has seen a second ago. Lezak et al. (2004) outline that the three trials in the ROCF test can prove to be difficult for patients with brain injuries. This can have a detrimental effect on an individual's everyday life as he/she is not able to function and retain information long enough to use it (Berry, Allen & Schmitt, 1991). The ability to perform in this trial is significant because, the performance permits the administrators of the ROCF to determine whether "incidental encoding of the sensory information" has taken place (De Kock, 2012, p.23).

2.6.3.3 Delayed Recall Trial (DR). The third trial measures long term memory. Long term memory refers to the storage of information over a long period of time (Berry et al., 1991). The ability to retrieve this information informs the capacity of functioning in everyday life. Long term memory allows for an unlimited amount of information to be stored. It is of significance as it allows individuals to remember facts that are important in life and tasks that are repeated frequently (Berry et al., 1991). As participants are not informed or alert about the DR trial, it provides administrators with evidence of whether long term visual memory encoding has taken place (Meyer & Meyer, 1995b). The unexpected nature of the DR trial limits participants from rehearsal and thereby emphasises the implicit visual memory component (Knight, 2003). This provides the administrator with the opportunity to collect evidence relating to encoding, controlling and the retrieving of information.

2.6.3.4 Organisation Procedure. De Kock (2012) postulate that the procedure in which a person follows as he/she attempts to copy or recall the complex figure is significant. The planning and organising of how the image will be structured on paper once the participant reproduces it, is indicative of executive functioning (Osterrieth, 1994). The way in which the participant approaches all trials clearly indicates whether there is effective storing and retrieval that is taking place (Strauss, Sherman and Spreen, 2006). This could also assist administrators with the assessment and understanding of individuals with dysfunctions of the mind and those who are unable to cope with everyday life.

Osterrieth (1944), cited in Lezak et al. (2013), outlines seven separate procedures associated with the drawing of the ROCF, ranging from being highly organised through to being extremely disorganised and/or unrecognisable. Visser (1973) cited in De Kock (2012) indicates that individuals who have suffered brain injuries lose the “overall gestalt or configuration of figure” (p. 24). These individuals are then faced with the difficulties of reproducing the various parts of the complex figure. Kramer and Wells (2004) explain that healthy individuals view the image as a whole, whereas those with cognitive deficits find it difficult to do so.

2.6.4 Demographic Effects on ROCF

The relationship between the performance of the ROCF and demographic factors has been found (Ardila & Rosselli, 2003; Mitrushina et al, 2005). According to De Kock, (2012) there have been no South African normative studies performed on the ROCF. Foxcroft and Roodt, (2005) contended that despite this, the ROCF remains a commonly utilised neuropsychological test in the present day. The effects of local demographic factors on test performance therefore remain unstudied (De Kock, 2012). In order to provide the reader with insight into the effect of demographic factors on test performance as well as organisational strategy, research by De Kock et al. (2012) and relevant international normative research will be reviewed below.

2.6.4.1 Age. The effects of age on memory are well documented (Ardila & Rosselli, 1989; Groth-Marnat, 2000; Lezak et. al., 2004; Lishman, 2006). Gallagher &

Burke (2007) are of the same view and argue that the normal effects of age on the performance the ROCF test are reported by a handful of researchers (Boone, Lesser, Hill Gutierrez, Berman & De'lia, 1993). These researchers all agree that performance declines as age increases. Mitrushina et al. (2005) agree with the notion of age having an effect on memory measured by the ROCF and support this as the researchers found age has an effect on all three trials (Copy, IR and DR trials). Some studies indicate that a gradual decline begins in middle adulthood (e.g. Fastenau, Denburg & Hufford, 1999) and others show that the scores remain relatively constant and that a sudden drop in scores only emerges in older samples (Ostrosky-Solis, Jaime & Ardila, 1998). However, researchers are not sure whether scores decline continuously with age or whether there is a direct drop in performance at a particular age (Gallagher & Burke, 2007).

De Kock (2012) who conducted a study on the performance of Xhosa speaking adults (Eastern Cape) on the ROCF divided their sample into two age groupings (18-29 years and 30-40 years). The younger group's mean performances for the Copy, Immediate Recall and Delayed Recall trials were 22.24 (SD. 4.55), 14.71 (SD. 4.48) and 15.03 (SD. 4.77) respectively, thereby outperforming the older group's mean performances of 21.72 (SD. 6.54), 10.78 (SD. 4.64) and 10.28 (SD. 5.37) respectively. A T-test analysis indicated that this difference was small for the Copy trial ($p = .792$), however significant for IR ($p = .019$) as well as DR ($p = .011$) trials (De Kock, 2012).

2.6.4.2 Sex. Sadock and Sadock (2007) acknowledge that there are differences observed in certain domains of function between men and women. Whilst some studies have found that males perform better than females (Ardila & Rosselli, 1989; Fastenau, Denburg and Hufford, 1999), others have found differences in test performance to be too small to consider (Boone et al., 1993; Meyers & Meyers, 1995). Strauss and colleagues (2006) conclude that the studies cited do not conclusively exclude the effect of other variables, such as "handedness", "familial handedness" and "academic concentration" (p. 826), to make a confident claim on sex effect. Fletcher, Janzen, Strickland and Reynolds (2000) warn that if these differences are not acknowledged in neuropsychological norms it "will overpathologise the scores of the underperforming sex and at the same time fail to detect true declines in the sex with

the higher baseline” (p. 73). Strauss et al. (2006) contended that the test performance of the ROCF, specifically to differences pertaining to sex is widely debated.

According to De Kock (2012) “this discrepancy in research findings may merely indicate large inter-sex variance” (p. 25). To the researchers’ knowledge, no studies have investigated the influence of sex upon procedural type, as defined by Osterrieth (1944). De Kock’s study clarifies that no significant differences were found when the sex stratifications were subdivided into younger (18 – 29) and older (30 – 40) age groupings ($p > 0.05$ for all trials). No consistent trend was noted for the sample as a whole, with females outperforming males on the Copy trial and males outperforming females on the IR and DR trials. Within the younger subgroup, however, males consistently outperformed females in all three trials (De Kock, 2012).

2.6.4.3 Education. De Kock (2012) assert that the effects of education on the ROCF test performance are similarly disputable. Cross-cultural researchers have reported the significant impact of education on the test outcome on all three trials (Ardila & Rosselli, 2007; Ardila, Rosseli & Rosa, 1989; Berry, Allen & Schmitt, 1991). Mitrushina et al. (2005) are of the view that the influence of the level of education may be more prominent within certain demographics, such as minority populations (Mitrushina et al, 2005). Ponton, Satz, Herrera, Ortiz, Urrutia and Young (1996) outlined in De Kock (2012) conducted a study in Los Angeles, California and examined the effect of the level of education on a healthy Spanish speaking population.

The test performance of Copy and Delay Recall trials were stratified according to age, sex and level of education. It is noted that “significant differences were observed for both trials, between same-sex participants of the similar age with either more or less than 10 years of formal education” (p. 26). The researchers also noted that formal education influences both the manner in which the ROCF is approached as well as the skill it took to recall the complex figure. Ponton et al. (1996) concluded that no measure of cognitive functioning can be divorced from the effect of education. The normative textbooks (Lezak et al., 2004; Mitrushina et al, 2005; Strauss et al., 2006) and standardisation studies (Fastenau et al., 1999; Meyers & Meyers, 1995b; Knight, 2003) recount the validity of these cross-cultural studies. To account for the ambivalence of research surrounding education, Mitrushina et al. (2005) suggest a

“threshold” theory (p. 250). They argue that once test-takers have achieved a particular level of education, test performance can be influenced by other variables such as age, IQ or sex, rather than the effect of education.

It is worthwhile to highlight that, whilst significant differences may be found within the sub-threshold range, beyond this threshold point the effect of education becomes nullified” (De Kock, 2012: p26). Mitrushina and colleagues place this threshold at the completion of high school, therefore greater than or equal to 12 years of education. According to De Kock (2012) and further research by the present study, there is currently no international studies available in regards to the investigation of the effect of the quality of education upon ROCF test performance. Lastly, Ardila and Rosselli (2007) have noted the impact of education upon visuospatial and visuo-constructive abilities in general. Correspondingly, Castro-Caldas (2007) discuss the relationship between functional brain organisation and education. These researchers have proposed that if test takers have achieved an adequate level of formal education, it may equip them with organisational strategies on how to approach the tasks asked of them (Ardila & Rosselli, 2003).

2.6.5 Applicability to the South African Context

Lahey and Cockcroft (2014) highlight the strength in the field of psychological assessment regarding its contributions to a just and equal society. They state that more work is required in order to make psychological assessment more accessible for and useful to the majority of people in South Africa. The ROCF test as been utilised in South Africa for different reasons and a handful of South African studies has been conducted using the test battery. This demonstrating the need for the test in South Africa and the need to develop South African norms on the ROCF test. One of those studies was a study by Megan Nield who used neuropsychological test performance to identify Alzheimer’s disease at a South African memory clinic. Nield used a number of neuropsychological tests including the ROCF test throughout her study. Nield (2007) states that this study is a first step to collecting normative data for older South African adults. The study emphasises that in the context of South African memory clinics and neuropsychology, the effects of age needs to be considered alongside the

marked individual differences in IQ, quality of education, and a range of other socio-cultural factors. One of the major aims of this study was to provide a first step toward collecting normative data for older South African adults on some of the most commonly-used memory clinic neuropsychological tests. Nield therefore concluded that these tests are the most sensitive to normal ageing processes, including the ROCF and also stated that South African norms for the ROCF test are provided in the form of means and standard deviations, which may be a useful reference should the ROCF test be included in the Memory Clinic battery in the future (Nield, 2007).

Another study was conducted by Jenny-Lee Lowin, on the effects of level and quality of education on the performance of South African adults on three commonly-used neuropsychological tests. The ROCF test was used as one of the neuropsychological test. Once again, the ROCF test was found as a useful tool in assessing the level and quality of education on the performance of South African adults (Lowin, 2008). It is therefore significant to note that research on the ROCF test and the collection of norms in South Africa is expanding. The two normative studies conducted on ROCF in South Africa, the present study, and De Kock (2012) are evidence of work being done to create accessibility to neuropsychological assessments, such as the ROCF, for the majority of South Africans. From the discussions on the ROCF, the essentiality of the test battery is evident. According to De Kock (2012) ROCF provides a great deal of insight into a variety of domains of functioning, including attention, eye and hand co-ordination ability, visual memory and executive functioning. According to Meyers and Meyers (1995b), this is significant as it permits for diagnostic and absolute conclusions to be made. This indicates that for norm collection and the standardisation of tests, the ROCF is relevant and applicable to the South African context.

De Kock (2012) highlights that ROCF in South Africa could be easily applicable as the material used to administer the test battery, such as paper and pencils, are accessible in rural settings. The most specialised of the materials used in the test are the protocol of the ROCF itself and the scoring sheet. This indicates that ROCF is not expensive to access. This being said, it provides clinicians with a huge amount of invaluable information about the test-takers' functioning. Of equivalent significance is that the ROCF is a non-verbal test. Instructions given to the test taker are designed to

be simple and clear. Traditionally, assessments are frequently achieved by use of an interpreter or relative to translate for the test-taker. The clarity and simplicity of the instructions helps to facilitate these translation processes. In a country such as South Africa, these invaluable features of the ROCF are to be embraced.

Chapter 3

METHODOLOGY

3.1. Chapter Preview

The primary purpose of the present study is to provide preliminary normative indications for three trials of the Rey-Osterrieth Complex Figure Test (ROCF), namely Copy (CT), Immediate Recall (IR) and Delayed Recall (DR). The test was administered on Xhosa speaking adults from the Eastern Cape with a Grade 11 to Grade 12 education received within the relatively disadvantaged setting of a former Department of Education and Training (DET) township school. The present study is an extension of a prior study that was conducted utilising the ROCF test on a relatively similar sample. The two local studies have minor differences; the previous study consisted of 33 Xhosa speaking adults (21 females and 12 males) subdivided into two age groups (18-29 years and 30-40 years) whilst the present study consists of 40 Xhosa speaking adults (18 females and 22 males) subdivided into two age groups (19-29 years and 30-40 years). The previous study was conducted at Rhodes University in 2012. The study, as a whole, forms part of a larger research project in which preliminary normative indications were obtained from 16 commonly employed neuropsychological tests on the same sample. The larger research project was funded by a Rhodes University Council research grant.

The previous researcher administered the test on a small sample (non-clinical sample of 33 black Xhosa speaking South African participants (21 female and 12 male) and collected norms that are relatively lenient when compared to the European and Westernised norms (t –test analysis compared the South African norms with the European and Westernised norms and the significant difference of $p=000^*$ was found in all instances). The researcher of the present study was part of the administering and the scoring of the instruments with the assistance of Honours and Masters Counselling Psychology students, under the supervision of Dr Ida Pienaar. This chapter represents the methods and research designs that have been used to gather and analyse the data of the present research project. Chapter three will thus provide details on how the research was carried out.

Research can be classified as either qualitative or quantitative. The present study utilised a quantitative method. The type of research design was a non-experimental, cross-sectional design. According to Sukamolson (2007) quantitative research, as a social research descriptor employs empirical methods. Sukamolson (2007) refers to an empirical statement as a descriptive statement concerning what “is” the case in the “real world” rather than what ought to be the case. Typically, empirical statements are expressed in numerical terms and empirical evaluations are applied. Sukamolson (2007) further defines empirical evaluations as a form that seeks to determine the degree to which a specific programme or policy empirically fulfils or does not fulfil a particular standard or norm. There are various definitions for Quantitative research/methods but Sukamolsons’ (2007) explanation of quantitative research defines the principal aim of the present study well. Currently, South Africa utilises psychological tests that do not have norms which are appropriate for the diverse population of South Africa. Therefore, in order to understand the performance of the Xhosa speaking Eastern Cape population (who derive from a previously disadvantaged education) on the ROCF, a quantitative research was conducted for purposes of examining at what “is” the case in South Africa rather than what “ought” to be the case.

3.2 Participants

The study encompassed of a non-clinical sample consisting of a minimum of 40 participants which comprised female and male (females 18 and males 22), black Xhosa first language participants between the age ranges of 19-40 years. Initially, the aim was to have an equivalent number of females and males, however, among the limitations that the present study encountered was the inability to acquire an equal number of participants. Those selected for the study worked and lived in East London (Mdantsane), Aliwal North, Stutterriem, Butterworth, King Williams Town, Ngcobo and Alice. The participants were from both urban and rural areas. The participants’ level of education ranged between Grade 11 and Grade 12, with no tertiary education or qualification. Their education was obtained in the Eastern Cape at a township school which could be classified as a former-DET institution. At the time of the study, all participants were Level F unskilled workers, as defined by the Employment Equity Act (S. Robertson, personal communication, October 12, 2007). The sample consisted

of both employed and unemployed participants. Those employed ranged from occupations such as security guards, cleaners, local shop merchandisers, kitchen staff and local garage attendants (generally menial labour positions). Most of the participants were drawn from the casual staff members of the University of Fort Hare. The participants had basic proficiency in the English language. The relevant demographics of the participants are discussed further to indicate their appropriateness in the present study.

3.3 Education

Relevant literature reviews emphasised the influence of education upon test performance. Importantly, research indicates that both level and quality of education may contribute towards performance (Andrews et al., 2012; Fike et al., 2012; Shuttleworth-Edwards et al., 2013; Shuttleworth-Edwards, Kemp et al., 2004; Skuy, Schutte, Fridjhon & O'Carroll, 2001). Correspondingly, parameters were put in place to investigate the potential influence of both these elements.

3.3.1 Level of Education

In contrast to the study conducted by Shuttleworth-Edwards et al. (2004), which compared the test performances of graduates versus individuals with an education level of Grade 12, all participants in the present study had completed no less than a Grade 11 and not more than a Grade 12 level of education and had not attended any tertiary institution. This was done in order to attain a restricted sample regarding level of education. To be sure that the variable of level of education was not confounding to the investigation, the equivalence of distribution of participants with Grade 11 and Grade 12 education was ensured between all comparison groups. Specifically, out of the 40 participants suitable for the study, 20 successfully passed Grade 11 and 20 successfully passed Grade 12.

The sample consisted of a classroom-sized distribution with three groupings across the spectrum of the present study because it is noted how the level and quality of education received is influenced by the number of learners within a classroom. Classroom size refers to the number of learners available for general teaching

(Department of Education, 2009). The classroom sizes ranged from 20-30, 30-40 and lastly from 40-50 individuals. Class size is an important determinant of participant outcome. Any attempts to increase class sizes could harm the performance and outcome of the participants (Schanzenbach, 2014). Therefore, classroom size is significant and the need for it to be considered in normative indication studies is enormous. Most participants in the present study come from a schooling background where they were in a classroom of 40-50 learners.

Table 3. The classroom-sized Distribution of Sample across three classroom groupings (20-30, 30-40 and 40-50)

	Frequency	Percent	Valid Percent	Cumulative Valid	%
20-30	4	10.0	10.0	10.0	
30-40	14	35.0	35.0	45.0	
40-50	22	55.0	55.0	100.0	
Total	40	100.0	100.0		

3.3.2 Quality of education

Officially, the DET-type (Department of Education and Training) education system no longer exists. However, as previously discussed in the literature review, its legacy is that these former DET schools remain disadvantaged by various shortcomings, which negatively impact the quality of education offered to learners. All participants in the sample attended DET schools throughout high school, which meant, in all probability, that they had also attended DET primary schools, although this information was not specifically elicited. The differences in test performance between urban and rural participants also formed part of the present study.

Table 4. T-test group statistics indicating performance between Urban and Rural participants across the three ROCF trials

	Quality of schooling	N	Mean	Std. Dev	Std Error mean
Copy	Rural	25	31.08	3.96	.793
	Urban	15	32.33	3.96	1.02
Immediate recall	Rural	25	20.14	7.94	1.58
	Urban	15	20.30	6.32	1.63
Delayed recall	Rural	25	19.74	7.04	1.40
	Urban	15	20.53	6.00	1.55

3.4 Age

Significantly, the present study's age-range was from 19 to 40 years. Andrews and Shuttleworth-Edwards (2008) asserts that this age range locates all the participants within the broad age range of the group most likely to be at risk for traumatic brain injury (Nell & Ormond Brown, 1991). Accordingly, "It follows that prevalence of neuropsychological assessments would be equally higher within this age band. Within the South African clinical context, obtaining accurate normative indications for this age band is much needed" (De Kock, 2012, P. 37). A variety of studies have confirmed that age has a significant contribution to test performance in all three trials of the ROCF (Ardila, Ostrosky-Solis, Rosselli & Gomez (2000); Groth-Marnat, 2000; Lezak et. al., 2004; Lishman, 2006; Mitrushina, Boone, D'Elia, 2005). In order to investigate this phenomenon, the present study divided the sample into two age groupings (19-29 years and 30-40 years).

Table 5. Age Distribution of the Sample (19 – 29 years, 30 – 40 years).

	Age group	N	Mean	Std. Dev	Std. Error Mean
Copy	19-29	17	33.29	2.09	.509
	30-40	23	30.26	4.53	.945
Immediate recall	19-29	17	23.97	6.94	1.68
	30-40	23	17.41	6.33	1.32
Delayed recall	19-29	17	22.5	5.82	1.41
	30-40	23	18.19	6.65	1.38

3.5 Sex

Lastly, a handful of research provides mixed opinions about the effects of sex on the ROCF test performance (Sadock & Sadock, 2007; Ardila, Rosselli & Rosa 1989; Fastenau et al., 1999). Neuropsychological texts remark on the significant sex effects on the performance of other neuropsychological instruments (Lezak et al, 2004; Mitrushina et al, 2005; Strauss et al, 2006). Acknowledging this potential influence of sex on performance, the present study's sample was divided into two sex groups consisting of 18 females (45%) and 22 males (55%).

Table 6. Sex Distribution of Sample across Two Age Groupings (19 – 29 years, 30 – 40 years).

	Male and Female	N	Mean	Std. Dev	Std Error mean
Copy	Male	22	32.59	3.02	.645
	Female	18	30.27	4.65	1.09
Immediate recall	Male	22	21.68	6.99	1.49
	Female	18	18.38	7.44	1.75
Delayed recall	Male	22	21.90	6.39	1.36
	Female	18	17.75	6.29	1.48

Note the effect of Sex performance within the two age groupings and keeping in mind the unequal numbers of participants (females and males).

3.6. Material utilised

A test battery that consisted mainly of the Rey-Osterrieth Complex Figure Test (ROCF) and short tests in between the ROCF trial breaks were utilised. ROCF was developed as a preliminary diagnostic tool that consisted of three trials that require participants to complete. The test measures a variety of abilities, the Copy Task assesses attention and visuo-constructional ability, but also requires a great deal of spatial organisational ability and executive functioning in order to execute successfully. The Immediate Recall Task also looks at attention, visuo-constructional ability and executive functioning, however, it is asserted to rely greatly on short term visual memory. The Delayed Recall task provides evidence of whether long-term visual memory encoding has taken place (Lezak et al., 2013). The abilities measured in each trial are of core significance in everyday functioning and the impairment of these

abilities can have a devastating effect on simple daily functions (Lu et al., 2003). The participants were given different colour pencils, interchangeably, and switched after specific time periods. Colour pencils were used to assess the participants' procedural method as part of the original procedural method set forth by Osterrieth (Lezak, 1983). Changing and controlling the order in which the colour pencils are used enables the examiner to determine the sequence with which each element of the drawing is completed (Lezak, 1983). They are requested to reproduce the complex figure onto the unlined, blank A4 page, 3 unlined blank A4 pages are required for the whole procedure.

3.7 Procedure

3.7.1 Participant selection process

The researcher approached both honours and masters counselling psychology students for assistance in administering the test. The students were trained to conduct the assessments and the administrators were requested to randomly find participants that were accessible to them. Guided by the inclusion criteria, the trained students began to approach the University of Fort Hare casual staff members, ranging from security guards, kitchen employees and cleaners. Most participants were selected by means of convenience sampling (collection from population members who are conveniently available to participate in the present study) which ultimately led to snowball sampling. Some participants would inform the administrators of other participants whom they knew would fit the inclusion criteria. From this information, researchers identified casual workers with the highest level of education of between Grade 11 and Grade 12, with no tertiary education. Permission was obtained from the participants after a presentation of the research purpose was communicated. Initially the test administrators made use of a convenience sampling technique where participants were selected because of their convenient accessibility. This technique ultimately led to the use of snowball sampling, whereby participants referred administrators to other people that also met the inclusion criteria.

These identified participants were then contacted telephonically and each participant was informed of when the administration of the test would take place. The researcher noticed that the participant size was too small. In order to increase the

number of participants, administrators were requested to move out of the grounds of the University of Fort Hare in order to source additional participants who would fit the present study's criteria. The test administrators managed to find local shop merchandisers, local garage workers and unemployed participants who were able to fit the inclusion criteria. The newly-identified participants were then contacted telephonically and the nature and purpose of the research project was fully explained to them. The new candidates were informed about the testing date and the compensation that would be provided for their participation. Suitable candidates were informed that, during the study, they would be provided with a single R50 note if they choose to participate. Suitable candidates were compensated with R50 notes which were used for transportation and refreshments during the administration period.

3.7.2 Test administration Preparations

It was decided that 17 students would administer the test battery. The testing team consisted of three Counselling Psychology Master's students and 14 Counselling Psychology Honours students who were trained to administer this specific test and were under constant supervision to ensure testing was performed correctly. Strict abidance to the standardised administration of the test was paramount to ensure accurate and scientific normative indications. The team of administrators underwent specific training for the administration and scoring procedures of the test battery by the research supervisor, Dr Ida Pienaar. To ensure efficiency and accuracy, the team of administrators performed the tests on each other first.

3.7.3 Pre-Testing

Administrators were given the responsibility of sourcing suitable candidates according to the given criteria. They also had the responsibility of administering the test battery as well as scoring the performance of participants allocated to them. Before formal testing began, administrators explained to the participants how the testing procedure would work and asked them to sign a consent form (Appendix A). It was reemphasised that test-taking was completely voluntary (Appendix B) and that participants were permitted to withdraw at any point. Lastly, participants were given a pre-screening questionnaire (Appendix C) to complete.

3.8 Data collection

3.8.1 Testing

Before participants took part in the administration process, the administrators explained the informed consent (Appendix A) to each participant before it was signed. The administrators comprised of three Counselling Psychology Master's students and 14 Counselling Psychology Honours students who were trained to administer the specific test and were under constant supervision to ensure testing was performed correctly. During the process, all instructions were provided in English and a specific pattern was followed (as indicated in Appendix. D). The administration process took a period of two hours per participant, which included a break of 10 minutes. The observation of behaviour and different ways of approaching the complex figure was carefully noted and recorded (as indicated in chapter 1, Table 1).

Keeping notes and records of the behaviour of participants is an integral part of the ROCF administration process. The ROCF neuropsychological test is designed to investigate six broad domains of functioning which are outlined in a variety of core neuropsychological tests. These main domains of functioning include: Visual and Verbal memory, Hand-Motor function, Attention, Visual Perception, and Language and Executive Function (Strauss et al., 2006). Each trial during the administration of the ROCF test was required to test an important domain. This also emphasised the significance of constantly observing the behaviour of the participant.

3.9 Data processing

3.9.1 Scoring

The administrators of the test were also involved in scoring and scored the test according to the standardised administration of the ROCF (Meyers & Meyers, 1995). For all trials of the ROCF (Copy, Immediate and Delayed Recall), a score of 0 to 2 points were allocated to each of the 18 structural elements of the figure. This meant that the total scores were calculated out of 36, as defined by Osterrieth (Knight, 2003). The participants' organisational strategy for drawing the complex figure were recorded for each trial and classified into one of seven procedural types (Osterreith, 1944).

3.9.2 Data Analysis

The present study aimed to obtain normative data for a specific population group for three trials of the ROCF (Copy, Immediate recall and Delayed recall). Therefore, the Statistical Package for the Social Sciences (SPSS) programme was utilised in order to capture and analyse data. Both descriptive as well as inferential statistics were calculated. Descriptive statistics were used to systematically arrange and summarise data so as to comprehend the data content. In order to draw conclusions from the sample data and generalise findings to the greater population, inferential statistics were used (Maree & Pieterse, 2010).

Lastly, the performances of the two age groups were compared to available international meta-analytical normative data. The comparison was attained in two ways: Firstly, by means of a table that demonstrated international and local norms, which allowed for a descriptive comparison. Secondly, an independent t-test was performed to establish whether the sample's performance differed significantly from international test takers. This was achieved by taking an average of the international normative performances that fell within the stratified age group i.e. 19-29 years and 30-40 years, and comparing these to the sample's corresponding performance. All of the above-mentioned statistical tests were conducted using an alpha level of 0.5 to determine the significance of the results.

3.10 Language

isiXhosa is the indigenous language spoken in the Eastern Cape Province. In order to ensure that the participant group was as homogenous as possible, one of the inclusion criteria was that all participants spoke Xhosa as their first language. All participants were required to have basic proficiency in the English language, and in order to ensure this, each participant was required to have passed English as a second language at the level of Grade 11 or Grade 12, and to be either currently employed in an English-speaking environment or have previously been employed in an English-speaking environment. Additionally, at the time of testing, a subjective rating of the participants' English language proficiency was obtained from the participants themselves, and each participant provided their assurance that they were confident

that their adeptness of the English language was of a standard to enable them to be tested in English.

The administrator observed that English was the preferred language/medium of communication throughout the three ROCF trials. In-between the Immediate Recall trial (IR) and the Delayed Trial (DT), there was a period of 40 minutes delay. During that 40 minutes, a participant was requested to provide the administrator with Xhosa words that began with “I”, “L” and “M” (Word-a-Minute test) and secondly, to provide the administrator with words that began with any alphabetical letter in the Xhosa language (participants were given one minute to provide words for each alphabet). This was an in-between test administered to shift concentration away from the ROCF complex figure for 40 minutes. This was done in order to effectively assess whether a participant had the ability to retrieve information that is stored in long-term memory (this was necessary in order to observe the ability to use a specific domain of cognitive functioning).

For several of the tests, such as the Word-a-Minute test (Baker & Leland, 1967), a specific level of English reading, writing and speaking ability was required. Manly et al. (2000) highlight the link between English and acculturation, concluding that reading and writing proficiency denotes a level of exposure or acculturation to the formal education setting and thus, the test-taking environment, which significantly impacts upon test performance in general. Although a good grasp of English is not a specific requirement for the completion of a non-verbal test, such as the ROCF, English literacy, in general, can significantly impact upon test performance.

The researcher noticed that the participants struggled with providing Xhosa words. The plausible reasons for this is that participants found difficulties in retrieving information under a timed environment (difficulties working under pressure), and secondly, they simply preferred providing English words over Xhosa words. The preference of English rather than Xhosa can be attributed to the occurrence of acculturation in the Eastern Cape Province. This is an interesting discovery because that means that acculturation has exposed people to the language in which most psychological assessments are administered. Therefore, this could ostensibly mean that for populations such as Xhosa speaking people, barriers such as language, during the administration of tests, might not be barriers anymore, consequently resulting in

better performance and a better attitude towards psychological assessments. This is a tentative hypothesis that will require further empirical testing.

3.11 Exclusion criteria

As the primary aim of this study was to provide preliminary normative indications of ROCF performance for a previously disadvantaged population sample, the influence of certain external factors needed to be controlled. Guided by research, the present study proposed to exclude participants whose test performance may be significantly influenced by the following factors: (i) a history of neurological or psychiatric disorder, be it mild or severe enough to require hospitalisation; (ii) the past or present use of psychotropic medications; (iii) a prior head injury with loss of consciousness for longer than one hour; (iv) history of prenatal or birth complications; (v) prior diagnosis of a learning disability or having received education in a special-needs facility; (vi) the need to repeat a grade more than once; (vii) history of alcohol or substance dependence, or having ever been admitted to a substance abuse treatment or rehabilitation institution.

In order to assure that participants did not meet any of the exclusion criteria, a pre-screening questionnaire (Appendix C) was provided to all potential candidates to complete. The questionnaire comprised of requesting biographical information relevant to these criteria. The questionnaires also included information about the type of school the participants attended, the language utilised at the school they attended and the number of years they had attended at the school. The researcher was present when all participants filled in the questionnaires so as to ensure that the participants understood what was elicited by the questionnaire. This questionnaire was administered on the same day of testing and it was put in place to minimise the external influences of the aforementioned factors. The present study also relied upon accurate transparency from participants. Due to limited resources, this information was taken at face value as researchers were unable to validate information with collateral or historical documents.

3.12 Ethical considerations

Prior to the commencement of the study, the researcher applied for and was granted Ethical Clearance by the University of Fort Hare's Research Ethics Committees (UREC). In addition, the researcher understood the importance to preserve the humanity and dignity of the participants. Therefore, participation was voluntary and informed consent was given by the participants. It was also communicated to the participants that they were free to withdraw from the study at any point and for any reason. The environment in which the test was administered to the participants was a favourable testing environment. This ensured that any harm anticipated (distress, anxiety, pain, negative feelings) was avoided. Participants were informed that transportation and refreshments to a total value of R50 would be provided. The confidentiality and anonymity of participants were ensured as no information pertaining to identification was requested. Confidentiality of data was maintained throughout the study and no harm to participants was anticipated. Support for psychological assistance was on standby for participants who were likely to experience psychological distress after the administration of the test. Fortunately no participant needed psychological assistance throughout the administration of the ROCF test.

3.13 Chapter summary

This chapter has described the process that was followed in carrying out the study. The aim of the research was presented and the research design explained. A description of the sample and the manner in which the sample was obtained were elaborated upon and the test battery administered to the participants was described. Statistical techniques and correlations were reviewed, and the relevant ethical considerations were taken into account. The next chapter will focus on the results of the statistical analysis.

Chapter 4

RESULTS PRESENTATION

4.1 Chapter Preview

This chapter presents results and a statistical analysis on the performance of participants on all three trials of the Rey-Osterrieth Figure Test (ROCF). The Levene's Test (1960) (test that indicates the normality of variances), the Independent sample t-test (test that indicates differences in mean between the two groups being compared) and Descriptive group statistics (used to describe the basic features of the data in the present study) were employed to compare the differences in performance of the participants in all three trials. The two methods made use of tables to analyse and describe the scores of the test in relation to aspects such as ensuring the validity of the null hypothesis and other significant aspects. The participants consisted of two groups (19-29 years and 30-40 years) which included both males and females. The purpose of this study was to compare the performance of the Eastern Cape Xhosa speaking adults, with a Grade 11 to Grade 12 education received in relatively disadvantaged settings, predominantly township schooling, with demographically equivalent European and Westernised norms.

Independent samples t-test was utilised to compare the performance of these groups in order to identify whether there was a significant difference presented within the sample. Results are highlighted and a table comparing the local sample's mean performance on all three trials, with a comparison alongside international normative performance, was drawn up. Finally, the overall general performance of the sample was statistically compared with international meta-analytical norms provided by Mitrushina et al. (2004). Research questions of the present study will be used to guide the reader to better understand the representation of the results.

4.2 Rey-Osterrieth Complex Figure Test

Table 7 illustrates the sample's overall performance of the Copy, Immediate Recall (IR) and Delayed Recall (DR) trials.

Table 7. Descriptive Statistics of Overall ROCF Performance – Copy, IR and DR

	N	Minimum	Maximum	Mean	Std. Deviation
Copy	40	20.50	36.00	31.55	3.96
Immediate Recall	40	3.0	34.50	20.00	7.29
Delayed Recall	40	7.0	32.00	20.00	6.60
ValidN (listwise)	40				

Note. Mean (M) and Standard Deviations (SD) represents score out of 36 using the Rey-Osterrieth Complex Figure Test (ROCF) scoring system (Meyers & Meyers, 1995a).

The Copy Trial scores ranged between 20 and 36 ($M=31.55$, $SD=3.96$); 3 to 34.5 ($M=20.00$, $SD=7.29$) for the Immediate Recall and between 7 and 32 ($M=20.00$, $SD=6.60$) for the Delayed Recall trial. According to the above descriptive statistical analysis, there was significant differences reported between the Copy trial ($M=31.56$, $SD=3.97$) and the two Recall trials (IR ($M=20.00$, $SD=7.30$) as well as the DR trial ($M=20.00$, $SD=6.60$). On the other hand, the comparative performance between IR ($M=20.20$, $SD=7.29$) and DR trials ($M= 20.03$, $SD=6.60$) rendered no significant differences.

4.3 Socio-cultural Considerations

4.3.1 Quality of Education

The researcher of the present study administered the ROCF test on 40 participants. The participants from the rural area represented 63% of the total number of participants and those from the urban area represented 38% of the total number of the participants (see Table 4). In accordance with the literature (Chapter 2) which evaluated the impact of the quality of education on test performance, the present study hypothesised that there is a significant difference in performance between participants with rural and urban schooling backgrounds. Table 8 provides comprehensible results regarding the effects of quality of education on the local sample, by means of the Levene's test and Independent sample t-test.

An independent t-test was conducted in order to determine if a difference existed between the mean test scores on the performance of rural and urban participants (disadvantaged and advantaged quality of education, respectively) on the ROCF test. There was no statistically significant difference between the mean scores of participants in all three trials; for the rural educational background Copy trial: (n=25, M=31.08, SD=3.96) and urban educational background: (n=15, M=32.33, SD=3.96), $t(38) = -.98, p=.34$. For the rural education IR trial: (n=25, M=20.12, SD=7.94) and for urban education (n=15, M=20.30, SD=6.32), $t(38) = -.07, p=.95$. Lastly, for the rural education DR trial: (n=25, M=19.74, SD=7.04) and the urban education: (n=15, M=20.53, SD=6.00), $t(38) = -.36, p=.72$. The researcher fails to reject the null hypothesis.

Table 8. Independent sample t-test confirming that there is no significance between Urban and R participants across the three ROCF trials.

		Levene's Test		t-test for Equality of Means						
		Equality of Variances								
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std Error Difference	95% Confidence Interval of Difference	
									Lower	Upper
Copy	Equal Variances Assumed	.004	.947	-.967	38	.340	-1.25333	1.29579	-3.87653	1.36987
	Equal Variances not Assumed			-.967	29.62	.341	-1.25333	1.29574	-3.90100	1.39433
Immediate Recall	Equal Variances Assumed	.642	.428	-.066	38	.948	-.16000	2.41409	-5.04706	4.72706
	Equal Variances not Assumed			-.070	34.840	.944	-.16000	2.27922	-4.78782	4.46782
Delayed recall	Equal Variances Assumed	.790	.380	-.364	38	.718	-.79333	2.18177	-5.21010	3.62343
	Equal Variances not Assumed			-.379	33.374	.707	-.79333	2.09527	-5.05437	3.4677

Note. The independent sample t-test indicates that when the *p value* is \geq the *Alpha* (α) *value* (0.05) the researcher accepts the null hypothesis, which states that there is no significant difference in performance between the urban and rural area's quality of education. The present study indicates that in all three trials, the *p value* is \geq 0.05; this indicates that the researcher accepts the null hypothesis.

4.3.2 Age

Forty participants were subdivided into two age group categories, the younger group (19-29 years) and the older group (30-40 years). The participants who formed the age group of 19-29 years represented 43% of the total number of participants and

58% of the participants represented the 30-40 years age group category. In accordance with the age effects that have been noted in the literature (Chapter 2), it was hypothesised that there will be significant age effects present in the local sample's performance for all three trials (Copy, IR and DR trials). Table 9 provides a clear picture in regards to whether the hypothesis is accepted or rejected. This will be achieved using the Levene's test and Independent *t*-test.

An independent *t*-test was conducted in order to determine if a difference existed between the mean test scores for all three ROCF test trials for the two age groups. There was a statistically significant difference between the mean scores of the participants in all three trials for both age group categories (19-29 years and 30-40 years). For the 19-29 age group, the Copy trial results are: ($n=17$, $M=33.29$, $SD=2.09$) and the 30-40 age group: ($n=23$, $M= 30.26$, $SD= 4.53$), $t(33) =2.82$, $p=.01$. For the 19-29 age group, the IR trial results are: ($n=17$, $M=23.97$, $SD= 6.95$) and the 30-40 age group: ($n=23$, $M=17.41$, $SD= 6.34$), $t(38) =3.11$, $p=.00$. Lastly, the results of the DR trial for the 19-29 age group are: ($n=17$, $M=22.53$, $SD=5.82$) and the 30-40 age group: ($n=23$, $M=18.20$, $SD=6.66$), $t(38) =2.14$, $p=.04$. The researcher thus rejected the null hypothesis.

Table 9. Independent *t*-test indicating performance between two age categories

		Levene's Test		t-test for Equality of Means						
		Equality of Variances							95% Confidence Interval of Difference	
		F	Sig.	t	Df	Sig, (2-tailed)	Mean Difference	Std Error Difference	Lower	Upper
Copy	Equal Variances Assumed	13.565	0.01	2.556	38	.015	3.033	1.18655	.63120	5.43529
	Equal Variances not Assumed			2.824	32.815	.008	3.033	1.07398	.84775	5.21875
Immediate Recall	Equal Variances Assumed	.245	.623	3.106	38	.004	6.557	2.11149	2.28307	10.83202
	Equal Variances not Assumed			3.063	32.720	.004	6.557	2.14164	2.19892	10.91617
Delayed recall	Equal Variances Assumed	.308	.582	2.144	38	.039	4.333	2.02163	.24119	8.42633
	Equal Variances not Assumed			2.188	36.841	.035	4.333	1.98065	.32000	8.34752

Note. According to the independent *t*-test if the *p* value is \leq the Alpha (α) value (0.05) the researcher rejects the null hypothesis, which states that there is a significant difference in performance between the two age groups (19-29 years and 30-40 years). According to the present study, for all trials (for the two age groups), the *p* value is \leq 0.05, therefore, the null hypothesis is rejected.

4.3.3 Sex

The male participants statistically represented 55% of the total number of participants and the females represented 45% of the total number of participants. In

accordance with the lack of significant sex effects, that has been noted in the literature (Chapter 2), the present study hypothesised that there will be no significant sex effects present in the local sample's performance for all three trials of the ROCF (Copy, IR and DR trial). Table 10 will elucidate clearly on whether sex effects have had an impact on the performance on all three trials of the test.

An independent *t*-test was conducted in order to determine if a difference existed between males' and females' mean test scores after the ROCF test was administered to them. The results for the independent *t*-test were not significant for the Copy and IR trials but for the DR trial, a significant difference is indicated for both male and female participants. For males, the results of the Copy trial: ($n=22$, $M=32.59$, $SD=3.02$) and for the females: ($n=18$, $M=30.27$, $SD=4.65$), $t(28) = 1.82$, $p=.08$. For the IR trial, males: ($n=22$, $M=21.68$, $SD=6.99$) and females: ($n=18$, $M=18.38$, $SD=7.44$), $t(38) = 1.44$, $p=.16$. Lastly, for the males, the results of the DR trial: ($n=22$, $M=21.90$, $SD=6.39$) and for the females: ($n=18$, $M=17.75$, $SD=6.29$), $t(38) = 2.06$, $p=.05$. For the Copy and the IR trials, the researcher failed to reject the hypothesis. For the DR trial, however, the researcher rejected the null hypothesis.

Table 10. Independent t-test indicating Sex Distribution across three ROCF test trials.

		Levene's Test		t-test for Equality of Means						
		Equality of Variances								
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std Error Difference	95% Confidence Interval of Difference	
								Lower		Upper
Copy	Equal Variances Assumed	5.439	.025	1.896	38	.066	2.31313	1.21999	-.15661	4.78288
	Equal Variances not Assumed			1.819	28.092	.080	2.31313	1.27186	-.29176	4.61803
Immediate Recall	Equal Variances Assumed	.275	.603	1.439	38	.158	3.29293	2.28781	-1.33849	7.92435
	Equal Variances not Assumed			1.430	35.456	.161	3.29293	2.30244	-1.37913	7.96499
Delayed recall	Equal Variances Assumed	.156	.695	2.062	38	.046	4.15909	2.01697	.07595	8.24223
	Equal Variances not Assumed			2.065	36.669	.046	4.15909	2.01367	.07776	8.24042

Note. According to the independent *t*-test, if the *p value* is \geq the Alpha (α) value (0.05) then one shall accept the null hypothesis, which states that there is no significant difference in performance between males and females. However, when the *p value* is \leq 0.05 (α) one rejects the null hypothesis. According to the present study, for the Copy and the IR trials the researcher accepts the null hypothesis ($p \geq 0.05$), whilst for the DR trial the researcher rejects the null hypothesis ($p \leq 0.05$).

4.4 Comparison of Norms across studies

A handful of demographically equal international normative indications for the Rey-Osterrieth Complex Figure Test are displayed in Table 11. The sample for the Rhodes University local study (De Kock's study), of which the University of Fort Hare's local study (present study) is doing an extension on, scored lower than all international samples, except for one, the Columbian illiterate population (Ardila et al., 1989). The present study, however, scored higher than the previous study on all ROCF trials and also scored higher than the Columbian illiterate population (Ardila et al., 1989). Equivalent to the previous study, the present study scored lower for almost all international samples, excluding for the Delayed Trial for United States of America (USA) for the 30-39 year age category. A difference in the mean score was indicated between the present study and the Delayed Trial for the USA for the 30-39 year age group.

Table11. ROCF: A Comparison of Present Study Results and Other Published Normative Indications for Two Adult Age Groupings (19 – 29, 30 – 40)

Study	Country	Age	N	Education	Copy	Immediate Recall	Delayed Recall
Present Study	South Africa	19-29	17	11-12	33.29	23.96 (6.94)	22.52 (5.82)
	Fort Hare University	30-40	23		(2.09)	17.41 (6.33)	18.19 (6.65)
					30.26		
De Kock Et al, 2012	South Africa	18-29	17	11-12	22.24	14.71 (4.48)	15.03 (4.77)
	Rhodes University	30-40	16		(4.52)	10.78 (4.64)	10.28
Mitrushina et al, 2005	International	18-29	15	14.33	34.99	24.82	24.87
	Meta-analysis	30-40		(0.98)	34.69	24.18	23.85
Ostrosky Solis et al., 1998	Mexico	20-29	15		35.1	25.8	24.1
				≥6	(4.9)	(4.9)	(6.8)
		30-39			32.8	24.1	24.6
Ponton et al., 1996	USA	16-29	23	<10	30.14		19.23
			55	>10	(4.05)		(6.59)
		30-39	35	<10	32.17		20.56
			62	>10	(2.98)		(5.77)
					28.32		16.01
					(5.96)		(7.03)
			31.86		21.17		
Ardila et al 1989	Colombia	16-25	20	Illiterate	20.7		
			20	≥10	35.3		
		26-35	20	Illiterate	21.0		
			20	≥10	35.5		
		36-45	20	Illiterate	19.2		
			20	≥10	34.2		

Note. Education represents years of formal schooling; Mean (M) and Standard Deviation represents a score out of 36 using the ROCF scoring system (Meyers & Meyers, 1995). The present study outperformed the previous study, but scored lower than international studies, except for the Delayed Trial for the USA (30-39 age group).

(as cited in Mitrushina et al., 2005)

Table 12 represents the overall general performance of the two local samples statistically compared with international meta-analysis norms proved by Mitrushina et al. (2004). The international meta-analysis statistics represent the overall mean score cited from different norm studies. The independent *t*-test analysis compared the three averages and noted robust, significant differences with all trials (Copy, IR and DR). All three trials were divided into two age categories. In comparing scores for the present study and the Meta-analysis, the present study scores moderately lower than the scores for the Meta-analysis. A significant difference between De Kock's study (previous study) and the present study has been identified. The present study appears to have a higher mean score in all three trials when compared to De Kock's study. It is important to consider that various external factors, such as the nature of the sample, manner of administration, the scoring, environment of testing, the concept of acculturation and many other variances, may have played a role in the increase of the mean score.

Table 12. ROCF: t-test Comparison of Present Study Results and Meta-Analytical Normative Predictions for Two Adult Age Groupings

Trial	Age	Previous Sample	M (SD)	Present Sample	<i>P</i>	Meta-Analysis
Copy	18-29; 19-29; 25-29	22.24 (4.52)	33.29 (2.09)	34.99 (1.39)	.000*	
	30-40; 30-40; 35-39	21.72 (6.54)	30.26 (4.53)	34.69 (2.01)	.000*	
Immediate Recall	18-29; 19-29; 25-29	14.71 (4.48)	23.97 (6.94)	24.82 (5.49)	.000*	
	30-40; 30-40; 35-39	10.78 (4.64)	17.41 (6.33)	24.18 (6.55)	.000*	
Delayed Recall	18-29; 19-29; 25-29	15.03 (4.77)	22.52 (5.82)	24.87 (6.67)	.000*	
	30-40; 30-40; 35-39	10.28 (5.37)	18.19 (6.65)	23.85 (6.67)	.000*	

Note. Mean (M) represents a score out of 36 using the ROCF scoring system (Meyers & Meyers, 1995). The Age column illustrates the age ranges of the previous study (18-29 years and 30-40 years), the present study (19-29 years and 30-40 years), and the age ranges of 25-29 years and 35-39 years that are used for comparative purposes from the Meta-analysis of ROCF data, as cited in Mitrushina et al., 2005.

4.5 Synthesis of Results

An Independent *t*-test analysis indicates no significant difference in performance in terms of the quality of education for all of the ROCF test trials ($p \geq 0.05$ in all instances). In addition, an observation regarding sex distribution indicated no significant difference for the Copy and IR trials, whilst for the DR trial, a significant difference was noted. A significant difference was found when the sex stratifications were subdivided into younger (19-29 years) and older (30-40 years) age groupings ($P \leq 0.05$ for all trials). An interesting trend was found when observing the descriptive statistics and independent *t*-tests statistics in terms of age. A significant difference was indicated (by the descriptive group statistics) where the 19-29 years age group outperformed the 30-40 years age group on all trials, even though the participants of the 19-29 years age group were less ($n=17$) than the 30-40 year ($n=23$) age group (acknowledgment of the unequal age distribution). The independent *t*-test ran an in-depth evaluation of these differences and thus one rejected the null hypothesis. From this, the test provided more evidence that age effects had an influence on test performance in all three trials. A classroom-sized distribution of the sample, across three classroom groupings, was included for the present study, in accordance with the literature (Chapter 2). From this, one observes that the level and quality of education received is also influenced by the number of learners within a classroom. The present study indicated that most participants were in classroom sizes that ranged from 40-50 learners (55% of the participants).

In comparing De Kock's study (Rhodes University local study) and the present study (University of Fort Hare local study), a significant difference was detected between the two local studies in Table 12. The present study indicates a higher mean score when compared to De Kock's study in all three trials of the ROCF test. Both South African local studies were outperformed by the international studies cited (Table 11), excluding a Columbian illiterate group's performance of the Copy Trial and Delayed Trial for the USA 30-39 year age group (Ardila et al., 1989) where the scores were lower than both of the local (South African) studies. In addition, for the present study and the Delayed Trial for the United States of America (USA) the 30-39 year age group indicated a difference between mean scores. The present study scored higher than the USA study for the Delayed trial (30-39 years) (see Table 11). Lastly,

a normative comparison between the local and international studies elucidated that the local samples were significantly outperformed in all three trials by the mean performance of Mitrushina et al's (2005) international meta-analysis.

4.6 Chapter summary

This chapter made use of independent t-test and descriptive group statistics to analyse and present results. It also highlighted statistically significant or no significant difference between means scores. The chapter firstly outlined a general overall descriptive statistics of performance in all three trials of the ROCF test. It went on to present specific results on a few demographical factors and the influence they have on test performance. Finally, comparison of results among different norm studies and meta-analysis of the ROCF test were presented.

Chapter 5

DISCUSSION

5.1 Chapter Preview

The present study aimed to provide preliminary normative indications relevant for clinical utilisation in South Africa, particularly for the Eastern Cape Province on the Rey-Osterrieth Complex Figure test (ROCF). This test required participants to carefully copy a complex image which included three trials, namely: the Copy, Recall and Delayed trials. The present study intended to explore the performance of a non-clinical sample of Xhosa-speaking adults, stratified into two groups: (19-29 years of age and 30-40 years of age) both consisting of females and males, with a highest level of education of between Grade 11 and Grade 12. Considerably, these participants received a poor quality of education from a disadvantaged DET township school system and curriculum. The researcher of the present study has conducted an extension on a previous study that was conducted at Rhodes University in 2012 by Heindrich Karl De Kock, under the Supervision of Professor Ann Edwards (the previous study has been addressed as De Kock's study throughout the chapter). Both studies are part of a larger project of which preliminary normative indications were obtained for 16 commonly used neuropsychological tests on the same sample.

Elicited from previous reviews, the researcher hypothesised that for all three trials of the ROCF test, international non-local samples would outperform the local sample. It was proposed that age would play an important role on test performance and no significant sex effects would be present for any of the ROCF trials. Lastly, based on enormous cross-cultural literature on the quality of education (inclusive of both advantaged and disadvantaged schooling) and the influence it has on neuropsychological assessments, the researcher was interested in the influence that urban and rural schooling backgrounds (including classroom size) has on test performance, particularly when using the ROCF neuropsychological test. In addition, Lezal et al. (2004) makes mention of Osterrieth (1944) ROCF Procedural types (see Chapter 1, Table 1), and as such, the approach and organisational strategy that the participant decided on will be moderately discussed in order to acquire additional cognitive information on the participants.

Discussions on the findings of the research are further clarified below in the order in which the hypotheses were positioned.

5.2 Comparison of the present study and De Kock's study on the ROCF Test

The present study (University of Fort Hare study) is an extension of a previous study (De Kock's study). Consequently, the two studies have a great deal in common. De Kock's study recommended a larger sample size, which the study suggested would allow for a clearer confirmation of normative indications, such as the overall cultural effects and Copy age effects to be made. The researcher of the present study decided to increase the number of participants as validation studies require larger samples. The increase in the number of test takers will confirm the validity and enhance local normative indications. The present study used a larger sample, a sample of 40 Xhosa-speaking adults (18 females and 22 males), stratified into two groups (19-29 years of age and 30-40 years of age). This was in contrast to the De Kock's study that used a smaller sample - a sample of 33 Xhosa-speaking adults (21 females and 12 males), stratified into two groups (18-29 years of age and 30-40 years of age). The present study, in a similar vein to that of De Kock's study, collected norms that are relatively lenient when compared to the European and Westernised norms (a *t*-test analysis compared the South African norms with the European and Westernised norms and the significant difference of $p=000^*$ was found in all instances). However, in comparing the two local studies, a mean difference was noticed between both local studies.

The descriptive statistics (indicated in Table 12) comparing De Kock's study, the present study and a Meta-analysis study (taken from Mitrushina et al., 2005), indicate a higher mean score (the present study scored higher than De Kock's study). However, the present study cannot account for the difference observed in Table 12 because there were no independent *t*-tests conducted in order to compare the precise differences between the two local studies. Nevertheless, the difference observed between the two local studies can possibly be attributed to external factors such as the nature of the sample, manner of administration, the scoring, environment of testing, the concept of acculturation and many other variances. The present study has been conducted in a different demographical area in the Eastern Cape and for that reason, numerous external factors may have played a role in inflating the score.

While cross-cultural studies contain a full-bodied literature on the influence of the quality of education on a selected population (Ardila & Rosselli, 2007; Ardila et al., 1989; Berry et al., 1991; Ponton et al., 1996; Ardila & Rosselli 2003), literature on normative indication and standardisation (Fastenau et al., 1999; Lezak et al., 2004; Meyers & Meyers, 1995b; Mitrushina et al, 2005; Knight, 2003 & Strauss et al., 2006) indicates uncertainty regarding the influence of the quality of education on the ROCF test. The scores of the two local studies (present and previous study) and the non-local studies were carefully explored in an attempt to explain the local samples' performance regarding the influence of education. The two samples (the local sample and non-local sample) were found to have been highly influenced by education as it was proposed by Mitrushina et al. (2005). The extent of the observed differences in performance of all three trials ($p=.000$) is, however, important so that external cultural factors may also be considered for the local studies. The non-local norm studies were observed not for the purpose of taking cultural factors, such as the quality of education, into consideration, but rather, because they solely placed emphasis on the level of education and the number of school years attended.

The researcher of the present study observed an interesting finding: cultural effects played a major role in test performance. For example, the quality and level of education was found to influence how participants approach and draw the complex figure. These findings support numerous South African studies that have observed significant cultural effects in both verbal and non-verbal neuropsychological test performances of local samples similarly influenced by a substandard quality of education (Andrews et al, 2012; De Kock, 2012; Fike et al, 2012; Shuttleworth-Edwards, Kemp et al., 2004). During the administration of the ROCF test, some of the participants (mostly from the 30-40 age group categories) would find it easier to recall the complex figure during the DR trial than during the Copy trial, whilst the 19-29 year age category found it easier to copy rather than recall the complex figure. This concept of meta-memory assigns the finding to experiences and beliefs (cross-cultural influences) and the influence that they have on encoding, storing and retrieving memory. This notion will be used to strengthen discussion throughout Chapter five.

The idea conveyed by meta-memory can be briefly discussed for a clearer understanding on how beliefs and experiences influence memory. Hultsch, Hertzog, and Dixon (1987) define the idea of meta-memory as an individual's way of comprehending their own memory functioning. A person often acquires meta-memory skills by learning how their memory functions by means of experience and applying this knowledge to improve the monitoring of their memory abilities (Rabbitt & Abson, 1991). Since older adults have more life experiences using their memory than younger adults, previous research has hypothesised that they should become better at predicting how well they will recall experiences (Johnsons & Halper, 1999). Observing the experiences and beliefs collectively held by Xhosa-speaking people, these findings suggest that trained professionals using psychological assessments cannot equate local and non-local effects to test performance; rather, they should be conscious of considering the diverse context of South Africa and the numerous factors that might affect test performance.

Chapter two (Literature Review) reveals a handful of information on the different domains of functioning tested by each ROCF test trial. The domains of function tested by each trial were postulated to be of importance to everyday life. However, literature confirms that external factors influence the use of cognitive functions. Below, discourses surrounding the ability and inability for participants to effectively elicit from these functions will be discussed. This will be done by examining the performance of the participants throughout the three trials.

5.3. Rey-Osterrieth Complex Figure test trials

5.3.1 Copy Trial

The two local studies hypothesised and confirmed that participants from the local population would perform poorer than the participants from the non-local population for the ROCF Copy trial. This was confirmed when independent *t*-test results for both local studies failed to reject the hypothesis ($M=33.29$, $SD=2.09$, $P=000^*$). The present study shows a higher mean score than De Kock's study. Different external factors can arguably account for the increase in mean scores between the two local studies. Other factors such as age, sex, area of upbringing,

classroom size and quality of education can also be included as they were suspected to have had an influence on test performance. The Copy trial tested three vital domains of functioning; these domains of functioning are well known for the enhancement of individual functioning. This trial tapped into the individual's ability to pay attention, an individual's visuo-constructional ability and executive functioning (including spatial organisational ability). These domains of functions are mediated by cultural variables and an exposure to formal western schooling systems.

The present study represents two age groups (19-29 year age group and 30-40 year age group). It was hypothesised that there would be a significant difference between the two age groupings; the independent *t*-test (present study) established a significant difference in all three trials. However, seminal normative textbooks (Lezak et al., 2004; Mitrushina et al., 2005; Strauss et al., 2006) emphasise the importance of the observation of behaviour and different ways of approaching the complex figure. The researcher recognises and acknowledges the independent *t*-test results, nevertheless, cross-cultural factors have also been considered by the researcher in that they clearly played a role in the way participants copied the complex figure in the test. Qualitative and clinical observations opened up some tentative speculation about possible factors contributing to differential performance between the two age group distributions. As mentioned before, the 19-29 year age group appeared to copy the figure easily, whilst participants in the 30-40 year age group category indicated an unenthusiastic approach towards copying the figure. As mentioned earlier, Hlutsch et al. (1987) introduced the concept of meta-memory and the role it plays in the performance of the Xhosa population. In light of this, the authors introduce an idea that a person's experience and their understanding of life influence their way of doing things and approaching everyday tasks.

South African black people have experienced inequality, the deprivation of basic resources and a limitation to experiences that could have enhanced their ways of functioning. Knight (2003) asserts that an individual can master complex visuo-constructional tasks, such as Copy trial, through reacting corporally to spatial demands in an intentional and organised manner, which requires equal measures of visuo-motor coordination and visuospatial organisation. Ardila et al. (1989) adds that such tasks, therefore, require a degree of repeated exposure and experience. Test-takers would

naturally reflect inexperience if the exposure is limited. Unfortunately for South African black people who have experienced inequality, deprivation of basic resources and limited exposure to educational experiences that could enhance their ways of functioning, exposure to such domains of functioning are predominately provided within the educational context. In South Africa's attempts to move to a just and equal society, the South African school Curriculum endured a variety of transformations. Transformation from the old system (Former Department of Education and Training [DET] schooling system) to the new, inclusive, post-apartheid system has resulted in equal exposure to advantaged education, which provides people an opportunity to practice skills and tasks that enhance visuo-construction, attention and memory. This could possibly elucidate the difference in performance between the two age groups (19-29 years and 30-40 years) and better explains the enhanced performance of the 19-29 year age group on the Copy trial.

Meyers and Meyers (1995b) argue that the low mean scores indicated by the Copy trial (local-sample) may not reflect underperformance in 'absolute terms' (p.39), but might indicate limited exposure and unfamiliarity with the test (test-wiseness) (Nell, 2000). When the administration procedure took place, the researcher observed different reactions to the complex figure test between participants who received an education from a rural setting and participants who received an education from an urban area. This was evident in the confidence in which urban-schooled participants approached the task and the pressure felt by the rural-schooled participants when approaching the task. There are many reasons that could have resulted in these reactions. Primarily, among those reasons is the poor quality of education in the rural schools (the present study indicates that the rural participants scored significantly poorer than the urban participants). Participants from the local sample arguably received fewer opportunities to practice skills and tasks requiring complex visuo-constructional functioning. Participants living in urban areas have access to available basic services like electricity where exposure to educational forums on television can be accessed. Therefore, their confidence indicates repeated exposure to tasks that are designed to enhance visuo-construction, attention and executive functioning. In addition, the rich quality of education received by the non-local sample explains the greater mean score received for the ROCF test copy trial.

5.3.2 Recall trials

The process of recalling the complex figure image consisted of two trials, namely: the Immediate Recalling (IR) of the complex figure and the Delayed Recalling (IR) [recalling after 40 minutes, whilst using 'word-a-minute' test in-between the time] of the complex figure test. The 'word-a-minute' test administered in-between the IR and DR trial requested participants to provide the administrator with Xhosa words that began with "I" "L" "M" and secondly, with words that began with any alphabetical letter in the Xhosa language (participants were given one minute to provide words for each alphabet). The researcher observed that participants from both age groups had struggled to perform. From this, there are three possible reasons to explain for their poor response: the concept of Acculturation (movement and integration of diverse cultures), Individualism and Collectivism. Individualist culture awards personal freedom and achievement whereas Collectivism, in contrast, encourages conformity and being part of a group (represents a group's achievements rather than individual accomplishments) (Platteau, 2000).

The Recall trials test memory (short-term and long-term memory). Memory serves as a very important domain of functioning amongst many. Memory allows individuals to store and retrieve an unlimited amount of information and facts that they may need for survival. Equivalent to De Kock's study, the present study hypothesised and confirmed that a demographically similar, non-local population would perform significantly better than the local population in both ROCF Recall trials. In both Recall trials, the present study scored higher than the previous study. As mentioned before, the age of participants played a vital role in all three ROCF test trials. In the DR trial, in contrast to the copy trial, it was observed that the 30-40 year age group performed better than the 19-29 year age group.

Rabbitt and Abson (1991) acquaints memory with experience. As such, the authors are of the view that a person acquires meta-memory skills and learns how their memory functions through experience. For an individual to be able to store and retrieve unlimited information and facts about life, repeated exposure to experiences that allowed practice, are required. The change in the South African curriculum may have had an influence on how different the two age groups (19-29 year age group and

30-40 year age group) store and retrieve short-term and long-term memory. In 2008, a new South African qualification, the National Senior Certificate replaced the Senior Certificate (SC), based on the NATED 550 curricula (Drussendorff, 2010). The results required to pass matric (Matriculation) for NSC are lower (a minimum of only 30% is required to pass matric) whereas the previous SC qualification required one to have a higher level of acuity (a minimum result of 40% was required to pass matric). As mentioned above, Johnsons and Halper (1999) predicted that since older adults have more life experiences using their memory than younger adults, older adults were predicted to recall information better than the younger adults. This is one way of viewing the differences in storing and retrieving memory between the two age groups and consequently, this was observed during testing. However, it is also important to acknowledge and keep in mind that cross-cultural effects and their influence on memory remains debatable and less clear (De Kock, 2012). Test-takers are only able to recall memories that are successfully encoded or stored. Thus, the low performance by the local sample, when compared to the non-local sample, can also be attributed to the poor visual memory that participants from the local sample were observed to struggle with, which can be credited to numerous factors mentioned in the discourses discussed above. Nevertheless, it is significant to mention that Shuttleworth-Edwards, Donnelly et al. (2004) conducted a study and found that the low performance on the IR and DR trials were most likely not the result of reduced visual memory functioning, (for example the encoding, storage and retrieval process) but rather, a shortage and limited exposure to visuo-constructional abilities.

5.4. Demographic Features

Age indications have been used to ground the discussion on the above-mentioned discourses, and so therefore, little more will be discussed regarding Age as a demographic feature. More focus, however, will be located on sex indications.

5.4.1 Age and Sex Indications

5.4.1.1. Age Indications. The present study hypothesised that there will be a significant difference in age effects present in the local sample's performance on all three trials of the ROCF test. The independent *t*-tests found a significant difference in all three trials. Participants from the present study were subdivided into two age

groups. Forty three percent were from the 19-29 age group and fifty eight percent were from the 30-40 age group. Systematically observed from the independent *t*-test conducted by the present study for age effects, the younger age group outperformed the older age group in all three trials. The independent *t*-test determined that a difference existed between the mean test scores for all three ROCF test trials for the two age groups. There was a statistically significant difference between the mean scores of participants in all three trials for both age group categories (19-29 years of age and 30-40 years of age). For the 19-29 year age group, Copy trial ($n=17$, $M=33.29$, $SD=2.09$) and the 30-40 year age group ($n=23$, $M=30.26$, $SD=4.53$), $t(33)=2.82$, $p=.01$. For the 19-29 year age group, IR trial ($n=17$, $M=23.97$, $SD=6.95$) and the 30-40 year age group ($n=23$, $M=17.41$, $SD=6.34$), $t(38)=3.11$, $p=.00$. Lastly for the DR trial for the 19-29 year age group ($n=17$, $M=22.53$, $SD=5.82$) and the 30-40 year age group ($n=23$, $M=18.20$, $SD=6.66$), $t(38)=2.14$, $p=.04$. This finding is supported by normative data on non-local populations (Ardilla, Rosselli, & Rosa, 1989; Chiulli et al., 1995; Fastenua et al., 1999; Ostrosky-Solis et al., 1998; Meyers & Meyers, 1995; Mitrushina et al., 2005) which explicated the advantage of younger ages during test performance.

5.4.1.2. Sex Indications. There were conflicting views about the influence that sex has on test performance. Some authors stated that there are differences observed between males and females during test performance (Ardila & Rosselli, 1989; Fastenua et al., 1999), whilst others found the difference in test performance to be too small to consider (Boone et al., 1993; Meyers & Meyers, 1995). The present research hypothesised that no sex effects would be present in the test performance for all three trials of the ROCF test. Fifty five percent of the total number of participants represents males and forty five percent of the total number represents the female participants. The results for the independent *t*-test indicated no significant difference for the Copy and IR trials but for the DR trial, significant differences were reported for both male and female participants. For males, the Copy trial indicated ($n=22$, $M=32.59$, $SD=3.02$) and for the females ($n=18$, $M=30.27$, $SD=4.65$), $t(28)=1.82$, $p=.08$. For the IR trial, males indicated ($n=22$, $M=21.68$, $SD=6.99$) and females ($n=18$, $M=18.38$, $SD=7.44$), $t(38)=1.44$, $p=.16$. Lastly, for the males, the DR trial indicated ($n=22$, $M=21.90$, $SD=6.39$) and for the females ($n=18$, $M=17.75$, $SD=6.29$), $t(38)=2.06$, $p=.05$. The findings clarify that only two trials (Copy and IR trials) confirm the hypothesis, whilst

one trial (the DR trial) rejects the hypothesis. These results also explicate that sex effects are important to consider during testing.

Other studies that indicate significant differences because of sex/gender justify these differences and readily include IQ, handedness or academic concentration and exposure to different external factors (Strauss, Sherman & Spreen, 2006). The Copy and IR trials reflect non-local normative studies (Boone et al., 1993, Fastenua et al., 1999; Meyer & Meyer, 1995; Mitrushina et al., 2005). Lezak et al. (2004) asserts that the performance of a participant in the Copy trial is generally a good indication of Recall performance. Hartman and Potter (1998) are of the same view and state that the visual information retrieved in the recall trials is incidentally encoded from the Copy trial. The studies anticipate that if sex effects are present during the present study, these effects should be present throughout all three trials. However, the present study indicated inconsistencies and the differences observed in local performance can be attributed to extraneous factors (Strauss et al., 2006).

5.4.2 Urban and Rural schooling backgrounds

The present study hypothesised and confirmed a significant difference in test performance between urban and rural participants, mainly because of the different quality of education provided in each geographical area. Alternatively, literature indicates that cognitive abilities can be detrimentally affected by the quality of education received. Urban participants represented 38% of the total sample population whereas rural participants represented 63% of the total number of the sample population. To this extent, urban participants outperformed the rural participants in all ROCF trials. Nevertheless, a report on Education in South Africa Rural Communities (2005) states that there is no agreement about what constitutes rural and urban areas in South Africa. Acculturation and movement between rural and urban areas essentially makes it difficult to define such areas.

Urban and rural schooling systems are different from each other. In rural areas, money and jobs are scarce and schools are often ill-equipped, under-resourced and poorly staffed. Television programmes (e.g. Cutting Edge, Special Assignment and many other programmes) indicate that rural people yearn for improvement in their

schooling systems. Unlimited resources prevent people in rural areas from taking their children to urban areas for a better education. The urban schooling system repeatedly exposes children to better and more advanced education which allows them to train their neurological domains of function (Memory, attention, visuo-constructional functions etc.) Carder (2010) states that, naturally, humans are intrinsically made to develop, produce and grow and each of these activities validates their individual existence. However, these activities are impossible to master if the environment and resources are not provided. If urban area participants are provided the environment to develop, produce and grow, then this might also explain for the reasons why they outperformed participants from rural areas. Abrahams and Mauer (1999) assert that members of historically disadvantaged groups in South Africa had suffered similar patterns of discrimination as have minority groups in the United States of America. Therefore, it is possible that South African urban participants' scores were similar to international norms and rural participants pulled the overall mean down so far that it looked significantly different. The researcher treated the data as a homogenous sample when comparing it to the meta-analysis study cited in Mitrushina et al., (2005).

5.5. Synthesis of findings and conclusions

In conclusion, the researcher concentrated on the findings provided by the three methods employed to compare mean differences for the ROCF trials. Attention was given to behaviour and reactions provoked by the ROCF test mainly because it provided more understanding on the development and use of cognitive abilities of participants. In observing the behaviour and reactions provoked in each trial, the researcher identified the need to take into consideration the socio-cultural influences in order to provide a full representation and analysis of norm indications. Experiences encountered by South Africans cannot be divorced from the conclusions drawn by norm indication studies. A specific finding is in support of this statement. In accordance with the age effects that have been noted in the literature (see Chapter 2), the present study hypothesised and confirmed that there will be significant age effects present in the local sample.

The researcher clinically and systematically observed that the young participants (19-29 year age group) outperformed the older participants (30-40 year

age group) in all three trials. For the younger participants, the Copy trial indicated ($n=17$, $M=33.29$, $SD=2.09$) and for the older participants ($n=23$, $M=30.26$, $SD=4.53$), $t(33)=2.82$, $p=.01$. For the IR and DR trials, a small inclination of the younger group having outperformed the older group was noted: for the younger group, the IR trial indicated ($n=17$, $M=23.97$, $SD=6.95$) and for the older group, $n=23$, $M=17.41$, $SD=6.34$), $t(38)=3.11$, $p=.00$) and for the DR trial: the younger group indicated ($n=17$, $M=22.53$, $SD=5.82$) and the older group indicated ($n=23$, $M=18.20$, $SD=6.66$), $t(38)=2.14$, $p=.04$. The 19-29 year-old age group comprised of 17 participants and the 30-40 year-old age group comprised of 23 participants of the total sample. The enhanced performance by the younger group, irrespective of the 17 participants that comprise the group, can be potentially attributed to different variables such as: test familiarity, curriculum changes, quality of education and other external factors.

The present study is an extension of De Kock's study that was carried out in 2012. The two local samples were descriptively and statistically compared to non-local normative studies. The previous and present local samples performed relatively lower than all available non-local norms. However, both studies scored higher for the Copy trial of an illiterate Columbian sample. A difference in mean score between the Delayed Trial for the United States of America (USA) for the 16-29 year and 30-39 year age category and present study (for the DR 19-29 year and 30-40 year age category) was detected (see Table 11). This difference can be explicated by factors such as organisational strategies, the nature of sample, administration of the test, the test environment and other factors. The present study hypothesised and confirmed that there would be a significance difference in performance between the Urban and Rural participants as well as in age indications. The present study hypothesised that the sex effects will not indicate a significant difference and only the Copy trial accepted this hypothesis. In contrast, the IR trial and DR trial rejected the hypothesis.

The independent t -test is statistically represented as follows: for males, the Copy trial ($n=22$, $M=32.59$, $SD=3.02$) and for the females ($n=18$, $M=30.27$, $SD=4.65$), $t(28)=1.82$, $p=.08$. For the IR trial, males ($n=22$, $M=21.68$, $SD=6.99$) and females ($n=18$, $M=18.38$, $SD=7.44$), $t(38)=1.44$, $p=.16$. Lastly, for the males, the DR trial ($n=22$, $M=21.90$, $SD=6.39$) and for the females ($n=18$, $M=17.75$, $SD=6.29$), $t(38)=2.06$, $p=.05$. Strauss et al. (2006) asserts that external factors, such as IQ, equality

of education, the ability to concentrate, environment (outside noises) may account for the significant difference statistically indicated by the DR trial. The present study observed the same as De Kock's 2012 study (previous study) and found that for the organisational strategy (indicated in Chapter 1 Table 1), participants approached the complex figure differently. Most participants used Type I and Type II for the Copy trial and for the Recall trials, participants ranged from Type I through to Type VI.

The domains of functioning tested by every trial were considered. The influence that education has on the development of some cognitive domains of functioning is potentially significant. Domains such as visuo-constructional functioning required exposure to better education, and education that provides an environment of growth and development. Alternatively, quality of education may more readily reflect Manly et al.'s (1998) idea of acculturation to the testing environment or what Nell (2000) refers to as "test-wiseness". The demand by neuropsychological tests on test-takers is massive. The unequal level and quality of education in South Africa has played a major role in the altered exposure and development of cognitive domains of functioning that are essential to enhance daily function. A sum of external factors need to be taken into consideration when explaining the significant differences observed between local and non-local performance.

5.6. Limitations and strengths

The researcher acknowledges that the sample selection of only Xhosa-speaking adults in the Eastern Cape has limited the representation of analyses. Initially a method of convenience sampling was used where participants were selected because of their convenient accessibility. This method ultimately led to the use of snowball sampling as a mode of data collection, which included participants leading administrators to members of the population with similar traits so that they could also be tested. A limitation encountered was that administrators would be introduced to people who would fit the selection criteria, but because of factors such as acculturation, they would be from a Sotho or Zulu speaking background whereas the preferred sample was from a Xhosa speaking background. This made the search for people who met the exact criteria to be somewhat challenging. However, the researcher wishes to clarify that this was to concentrate on the selection criteria used

by De Kock's study and thus extend on significant traits revealed by the population of preference. Another challenge that the researcher came to observe was that the sample used was small ($N=40$) which could be a possible indication for the local sample performing relatively poorer when compared to the non-local sample's scores. The present study hoped for an equal division of demographic features (quality of education, age and sex distribution) amongst participants. The equivalence was seen as an advantage as it would have positively increased representation during analysis. However, the research was unable to achieve an equal distribution amongst participants, which makes it possible to attribute a low performance of the local sample when compared to the non-local sample.

Mitrushina et al. (2005) proposed a specific requirement for adequate normative studies (i) a sample size of 50 participants or more (ii) detailed information about the sample should be provided (iii) the sample should indicate age groupings (iv) the sample's education level should be indicated, as well as (v) their intellectual function as expressed by IQ (The present study did not have information regarding the intellectual functioning (IQ) of participants; this limits the study because if this information was available, clearer conclusions could be drawn with regards to the observed differences between non-local and local performance) and lastly (vi) the sample's sex composition should be stated. These requirements elicit the strengths and limitations from the present study. The present study obtained a smaller sample than required, however, the research sets out only to provide preliminary norm indications and on the basis of the number of participants utilised, can also be considered adequate, despite not having achieved the full number of $N=50$ (De Kock, 2012). The present study meets the requirements for most of the criteria as it is well stratified on the basis of age, sex, level and quality of education as well as language.

5.7. Recommendations for future research

The present research recommends further investigation in order to add to the contribution made by this thesis. Similar to the previous research, the present research suggests that a much larger sample size should be considered as it would provide confirmation of the preliminary normative indications. South Africa is a diverse country with diverse people; it would be useful for future research projects to include the

speakers of other African languages in order to provide clearer and more comparative findings. It is evident from the above discourses that socio-cultural factors play a significant role in normative studies in South Africa.

The present research also considered classroom size as an important determinant of the quality of education people are exposed to. In the present study, fifty five percent of the total number of participants were in a classroom size of 40-50 people, thirty five percent of the total number represents 30-40 people in a classroom and only ten percent of participants represented 20-30 people in a class. However, the present study failed to provide independent *t*-tests that examine the exact significance of classroom size on the quality of education received. Therefore, it is recommended that future studies consider focusing on the connection of classroom size and the influence it has on the quality of education. This can be done through the use of independent *t*-tests and descriptive statistics in order to obtain a clearer picture. A similar recommendation is for future studies to use independent *t*-tests and descriptive statistics to emphasize meaningful results and provide a clearer picture in all significant results. The present study only used a descriptive statistics table and failed to present a clear picture of the sample's overall performance of the Copy, Immediate Recall (IR) and Delayed Recall (DR) trials using an independent *t*-test, which would have provided deeper understanding into the overall performance of all three trials of the ROCF test. Finally, the present study observed the Organisational Strategy Indication (mentioned in Chapter 2), which was developed for ROCF test administrators to acquire more information about the cognitive functioning of the test-taker. The previous study focused more on the organisational strategy and represented an analysis on the approach taken by participants. Unfortunately, the present study did not analyse the organisational types comprehensively and recommends that future research considers doing an in-depth and systematic observation and analysis of the types of approach a test-taker decides on. This will provide more information on the participants' cognitive functioning.

5.8. Final conclusion

The thumbnail of the context behind this research study was to determine normative indications relevant to the South African Xhosa population on a commonly

used Rey-Osterrieth Complex Figure Test. Therefore, the study accomplished its aim and has offered an extremely useful addition to the growing research and information base of norms that are developed for disadvantaged people in South Africa. The research acknowledges the limitations and particularly recommends the use of diverse demographic groups from other areas as this will give support to the collection of norm indications and a clearer representation of analysis will be accomplished. Further research is required in order to confirm the results of the present study and to add to relevant literature on the same topic. Finally, the present study observed the incredible impact that socio-cultural factors have on test performance and warrants further research to focus on these significant aspects in order for more valuable conclusions to be drawn.

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APPENDIX A

Confidentiality and Informed Consent Form

Our University of Fort Hare and the Department of Psychology is asking Xhosa-speaking adults between the ages of 19-40 years who received their schooling in former DET/Township schools from the Province of Eastern Cape to take part in an administration of a Neuropsychological Test that assess various types of abilities, with the aim of collecting cross-cultural norms, which we hope will benefit your community and possibly other communities in the future. The University of Fort Hare, Department of Psychology is conducting research regarding the relevance of Psychological assessments which were developed and standardized for Western countries and utilized on the South African population. We are interested in finding out more about the performance of Xhosa-speaking adults of the Eastern Cape who have received DET/township schooling on the Rey-Osterrieth Complex Figure Test. We are carrying out this research to help practitioners make correct decisions for their clients and decrease discrimination against people who have received schooling in former DET/Township schools.

Please understand that you are not being forced to take part in this study and the choice whether to participate or not is yours alone. However, we would really appreciate it if you do share your thoughts with us. If you choose not take part in the assessment, you will not be affected in any way. If you agree to participate, you may stop me at any time and tell me that you don't want to go on with the assessment. If you do this there will also be no penalties and you will NOT be prejudiced in ANY way. Confidentiality will be observed professionally. I will not be recording your name anywhere on the assessment and no one will be able to link you to the performance you give. Only the researchers will have access to the unlinked information. The

information will remain confidential and there will be no “come-backs” from the answers you give.

The assessment will last around an hour (60 minutes) (this is to be tested through a pilot). I will be administering a psychological assessment and ask that you perform as best as you possibly can during the administration of the assessment. The psychological assessment might be difficult or easy at times. The tool that we will be utilizing might need some thinking, organizing and planning. We know that you cannot be absolutely certain about the performance on this assessment but we ask you to try your best. When it comes your performance during assessment there is no right and wrong performance. If possible, our organisation would like to come back to this area once we have completed our study to inform you and your community of what the results are and discuss our findings and proposals around the research and what this means for people in this area.

INFORMED CONSENT

I hereby agree to participate in research regarding the administration the Rey-Osterrieth Complex Figure Test (psychological assessment); I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this assessment at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise during the assessment.

I understand that this consent form will not be linked to the assessment, and that my answers and performance will remain confidential.

I understand that if at all possible, feedback will be given to my community on the results of the completed research.

.....

Signature of participant

Date:.....

I hereby agree to the tape recording of my participation in the study

.....

Signature of participant

Date:.....

APPENDIX B

Dear Participant

Thank you for agreeing to participate in this research. An Honours or Masters student in Psychology will be administering a test battery to you which will take about an hour to complete. You will be given a short break in between.

The test battery that will be administered to you consists of a Rey-Osterrieth Complex neuropsychological tests that assesses various types of abilities. The results obtained from the test will form part of a bigger research project, with the aim of collecting cross-cultural norms for Xhosa-speaking adults between the ages of 19-40 years who received their schooling in former DET/township schools. The collections of these norms are important to help practitioners make correct decisions for their clients. You are therefore helping to decrease discrimination against people who have received, similar to you, their schooling in former DET/township schools.

Please understand that you are not being forced to participate in this study. The information obtained from this assessment will be treated confidentially. Your names will not be made known and will not be linked to the outcome of the test. Please also be aware that there is financial remuneration for participation. You will be reimbursed for your travelling costs and will receive refreshments. You will be asked to sign a consent form which will ensure that you understand, and agree to the terms of taking part in this research project. We appreciate your willingness to participate in this research project, and can ensure you that your contribution is important in the development of fair testing in South Africa.

Dr I Pienaar

(Clinical Psychologist)

Dr R. Botha

(Counselling Psychologist)

**APPENDIX C
PRE-TEST SCREENING QUESTIONNAIRE**

Pre-Test Screening Questionnaire Encourage participant to answer as accurately as possible. This is a questionnaire not a test, participants are encouraged not to dwell too long on a question. The pre-test screening questionnaire is there to collect qualitative information of the participant and to ensure that the participant meets the inclusion criteria.

BIOGRAPHICAL DATE					
Participant name:					
Date of birth:					
Place of birth:					
Age:					
Sex:					
	Male		Female		
Education:	Year that Grade 11 & 12 was obtained (<i>Please specify which Grade</i>):				
Marital Status: (<i>please tick</i>)	Single		Married		Divorced
Children: (<i>Specify number, sex and age</i>)					
Occupation: (<i>specify duration and position</i>)					

ENGLISH PROFICIENCY INFORMATION
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How often is English used at home?	English	%	Xhosa	%	Other	%
How often is English used at work?	English	%	Xhosa	%	Other	%
How often is English used socially?	English	%	Xhosa	%	Other	%

SECONDARY SCHOOL INFORMATION					
Secondary school name: <i>(if more than one primary, specify names and duration at each school) Under area:</i> <i>Specify suburb and city/town for urban school and town and or township or closest township for rural schools.</i>	School		Duration		
	Area				
	School		Duration		
	Area				
Language of tuition:	English		Xhosa		
			%		%

<p>Please tick the most applicable box with regards to the participant's secondary school where Grade 11 or 12 was achieved.</p>				
Was there electricity at the school?	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Was the electricity reliable?	<input type="checkbox"/> Reliable <input type="checkbox"/> Unreliable			
Was there water available at the school?	<input type="checkbox"/> No <input type="checkbox"/> Unreliable <input type="checkbox"/> Yes, Municipal water from taps <input type="checkbox"/> Yes, from tanks			
The toilet facilities can be described as follows:	<input type="checkbox"/> No facilities <input type="checkbox"/> Pit latrines <input type="checkbox"/> Bucket latrines <input type="checkbox"/> Flush toilets			
Was the school premises fenced and gated?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Partly			
Did the schools have a library?	<input type="checkbox"/> Yes <input type="checkbox"/> No			

How was the content or stock of the library?	Fair Poor
Did the school have laboratory facilities?	Yes, with adequate laboratory equipment Yes, but poorly equipped No
Did the school have a computer centre?	Yes, a good one Yes, but poor standards No
Did the school have any of the following sport facilities? (<i>tick all sport facilities that were available</i>)	No facilities Soccer/rugby field Netball courts Hockey fields Tennis fields Athletics tracks Cricket pitch Swimming pool
Which of the following communication system (s) did the school have?	Telephone Fax 2 way radio Internet Callbox
Did the classroom (s) have windows and doors?	Yes No

Did you have handbooks?	Yes No
On estimation, how many learners were in a class taught by one teacher?	1-10 10-20 20-30 30-40 40-50 Other(<i>specify</i>):
Were the teachers mostly present at the school?	Yes No
Did you perceive your teachers as proficient in their jobs?	Yes, most were very proficient Some were, others not Mostly not proficient teachers The teachers were not proficient

**APPENDIX D
TEST BATTERY**

REY-OSTERRIETH COMPLEX FIGURE (ROCF) Instruments

	Date:	/	/
Clients Name:	D.O.B:	/	/
Clinician:	Age:		

Requirements: Copy of Figure
A4 Paper (Blank, unlined)
6 Colour Pens (**Black, blue, green, pink, red, purple**)

NOT TIMED

Instructions:

COPY

Place a blank unlined A4 page (Short and facing the client) and the first coloured pen in front of the client, Then placed the figure in front of the client.

“Copy this figure as best you can. There is no time limit.”

*It is very important to observe the strategy employed by the clients while copy the drawing, Ask the subject to change colour pens every 30 seconds so that it is possible to tell where they began etc. Hand the subject the pens in the order, **black, blue, green, pink, and red, purple**. Allow the subject to finish with the purple pen.*

If you do not have 6 coloured pens try to either use at least 4 different colours or else record the order in which the lines were drawn on a spare copy of the figure.

Do not allow the client to rotate the card, if they do, reposition it and say

“No, it needs to stay like this.”

IMMEDIATE RECALL

*Place a new unlined A4 page (short and facing the client) and a coloured pen in front of the client, **DO NOT** show them the figure again.*

“Now try to draw the figure you have just drawn as best you can from memory. “There is no time limit.”

DELAYED RECALL

*After a 40 minutes delay, place a new unlined A4 page (short and facing the client) and a coloured pen in front of the client, **DO NOT** show them the figure again.*

“Now try to draw the figure you drew for me earlier as best you can from memory.

“There is no time limit.”

Observe the strategy used as described above for the Copy task.

STRATEGY

- I. Subject begins drawing the large central rectangle and detail is added in relation to it.
 - II. Subject begins with a detail attached to the central rectangle, or with a subsection of the central rectangle, completes the rectangle and adds remaining detail in relation to the rectangle.
 - III. Subject begins by drawing the overall contour of the figure without explicit differentiation of the central rectangle and then adds the internal details.
 - IV. Subject juxtaposes details one by one without an organising structure.
 - V. Subject copies discrete parts of the drawing without any semblance of organisation.
 - VI. Subject substitutes the drawing of a similar object such as a boat or house.
 - VII. The drawing is an unrecognisable scrawl.
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