HUMAN FIGURE DRAWINGS AND THE GENERAL MENTAL DEVELOPMENT OF SOUTH AFRICAN CHILDREN

By

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DECLARATION

I, Reinhart Gerrit Burger (student number: 209096014), hereby declare that the treatise for Magister Artium in Counselling Psychology is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another university or for another qualification.

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Summary

This quantitative exploratory-descriptive study investigated the value of human figure drawing (HFD) tests for developmental testing in the South African context. Due to their characteristics such tests may be particularly suitable to screen for developmental delays in the local South African context. The objectives of the research were to explore and describe the standardized HFD scores and Griffiths Mental Development Scales – Extended Revised (GMDS-ER) general quotients (GQ) of the sample; to investigate whether a relationship exists between the standardized HFD scores and GQs; and to investigate the strength and directionality of this relationship if it was found to exist in the sample. Relevant literature was discussed and an integration of key constructs was provided. The research sample consisted of 30 GMDS-ER protocols collected at a University Psychology Clinic in the Nelson Mandela metropol, Eastern Cape, South Africa. The HFDs of the Draw-a-person items of the GMDS-ER protocols were scored according to the scoring criteria of the Draw-a-Person Intellectual Ability Test for Children, Adolescents, and Adults (DAP: IQ). Key findings included the following: a statistically significant large positive correlation indicative of a marked relationship existed between standardized HFD scores and GQs. The DAP: IQ might provide a better indication of mental development than intellectual ability. A statistically significant medium positive correlation indicative of a small but definite relationship existed between chronological age and HFD raw scores. In conclusion, the findings suggest that HFDs follow a developmental progression and that HFD tests may be useful in developmental testing.

Keywords: Conceptual maturity, Developmental testing, Draw-a-person Intellectual Ability Test for Children, Adolescents, and Adults, Griffiths Mental Development Scales – Extended Revised, Human figure drawing test, Mental development
Chapter 1
Introduction

1.1. Overview

This chapter provides an overview of the research. The motivation and rationale for the research is presented. The history and uses of non-projective human figure drawing tests as well as the importance and context of developmental assessment in South Africa is discussed. This is followed by a discussion of the research objectives, and finally a delineation of the chapters that are to follow is provided.

1.2 Problem Statement

Human figure drawings (HFDs) are often used to assess development since the characteristics of such tests are particularly well suited to the South African context. This study aims to explore whether HFDs provide a useful estimate of a child’s mental developmental level. Contemporary non-projective use of HFDs is based on the principle that an index of a child’s conceptual maturity, mental maturity and intellectual ability may be obtained by the systematic analysis and scoring of HFDs. The history and uses of HFDs, as will be reviewed in the following section, warrants the formulation of the hypothesis that scores obtained from these drawings are somehow related to scores of mental development obtained from a well-established, robust and detailed measure with proven validity and reliability such as the Griffiths Mental Development Scales – Extended Revised (GMDS-ER) (Luiz et al., 2006a).

1.3 History and Uses of Human Figure Drawings

The psychological use of human figure drawings (HFDs) can be divided into their use as projective and non-projective measures. In the projective use of HFDs, graphic
representations of the human figure are used to gain insight into the personality and affect of the person who made the drawing (Michaelides, 2005). The non-projective use of HFDs involves the application of standardized administration procedures and quantitative scoring systems to obtain an estimate of conceptual maturity (Harris, 1963), mental maturity (Koppitz, 1968), or intellectual ability (Reynolds & Hickman, 2004). This study focuses on the non-projective use of human figure drawings, with particular reference to their use in developmental testing.

Developmental differences in children’s drawings have been the subject of scientific investigation for over a century. The value of human figure drawings (HFDs) was first recognised as a component of psychological assessment by Cooke in 1885 and Ricci in 1887, who observed a developmental sequence in children’s HFDs (Cox, 1993). This developmental progression has since been well documented by a number of studies (Goodenough, 1926; Harris, 1963; Koppitz, 1968).

Investigating the developmental sequence observed in children’s HFDs, early researchers found that the increasing number of details and progressively more realistic proportions of the body parts are correlated with a child’s chronological age (Schuyten, 1904), and particularly with mental age (Rouma, 1913). At the end of the 20th century commentary on children’s drawings was included in various baby biographies, articles and books on child development (Jolley, 2010). These works typically described stage and age progressions in different forms of drawing representation and occasionally related representational changes to children’s mental development (Jolley, 2010). Researchers have since elaborated on this groundbreaking work to produce ever more refined systems for obtaining and scoring children’s HFDs. This pioneering research allowed Florence Goodenough to develop the first standardised test based on HFDs, known as the Draw-a-Man Test (Goodenough, 1926). Drawings obtained through standardised instructions were
awarded points based on the number of body parts drawn, the proportions of these parts, and the way they were attached to the main figure (Cox, 1993).

In his revision of the Draw-a-Man Test, Harris (1963) challenged the historical assumption that HFDs could be used to obtain estimates of intelligence. The terms intellectual and conceptual maturity were introduced to convey the view that the test measures the child’s actual rather than potential level of intellectual functioning (Cox, 1993). In keeping with this more contemporary view, Koppitz (1968) based the scoring of her Draw-a-Person Test on 30 developmental items (Cox, 1993). This developmental progression is also recognized by Reynolds and Hickman (2004), the developers of the most recent test based on HFDs called the Draw-a-Person Intellectual Ability Test for Children, Adolescents, and Adults (DAP: IQ).

Human figure drawing tests are becoming more valid with the incorporation of quantitative global scoring systems, particularly when used for the measurement of intellectual maturity (Sack, 2009). The DAP: IQ (Reynolds & Hickman, 2004) is the latest human figure drawing test to employ such a scoring system. It also offers the largest collection of normative data on human figure drawings (Sack, 2009). These characteristics add to the reliability and validity of the measure and contributed to the decision to use an adapted administration of the DAP: IQ to obtain human figure drawing scores in the present study.

1.4 Motivation for Research

1.4.1. The importance and context of developmental assessment. The early identification of children with developmental delays is essential to ensure that these children achieve more favourable developmental outcomes. The earlier a child with developmental difficulties participates in an intervention programme, the greater the gains will be (Rydz,
Shevell, Majnemer, & Oskoui, 2005). The failure to identify developmental delays and provide appropriate intervention may also lead to more severe problems and secondary handicaps (Lifter, 1992). To this end, assessment must aim to gather data that is representative of the child’s typical functioning (Bondurant-Utz & Luciano, 1994).

Psychometric measures serve a vital purpose in this regard. Cronbach (1990, p. 32) defines a psychometric test as a “systematic procedure for observing a person’s behavior and describing it with the aid of a numerical scale or categorical system”. Tests aim only to provide an indication of an individual’s ability at a given point in time, whereas the term assessment implies a broader scope including integration and evaluation of the information obtained (Anastasi, 1988; Cronbach, 1990). Human figure drawings that employ systematic administration and scoring procedures can therefore be rightly classified as psychometric tests.

1.4.2. Screening and diagnostic measures. Developmental measures fall into two categories, namely screening measures and diagnostic measures (Foxcroft & Roodt, 2001). Screening measures are generally less comprehensive than diagnostic measures, providing only an indication of the child’s general development. Conversely, diagnostic measures usually provide numerical scores and age equivalents for a child’s overall performance as well as for specific domains measured (Luiz & Jansen, 2001). The DAP: IQ is evidently simpler than the GMDS-ER insofar as the DAP: IQ only provides an indication of the broad domain that Reynolds and Hickman (2004) call ‘intellectual ability’. Conversely, the GMDS-ER provides an indication of a child’s development across six domains, or ‘avenues of learning’ in addition to providing an indication of the child’s general level of mental development (Griffiths, 1954). In this sense, the DAP: IQ more closely resembles a screening measure whereas the GMDS-ER fits into the diagnostic measure category.
The aim of screening is to identify children that require further in-depth assessment (Widerstrom, Mowder & Sandall, 1997). Brooks-Gunn (1990) outlines the following characteristics of effective screening measures:

1. such tests should be short;

2. the design of such tests should allow for their use in post-natal clinics, paediatricians’ offices, community health services and outpatient hospital clinics;

3. the test should be accessible to a broad range of practitioners and require only a minimal amount of training;

4. the test should be time-efficient so as to better ensure that it is used within the context of busy clinical practices;

5. such tests should have simple and quick scoring systems;

6. such tests should keep the amount of false negatives to a minimum, since children incorrectly placed into a non-risk group will not be tested again.

The DAP: IQ and HFD tests of intellectual ability in general meet these requirements, with the possible exception of the seventh criterion, namely the minimization of false negatives. Personal correspondence with professionals who have used such tests suggest that they may overestimate intellectual ability, thereby incorrectly placing at-risk children in a non-risk group. HFD tests may therefore play an important role in the screening of developmental delays, although it may be necessary to use them in conjunction with other brief measures to reduce the risk of obtaining false negatives.

Several screening measures of development are available, including the Denver Developmental Screening Test 2nd edition (Frankenburg et al., 1990); the Bayley Infant Neurodevelopmental Screener (Aylward, 1995) and the Batelle Developmental Inventory Screening Test (Newborg et al., 1984), among others. The DAP: IQ is a popular measure in South Africa and possesses characteristics that make it particularly attractive within the local
This measure may therefore be of great value in South Africa if it is confirmed to be useful as a developmental screening test.

1.4.3. The DAP: IQ in the local South African context. The DAP: IQ remains popular in South Africa. This popularity may be understood in the light of several distinguishing features of this measure. The total time taken to administer, score, and interpret the DAP: IQ is usually less than 10 to 12 minutes and the test may also be administered in a group format (Reynolds & Hickman, 2004). These characteristics make this an appealing measure to use in the South African context where resources available for mental healthcare are often very limited.

A serious issue facing psychometry in South Africa is that many of the psychometric measures in use are not appropriately standardized for use in the local context (Foxcroft, Roodt & Abrahams, 2001). The difficulty associated with standardization and the development of appropriate norms for use with the diverse South African population poses a major challenge with regards to ethical test usage (Murphy, 2002). Davis (2006) established that the published DAP: IQ norms for children aged 5 to 7 are appropriate for use in the local South African context. This puts the DAP: IQ at a major advantage over other measures that have not been appropriately normed for use in the local context. In this regard human figure drawing tests may be valuable when other measures have not in any way been appropriately standardized. The present study also contributes to a project to restandardize the GMDS-ER that is currently being conducted and is therefore valuable in helping to address the issue of poorly standardized psychometric measures in the local context.

Respondents in Foxcroft, Paterson, Le Roux and Herbst’s (2004) needs analysis of psychological assessment in South Africa identified culture as the main issue of test
development and revision. In particular, a need for culture fair and culture reduced measures surfaced (Foxcroft et. al., 2004).

Reynolds and Hickman (2004) describe the DAP: IQ as a culturally reduced measure. No test can claim to be culture free because psychological tests sample behaviour that is affected by the context in which the person was raised (Jansen, 1991). A test may however be described as ‘culture-fair’ when the test content is based on experiences that are common across cultures (Baker, 2005). The DAP: IQ is based on the drawing of a human figure, which is a frequently experienced object to children in all cultures and makes this a particularly suitable object to include in a test based on drawing. There are however some noteworthy exceptions to the reduced role of culture in the DAP: IQ that receive remarkably little attention in the literature. Some religions, including Islam for example, altogether forbid children from drawing human figures (Carmichael, 2006). Such an exception clearly has a massive impact on the validity and ethics of using the test with certain populations, but it is questionable whether many practitioners are aware of such.

South Africa is a multiracial and multi-ethnic society. According to the most recent census conducted in 2001, the population of South Africa consists of the following demographic groups: Black African (79%), White (9.6%), Coloured (8.9%), and Indian/Asian (2.5%) (Statistics South Africa, 2003). These figures may lead the reader to assume greater cultural homogeneity than is in fact the case. Acknowledgement of the diversity of such groups reduces the risk of bias. This is also important when considering the establishment of appropriate norms which is an on-going process in South Africa. The ‘Black African’ group comprises Zulu (22.4%), Xhosa (17.5%), North Sotho (9.8%), Tswana (7.2%), South Sotho (6.9%), Tsonga (4.2%), Venda (1.7%), and Ndebele (1.5%), while those from relatively recent European descent including Afrikaners, English speakers from varying backgrounds and Portuguese are grouped under ‘White’ (Institute for African Development,
This multiculturalism/multi-ethnicity is further reflected in the language most often spoken at home. The most recent census provides the following figures: IsiZulu (23.8%), IsiXhosa (17.6%), Afrikaans (13.3%), Sepedi (9.4%), English (8.2%), Setswana (8.2%), Sesotho (7.9%), Xitsonga (4.4%), SiSwati (2.7%), Tshivenda (2.3%), IsiNdelbele (1.6%), and other (0.5%) (Statistics South Africa, 2003). While exceptions like the prohibition on drawing human figures referred to above are important to investigate, the reduced role of culture in the DAP: IQ, along with Abell, Wood, and Liebman’s (2001) assertion that this measure may be used with non-reading or non-English speaking individuals, further explains the popularity of this measure in South Africa.

Drawing activities may be particularly helpful when working with shy or impulsive children, children with speech and language difficulties, or those who speak a different language from the practitioner as these children tend to respond well to such activities (Klepsch & Logie, 1982). Another contributing factor is that the use of this measure in South Africa is not restricted to registered psychologists, thus allowing a large number of individuals from other registration categories in psychology (e.g., psychometrists and registered counsellors) and other disciplines (e.g., general medical practitioners and educators) to use this measure.

A short screening test such as the DAP: IQ may be of remarkable value if it is found to provide an accurate reflection of a child’s mental developmental level. The DAP: IQ is widely used for this purpose and there is reason to believe that HFDs may be useful in the screening of developmental delays. Church, Katigbak, and Almario-Velazco (1985), for example, found that concept formation – as measured by HFD tests - is significantly correlated with ability in language and mathematics, as well as with overall achievement in Grade 1. Such evidence suggests that human figure drawing tests can be meaningfully applied in the screening for developmental delays. The value of this research lies in the
pressing need to establish whether HFDs such as the DAP: IQ serve this function of screening for developmental delays.

1.5. **Primary Research Objectives**

The primary research objectives of this study are summarised in the following four statements:

- To explore and describe the standardized human figure drawing scores of the sample.
- To explore and describe the GMDS-ER general quotients of the sample.
- To investigate whether there is a relationship between the standardized human figure drawing scores and GMDS-ER general quotients of the sample.
- To investigate the directionality and strength of the relationship between standardized human figure drawing scores and GMDS-ER general quotients of the sample.

1.6. **Delineation of the Study**

Chapter 1 serves as an introduction to this study. In this chapter, the context, problem statement, motivation for the research, and primary objectives of the study are briefly presented.

Chapter 2 presents conceptual models of mental development and forms the theoretical framework of this study. Literature from the broad field of developmental research is reviewed and applied to human figure drawing tests and the Griffiths Mental Development Scales – Extended Revised.

Chapter 3 presents a discussion in which the relationship between key constructs of the present study, including conceptual maturity, intelligence, and mental development is clarified.
Chapter 4 describes the research methodology and the design utilised in this study. The methodological considerations made in the study are discussed. Information is presented on the research design, participants, sampling procedure, measures used and data analysis techniques used toward achieving the aims of the study.

Chapter 5 provides a presentation and a discussion of the research results of this study. These results are discussed in the context of the conceptual frameworks presented in earlier chapters and related to the research objectives.

Chapter 6 presents the conclusions to the present study based on the research results, reviews limitations, and provides suggestions for further research in this area. The chapter concludes with an overview of ethical considerations made in the present study.

1.7. Conclusion

This chapter provided an overview of the research. The motivation and rationale for the research was presented. The history and uses of non-projective human figure drawing tests was discussed. It was shown that researchers observed a developmental progression in children’s human figure drawings and that human figure drawings have been used to measure conceptual maturity, mental maturity and intellectual ability. The importance of developmental assessment in the South African context was then discussed. It was shown that specific characteristics of human figure drawing tests may make such tests particularly useful tools to identify developmental delays in the South African context. This was followed by a discussion of the research objectives. The chapter concluded with a delineation of the chapters that are to follow. In the following chapter, the theoretical foundations of this study are discussed in greater detail.
Chapter 2
Theories of Child Development

2.1. Introduction

The historical development of human figure drawing (HFD) tests and the recognition that aspects of human figure drawings are related to a child’s chronological and/or mental age as well as the developmental progression seen in these drawings was briefly discussed in Chapter 1. In this chapter relevant literature from the broad field of developmental research is reviewed and applied to human figure drawing tests and the Griffiths Mental Development Scales – Extended Revised (GMDS-ER). Important definitions are first provided to orientate the reader. This is followed by a review of developmental theories, in particular: Piaget’s theory of cognitive development (Piaget & Inhelder, 1969); Vygotsky’s (1978) sociocultural theory; Bruner’s (1960, 1966, 1986, 1990, 2006a; 2006b) theory of cognitive development; and contributions from neuropsychological and information-processing perspectives (Bensur & Eliot, 1993; Bensur, Eliot, & Hedge, 1997; Case, 1985; Cherney et al., 2006; Chi, 1977; Kail, 1992; Kail & Hall, 1994; Kail & Salthouse, 1994; Schneider & Pressley, 1997; Scott, 1981; Zgourides, 2000). Similarities and differences between these views and the implications of these theoretical contributions to the present study are discussed throughout. The chapter provides the reader with a framework in which to understand the relationship between development in general and the developmental progression seen in HFDs. To this end, Luquet’s (1927) theory of drawing development is integrated with the discussion on development in general.

2.2. The Study of Child Development

Development has been defined as the “orderly and relatively enduring changes over time in physical and neurological structures, in thought processes, in emotions, in forms of
social interaction, and in many other behaviours” (Newcombe, 1996, p.4). Ruth Griffiths adopted an inclusive view of development, which she defined as “the processes and rates at which growth and maturation of a child’s attributes and abilities takes place” (Luiz et al., 2006a, p.1). Di Leo (1970, p.4) defined development as "differentiation and increase in complexity of function, thereby distinguishing it from "growth", a term used to express increase in size and weight”. Di Leo (1970, p. 4) notes that "these two aspects of maturation are intimately related and begin inseparably, with life”. Both Griffiths’ and Di Leo’s broad definitions are not particularly helpful for the purposes of operationalization. A final important definition is that of cognitive development, which is defined as “the appearance, expansion, and alteration of mental processes from birth until death including sensory and motor perception and control, all types of memory, consciousness, attention, analyzing, solving problems, emotional experience and regulation, counterfactuals, and conscious thought” (Matsumoto, 2009, p. 115). The authors of the most recent human figure drawing test of intellectual ability, the DAP: IQ, state that “as children mature cognitively and their thought processes become more complex, their drawings of a person become more detailed, complete, and complex” (Reynolds & Hickman, 2004, p.2).

The present study is informed by Luquet’s (1927) theory of drawing development. Luquet described the developmental progression referred to by Reynolds and Hickman (2004). Luquet’s theory was chosen because it provides a useful introduction to the development of representational drawing in children, as well as due to its strong influence on other researchers in the field (Jolley, 2010). Jean Piaget, the Swiss developmental psychologist and philosopher, incorporated Luquet’s theory of drawing development into his own theory of cognitive development (Piaget & Inhelder, 1956, 1969). This provides an invaluable theoretical link between the concepts of representational development and mental development in general. The importance of studying development will now be discussed,
after which specific developmental theories are reviewed and discussed in relation to human figure drawings. Luquet’s (1927) description of the developmental progression of human figure drawings is integrated throughout the discussion.

Development as the subject of study is important for several reasons. According to Newcombe (1996) the most prominent of these are:

1. that it allows one to understand changes that are apparently universal in all cultures;

2. that it contributes to one’s understanding of individual differences;

3. that it allows for a greater appreciation of the way that the environmental context or situation influences children’s behaviour;

4. the study of development also provides a knowledge base that may be used in the early identification of children with potential developmental delays.

While all the reasons for studying development listed above are important, the fourth is the most directly relevant for the purposes of the current study. An understanding of development allows practitioners to compare children’s development to established developmental norms. This knowledge is useful in applied psychology as it allows for the screening of children with developmental delays who may then receive appropriate interventions. The remainder of this chapter provides an overview of influential theories of child development. The focus is on particular aspects of these theories that are most relevant to the present study.
2.3. Piaget’s Theory of Cognitive Development

Piaget’s (Piaget & Inhelder, 1969) theory of cognitive development remains one of the most well-known and influential theories of child development (Slee & Shute, 2003). This section provides an overview of the contributions made by Piaget that are most relevant to the present study. Piaget’s (Piaget & Inhelder, 1969) theory is first contextualized within the constructivist framework. The key concepts that Piaget used to explain intellectual development, namely: assimilation, accommodation, equilibrium, and disequilibrium are then explicated. This is followed by an overview of Piaget’s developmental stages, namely: sensorimotor, preoperational, concrete operational, and formal operational stages. The discussion on Piaget concludes with the four factors he believed to underlie cognitive development.

Piaget’s (Piaget & Inhelder, 1969) theory is often described as a constructivist theory. Constructivism is a cognitive perspective that proposes mental processes to be constructions produced by the mind in interaction with the environment. Mental processes are then used in the understanding of new information and the recall of the past (Matsumoto, 2009). Philosophically, it owes much to the work of Berkeley and Kant who underlined the subjective nature of perception (Slee & Shute, 2003). This label is applicable to Piaget’s theory since the role of the child in actively constructing the external world through acting on it is emphasized (Gelcer & Scharwtzein, 1989). Gelcer and Schwartzbein highlighted two assumptions of Piaget’s work that support such a view, namely:

1. The same experience can be known on different levels, and

2. The individual’s problem-solving approach becomes more flexible with higher levels of abstraction.
Constructivist theories do not view the individual as merely reactive, as many mainstream theories do, but rather propose that people actively participate in observation and that meaning is co-created through this process (Slee & Shute, 2003). The theories of Vygotsky and Bruner that follow also contain strong elements of constructivism. It must be noted that while Piaget acknowledged the child’s active role in his own development, he did not discount the role of biological maturation and that he regarded development in this sense to be progressive and directional (Slee & Shute, 2003).

2.3.1. Assimilation, accommodation, equilibrium, and disequilibrium. In agreement with other constructivists, Piaget pitches his theory against the nativist assumption that children are born with knowledge or ideas about reality or that adults teach them how to think (Shaffer & Kipp, 2010). Piaget’s constructivist argument proposes that children’s understanding of the world is actively constructed on the basis of their experiences (Shaffer & Kipp, 2010). In this process they “experiment with objects they encounter; they make connections or associations between events; and they are puzzled when their current understandings (or schemes) fail to explain what they have experienced” (Shaffer & Kipp, 2010, p. 54). Two mechanisms, namely assimilation and accommodation, underlie this process of active involvement in their own intellectual development. Children make sense of new experiences by “incorporating them into existing schemes” (Shaffer & Kipp, 2010, p. 54) – a process Piaget termed assimilation. Conversely, children may adapt their existing cognitive schemes to allow the incorporation of new experiences - which Piaget called accommodation (Shaffer & Kipp, 2010, p. 54).

Equilibrium and disequilibrium are other important Piagetian concepts. Equilibrium refers to a state where “a balanced, harmonious relationship [exists] between one’s cognitive structures and the environment” (Shaffer & Kipp, 2010, p. 54), whereas disequilibrium is defined as “imbalances or contradictions between one’s thought processes and environmental
events” (Shaffer & Kipp, 2010, p. 54). A child will use accommodation (that is, modify his existing schemes) when assimilation is not effective in the incorporation of new experiences into current cognitive schemes (that is, when the facts contradict a child’s current understanding thereby creating disequilibrium).

2.3.2. Piaget’s stages of cognitive development. Perhaps the most well-known of Piaget’s contributions is his description of the stages of cognitive development. Piaget’s four stages are: (a) sensorimotor, (b) preoperational thought, (c) concrete operations, and (d) formal operations. Inhelder (1962) described several characteristics of Piaget’s stage theory, namely: Piaget’s theory describes stages in which mental operations form and become ever more organized over time; these stages are hierarchical, with each stage building on preceding stages; individuals show similarities when reaching each stage; and the stages progress in a fixed direction from lower complexity to higher complexity. These stages are now discussed in turn.

2.3.2.1. Sensorimotor stage. In this first stage from birth to two years of age infants learn through the use of their senses and develop motor control by doing, that is, by actively exploring and interacting with their environment (Sadock & Sadock, 2007; Zgourides, 2000). Early causal reasoning develops during this stage, as infants progress from simply using their reflexes towards deliberate goal-directed behaviour (Zgourides, 2000). Object permanence, referring to the realization that objects still exist even if they cannot be seen, is generally developed around the age of nine months (Zgourides, 2000). The end of this stage is marked by the development of symbolization: the process of using mental symbols and words as mental representations that signify real objects (Sadock & Sadock, 2007). This is the beginning of representational (symbolic) thought in which symbols are internalized as objects (Zgourides, 2000). The development of representational thought and growing conceptual maturity is central to the thesis of this study.
2.3.2.2. Preoperational thought. The stage of preoperational thought spans the ages of two to seven years (Sadock & Sadock, 2007; Zgourides, 2000). This stage is of particular importance as participants in the current study are in this developmental stage. There is an increase in symbolic thought, namely thought that relies on the use of language and other symbols (Sadock & Sadock, 2007; Zgourides, 2000). Children’s concepts during this stage are still primitive, for example, they know the names of objects but cannot classify objects by grouping them according to features (Sadock & Sadock, 2007; Zgourides, 2000). The advances in language use that occur at this stage play an important role in drawing development (Toomela, 2002). The ability to name objects helps a child to select which aspects to include in his drawing, whereas self-directed speech helps the child to plan activities and organize elements in his drawing (Toomela, 2002).

Piaget’s description of the semiotic function that develops during the preoperational period is of particular relevance to the present study (Sadock & Sadock, 2007). The semiotic function refers to a new ability that allows children to represent things, including objects, events, or conceptual schemes, by means of a signifier (Sadock & Sadock, 2007). Drawing is an example of this ability to use signs and symbols to refer to something else (Sadock & Sadock, 2007). The child’s proficiency in drawing a human figure is therefore dependent on the degree to which he has mastered the semiotic function.

The attainment of symbolic thought is central to conceptual development. A child can now operate on a new level by using concepts: “the mental representation of a thing or class of things so that an individual can decide whether a specific stimulus is an instance of that object or class of objects and act on the basis of that judgment” (Matsumoto, 2009, p. 123). The non-projective use of human figure drawings is based on the belief that human figure drawings measure conceptual maturity (Harris, 1963). Harris (as cited in Cox, 1993) stated that:
the child’s drawing of an object is an index of his concept of that object, and his concept of a frequently experienced object such as a human being is a useful index of the growing complexity of his concepts in general. (p. 70)

As Cherney, Seiwert, Dickey, and Flichtbeil (2006, p. 127) put it: “children’s drawings are thought to be a mirror of a child’s representational development”. It may therefore be hypothesised that human figure drawings measure a child’s mental development by providing an indication of the degree to which the child has developed the semiotic function.

Luquet’s Theory of Drawing Development (1927) proposes that children’s drawing is characterised by different stages of representational development. The scribbling stage of 2 to 4 year olds refers to the initial stage during which a child scribbles without knowing that he can use his drawings to represent reality (Luquet, 1927). During this scribbling stage the child’s drawing is simply motor activity without any attempt to create a graphical representation of an object (Luquet, 1927). This initial non-representative drawing activity fits with the absence of the ability to use symbols as would be predicted by Piaget’s description of the sensorimotor stage and the early preoperational stage.

According to Luquet (1927) a child will eventually notice a likeness between his own scribbles and an aspect of the world, called fortuitous realism. This new knowledge that he can represent life, subsequently typifies his future drawing development insofar as he increasingly attempts to create representational drawings from the outset (Luquet, 1927).

Luquet’s (1927) second stage of drawing development which spans the ages of 4 to 7 years is known as the pre-schematic stage. A child at this stage attempts to represent objects in his drawings, but his increasingly representational drawings are hampered by difficulties with motor, cognitive, and graphic obstacles. Errors are frequent, including such errors as
incorrect use of line (due to poor motor control), omission of details (due to poor attention), problems of position, orientation and proportion, and inaccurate relations between parts of the drawing (Luquet, 1927). Intellectual realism develops towards the end of this stage (Luquet, 1927). At this stage a child aims to represent as many as possible of the essential details of a subject in their characteristic shapes. Jolley (2010, p. 17) states that a child at this stage of development draws “from what he or she knows about the topic, not from what he or she sees from one viewpoint”. The child’s concept of what he is drawing is therefore crucially related to the quality of his drawing output. With regard to human figure drawings, it is at this point where the body appears (that is, not a tadpole drawing anymore), the amount of details increase, and the relationship between the details becomes increasingly accurate. According to Luquet (1927) children at this stage are not trying to represent a subject as seen from a certain angle, but rather are relying on an internal model constituted of features the child believes to be important to the subject at hand. These internal models become increasingly detailed over time.

The human figure drawings used in the present study were produced by children in this age range. The growing ability to create representational drawings that develops during this stage is consistent with Piaget’s and Inhelder’s (1969) proposal of the emergence of the semiotic function and the rapid development of representational thought that occur during the preoperational stage.

**2.3.2.3. Concrete operations.** The stage of concrete operations spans the ages of 7 to 11 years (Sadock & Sadock, 2007; Zgourides, 2000). This age range exceeds the upper age limit of the present study, and as such is not as relevant to the present study as the preceding stages. During this stage children develop a more complete understanding of causal relationships, become more systematic in their thinking, and develop the ability to take on the perspective of others (Sadock & Sadock, 2007; Zgourides, 2000). The emergence of concrete
operations marks “logical thought about specific objects or situations, which involves letting go of (decentering) one’s perceptually centered viewpoint and thinking in somewhat abstract terms” (Matsumoto, 2009, p. 124). With this increase in logical thought, children attain conservation, that is, they come to realise that if the shape of an object changes other characteristics stay the same and it does not become a different object altogether (Sadock & Sadock, 2007). A better understanding of the relation between things allow them to recognize that one thing can take different forms or turn into something else and back again such as is the case with water and ice (Sadock & Sadock, 2007). Children’s thinking is still concrete at this stage, but the increase in abstract thought and emergence of conservation and reversibility distinguish this stage from its predecessor (Sadock & Sadock, 2007; Zgourides, 2000).

Luquet’s (1927) theory of drawing development refers to children between the ages of 7 and 9 years as being in the schematic stage. Visual realism emerges when the child at this level of drawing development realises that although his drawings include the important features of his subjects, they do not look realistic (Luquet, 1927). Such a child abandons “separation, transparency, plan, and folding-out techniques, and instead they begin to get to grips with the graphic techniques of visual realism that include occlusion, suppression of details, and perspective” (Jolley, 2010, p. 18). The use of such techniques is more cognitively demanding than earlier, simpler drawing styles. As such, a higher level of cognitive development would be necessary for the successful progression to this stage of visual realism. The child now attempts to draw visual models, rather than internal models. Cherney et al. (2006) support the progression described by Luquet (1927), stating that the greater amount of distinctive features included in children’s drawings with advancing age lends a quality of realism to these drawings.
2.3.2.4. **Formal operations.** Piaget’s final stage, that of formal operations, stretches from the child’s 11th year past the end of adolescence (Sadock & Sadock, 2007). This stage is characterized by ever more logical, systematic, and symbolic thought, that allow for the emergence of complex logic and complex, grammatically correct language (Matsumoto, 2009; Sadock & Sadock, 2007). The most organized forms of cognition appear during this stage (Matsumoto, 2009; Sadock & Sadock, 2007; Zgourides, 2000). Hypothetico-deductive reasoning involves the ability to form and test hypotheses (Matsumoto, 2009; Sadock & Sadock, 2007). Individuals in this stage are also able to perform scientific-inductive reasoning by which they may form generalizations based on multiple observations (Matsumoto, 2009). The ages at which the different developmental stages appear are approximate and not all individuals reach the stage of formal operational thought (Sadock & Sadock, 2007).

2.3.3. **Factors that underlie cognitive development.** In addition to the description of the stages of intellectual development described above, Piaget also attempted to explain the processes that account for this developmental progression. Piaget (as cited in Slee & Shute, 2003) outlined four factors that underlie cognitive development, namely (a) maturation; (b) experience; (c) social transmission; and (d) equilibration. These four factors are now discussed in turn.

2.3.3.1. **Maturation.** The biological process of physical brain development, which begins before birth and extends long into life, allows for the unfolding of increasingly complex cognitive ability (Slee & Shute, 2003).

2.3.3.2. **Experience.** Piaget divides experience into direct physical experience and mathematical experience. The prior involves experience that originates directly through the use of the five senses, whereas the latter involves logico-mathematical experience that arises
from the child acting on the world instead of from direct experience in itself (Slee & Shute, 2003).

2.3.3.3. Social transmission. Piaget regarded the child’s interaction with the physical world to be the main impetus of development, but he also acknowledged the role of interaction with other children and adults as motivator for development (Slee & Shute, 2003). In such instances the child has to decentre in order to make sense of conflicting ideas (Slee & Shute, 2003).

2.3.3.4. Equilibration. Through this most basic underlying factor the child obtains a new balance between previously understood information and new experience (Slee & Shute, 2003). It involves the processes of assimilation and accommodation referred to earlier.

The broad factors that Piaget believed to account for cognitive development illustrate the fact that a multitude of influences impact on cognitive development. A discussion of all of these influences would fill several books and is well beyond the scope of the present study. The most directly relevant of these were therefore included in the discussion. Specific theories of development focus more heavily on some of these factors than others, but the reader is encouraged to bear in mind that a holistic view that takes into account as many as possible of these influences will lead to the most thorough understanding of the complex process of development. This concludes the section on Piaget’s (Piaget & Inhelder, 1969) theory and the discussion now turns to Vygotsky’s (1978) sociocultural theory.

2.4. Vygotsky’s Sociocultural Theory

This section discusses the theory of the Soviet psychologist Lev Vygotsky. Important aspects of his theory such as cultural mediation, the centrality of language and social interaction in cognitive development, and his concepts of elementary and higher mental
functions are discussed. His concept of the Zone of Proximal Development (ZPD) is also discussed and applied to the two measures used in the present study. The section concludes with a description of key differences between the theories of Piaget and Vygotsky.

Vygostky (1978) made important contributions to the understanding of child development by affording a central role to society and culture as forces that shape cognitive development. Whereas Piaget believed development to originate in the child’s active experimentation on the world, Vygotsky (1978) contended that social interaction forms the foundation of cognitive development. In their classic comparison of Piaget and Vygotsky’s theories, Cole and Wertsch (1996, p. 2) summarize Vygotsky’s broad conceptualization of cultural mediation by stating that “the development of mind is the interweaving of biological development of the human body and the appropriation of the cultural/ideal/material heritage which exists in the present to coordinate people with each other and the physical world”. This statement does justice to Vygotsky’s emphasis on the primacy of social interaction in development, but does not neglect the essential contribution of biological maturation as acknowledged in Piaget’s theory. The reader is encouraged to incorporate each new perspective into his or her understanding of child development as these are discussed. While consolidating such a broad body of work is admittedly no easy task, such a creative synthesis will allow the reader a more thorough understanding of child development that goes beyond the limits of dogmatic adherence to any one theory.

Whereas theories such as Piaget’s propose that cognitive development helps an individual to adapt to his environment, Vygotsky argues from the opposite direction: that cognitive development begins in social interaction and that these social functions are then internalized and converted into mental functions (Driscoll, 2000). Vygotsky (1978) stated that:
every function in the child’s cultural development appears twice: first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of ideas. All the higher functions originate as actual relationships between individuals. (p. 57)

2.4.1. Elementary and higher mental functions. Vygotsky (1978) drew a distinction between elementary and higher mental functions. Elementary mental functions are innate and include such abilities as attention, sensation, perception and memory (Vygotsky, 1978). Higher mental functions, on the other hand, refer to the creation and use of abilities such as thought, linguistic ability, mathematical ability and problem-solving (Vygotsky, 1978). Vygotsky (1978) proposed that culture transforms the elementary mental functions to give rise to more sophisticated higher mental functions. These higher mental functions are the tools of the culture in which the individual lives. He believed that higher mental functions originate externally in social occurrences and that they are only later integrated into a person’s thinking by means of language (Lutz & Huitt, 2004). In this way society determines what is to be learned and how it is to be learned, thus society is the main influence behind cognitive development (Lutz & Huitt, 2004).

This shows that Vygotsky (1978) viewed social interaction not only as one important factor in cognitive development, but as the central force behind cognitive development. Vygotsky’s (1978) central tenet is therefore that learning occurs as a result of social interaction that transforms elementary functions into higher-level functions, thus allowing the development of more complex thought through the use of signs and symbols.

As mentioned above, Vygotsky distinguished between elementary mental functions and higher mental functions. He suggested that elementary mental functions are innate while higher mental functions are socially mediated. It would be incorrect to understand this as
meaning that higher mental functions do not also rely on biological maturation. It is known that any learning corresponds to physiological changes. The point to keep in mind here is that such phenomena as learning may be investigated at different levels of abstraction and that investigators may choose to focus on neuronal pathways, metabolic activity in the brain, willed behaviour, or on any of a number of contexts from the micro to the macro-sociological context, to name but a few influences on learning. These different perspectives do not necessarily negate one another and together allow for a better understanding of development.

Vygotsky viewed language as the most important cultural tool that allows the development of thought (Slee & Shute, 2003). Vygotsky also observed qualitatively different developmental stages (Slee & Shute, 2003). He highlighted the importance of speech and thought coming together at around the age of two years, which forms the basis of future conceptual development, and believed that proper abstract thought appears in adolescence, but that the more concrete thought of previous stages remains present (Slee & Shute, 2003). Vygotsky’s ideas in this regard are very similar to those of Piaget discussed earlier. Although both theorists proposed developmental stages, Piaget’s stage theory is more widely acknowledged whereas the most valuable contribution of Vygotsky’s theory is the recognition of the role of social interaction and language in cognitive development (Slee & Shute, 2003). Language is a symbolic system that relies on representational thought. Human figure drawings also rely on representational thought and may be of value to gauge the child’s ability to think in terms of abstract symbols that refer to things and his level of growing conceptual maturity.

2.4.2. Drawing, language, and representational thought. Vygotsky’s (1978) theory offers valuable insight into children’s drawings. He proposed that children in early stages of drawing development draw from memory, that is, from what they know instead of from what they see. He noted that such children would not only ignore perceptual information of the
object in front of them, but that they in fact contradict such information (Vygotsky, 1978). This observation supports Luquet’s (1927) assertion that drawing development progresses from intellectual realism to visual realism. It also underlines the importance of memory in the creation of graphic representations as well as the fact that internal concepts are essential for the production of representational drawings. On the subject of concept formation, Vygotsky (1986, p. 149) wrote: concept formation “is a complex and genuine act of thought that cannot be taught by drilling, but can be accomplished only when the children’s mental development itself has reached the requisite level”. Here again, mental development appears to be closely related to conceptual maturity, as measured by human figure drawing tests.

According to Toomela (2002), Vygosky’s theory provides an explanation of the role of language in drawing. Vygotsky (as cited in Toomela, 2002) suggested that a direct relationship between stimulus and response is presupposed in elementary functions but that this direct link can be semiotically mediated by signs such as verbal language. In this way “language selects and reorganises information and directs attention to significant aspects of a situation” (Toomela, 2002, p. 235). Toomela further argues that words are tools that allow the child to choose which aspects of the object to represent in his drawing. Toomela uses the example that if a child only has a word (or concept) of a dog, he can differentiate between dogs and other animals, but only when he learns words such as ‘collie’ and ‘poodle’ the child becomes able to appreciate the subtle differences between these objects and represent them in his drawing. Vygotsky’s notion of language as a cultural tool that originates in the social context and allows for cognitive development when internalized is therefore very useful in the understanding of children’s representational drawings. This illustrates Vygotsky’s proposition that culture transforms elementary mental functions into higher mental functions. As the child learns words such as ‘dog’, ‘collie’ and ‘poodle’ through social interaction and
internalizes them by means of language, his developing conceptual maturity allows for ever more advanced ways of thinking.

The link between drawing and language suggested by Toomela (2002) corresponds to Vygosky’s (1978) description of drawing as graphic speech which is based on verbal speech and precedes the development of written language. This discussion further illustrates the relationship between drawing and representational thought. Drawing is clearly an expression of the semiotic function discussed earlier in relation to Piaget’s preoperational stage. As Ahn (2007) notes, Piaget and Vygotsky both regard drawings as reflections of children’s representational abilities. One may understand representational thought as resulting from the child’s growing cognitive schemes developed through active experimentation, as Piaget argued, or from the development of higher mental functions as a result of the internalization of cultural tools such as language as proposed by Vygotsky. In both cases it may be hypothesized that children’s human figure drawings offer an indication of their development in terms of this crucial ability.

2.4.3. The zone of proximal development (ZPD). Another famous concept that originated with Vygotsky is the zone of proximal development (ZPD). The ZPD refers to the range of a person’s learning potential at a given point in development (Vygotsky, 1978). Vygotsky (1978) suggested that at any point in development there are things that an individual can do without help, things that he or she can only do when helped by another, and things that he or she still cannot do even with the help of others. The ZPD is the gap between an individual’s actual developmental level – those things he can do without assistance, and the level of potential – the things an individual can do with guidance or support by others that are more proficient in the task at hand (Vygotsky, 1978). In the following section the concept of the zone of proximal development is applied to the two measures used in the present study.
The GMDS-ER aims to provide an indication of the child’s best possible performance. Several measures are taken toward this end. Throughout the administration of the measure, the child is encouraged to perform as well as he possibly can. The test administrator will first determine a basal, this being a set of six consecutively passed items (Luiz et al., 2006a). Items are then administered in order of progressing difficulty until the child fails six consecutive items and a ceiling is thus established (Luiz et al., 2006a). The basal helps to ensure that the child is credited for items early in the test that he can reasonably be expected to have mastered granted his developmental level. The ceiling provides him the opportunity to demonstrate his abilities in items that he has only recently mastered or is beginning to master.

The items that make up each particular child’s basal and the preceding items can be considered to correspond to the bottom end of Vygotsky’s zone of proximal development. These items correspond to tasks the child has already mastered and can perform without assistance. As test items become more difficult, the child progresses toward the higher end of the zone of proximal development until he finally reaches his ceiling. Since the test administrator may usually only encourage the child and is generally not allowed to actually help him, the upper end of the child’s performance on the GMDS-ER is more an indication of tasks the child can perform without assistance than tasks he can perform with some assistance or that he cannot master even if helped by others. The child’s performance on the GMDS-ER therefore does not necessarily reflect the upper end of the child’s zone of proximal development.

The GMDS-ER does however include items such as “Washes own hands and face, with some assistance” (Luiz et al., 2006a, p. 35). These items measure the middle range of Vygotsky’s zone of proximal development. The administration instructions for some items on the GMDS-ER, such as “Builds a tower of 8+ bricks” (Luiz et al., 2006a, p. 52), require that
the test administrator demonstrate the required task to the child before the child attempts it. In this item, for example, the examiner may help the child by pointing out where the bricks should be placed. Some items on the GMDS-ER allow the child two chances to pass the task, while others such as “4-squares board: 50 seconds” (Luiz et al., 2006a, p. 69) provides the opportunity for the child to improve his performance with a second attempt. In this timed task, for example, the best of the two scores is recorded, thus allowing for the child to demonstrate his best performance. In cases where the examiner may help the child, the test items measure the middle range of Vygotsky’s zone of proximal development. Failing these items reflects the upper limits of the zone of proximal development, namely those tasks that the child cannot complete even with the assistance of others.

With regards to tests of HFD’s the standardized administration of the DAP: IQ does not permit the administrator to encourage the child or to provide him with guidance or assistance while he is completing his human figure drawing. This task therefore measures the lower range of the zone of proximal development, namely tasks the child can complete without assistance. This does not however imply that this test measures only the most developed abilities of the child, thereby underestimating his developmental level. Norm tables are used to obtain standardized test scores and as such the child is positioned relative to the performance of his peers. This overcomes the apparent problem posed by using a task where successful completion would indicate mastery in the lower range of the zone of proximal development.

On the other hand in the standardized administration of the GMDS-ER the examiner initiates the ‘Draws a person’ item or task by saying to the child: “I want you to draw a man” (Luiz et. al., 2006a, p. 53). The instructions further state “encourage the child to draw the best possible person” (Luiz et. al., 2006a, p. 53). The degree to which the examiner is allowed to assist the child in this task is not clear from the standardized instructions, and the
administration of this item does therefore not conform to the DAP: IQ standardized instructions. The most likely interpretation of the GMDS-ER ‘Draws a person’ instructions is that the examiner must be supportive, but not directive. Instructing the child to include features such as eyes or arms would in most cases mean that the child would pass later ‘Draws a person’ items that he might not pass without these instructions. Such instructions would therefore defeat the purpose of these items. It may therefore be concluded that ‘encourage’ does not mean to give specific advice to the child. The human figure drawings obtained from the GMDS-ER protocols therefore provide an indication of the child’s best effort to produce a human figure drawing, based on his concept of a person. It follows that although the GMDS-ER ‘Draws a person’ instructions differ from the DAP: IQ instructions, the obtained human figure drawings can be expected to be comparable.

2.4.4. Differences between the theories of Vygotsky and Piaget. Vygotsky’s (1978) social cognitive theory of development departs from Piaget’s (Piaget & Inhelder, 1969) theory in several respects. Firstly, Vygotsky affords a central role to culture and social interaction in the process of cognitive development, whereas Piaget’s theory tends to depict the child as a more autonomous agent that realizes his own development through interaction with his environment. Vygotsky’s theory also breaks away from the defined milestones set out in Piaget’s stage theory and instead promotes the view that there always remains some potential for development that is not actualized. Development is therefore construed as an ongoing process without a final destination (Lutz & Huitt, 2004). The discussion now turns to the work of Jerome Bruner.

2.5. Bruner’s Theory of Cognitive Development

The work of the American psychologist and educator Jerome Bruner will now be discussed. Key assumptions of Bruner’s theory are first presented. This is followed by a more
detailed discussion of his theory, focussing on such aspects as the role of culture and language in cognitive development; the enactive, iconic, and symbolic modes of representation; the spiral curriculum; and cognitive readiness. Throughout the discussion, these contributions are compared to the ideas of Piaget and Vygotsky presented in the previous two sections of this chapter.

The first key assumption of Bruner’s (1960, 1966, 1986, 1990, 2006a; 2006b) theory is that meaning is actively constructed from the world and there is no objective reality that exists independently of human mental activity and symbolic language (Bruner, 1986). The implication of this metaphysical position is evident in the observation that the same event can hold different meanings to different individuals (Slee & Shute, 2003). Secondly, he argued that development can never occur independently of an individual’s cultural and historical context (Bruner, 1986). The third assumption inherent in his work is that children play an active role in constructing their world, but do not do so in isolation (Slee & Shute, 2003). Instead, it is through social interaction that the child “acquires a framework for interpreting experience, and learns how to negotiate meaning in a manner congruent with the requirements of a culture” (Bruner & Haste, 1987, p. 1) and that in this way, “culture gives shape to our thoughts” (Bruner, 2006b, p. 4). Bruner’s ideas can be seen to occupy a position between the Piagetian emphasis of the child’s active role in his own development and the centrality of culture in mental development found in Vygotsky’s thought.

Bruner (1966) believed increases in an individual’s intellectual functioning to be driven by development in the individual’s language facility as well as exposure to systematic instruction. From this perspective language is seen as a prerequisite of thought (Slee & Shute, 2003). This illustrates the primacy that he attached to language as an underlying factor of cognitive development as well as his acknowledgement of social factors in development.
2.5.1. Modes of representation. Bruner (1966) described three modes of knowing that form part of development, namely: enactive, iconic and symbolic. These modes of representation emerge in a developmental sequence, as seen in Bruner’s (2006a, p. 69) statement that their development “is in that order, each depending upon the previous one for its development, yet all of them remaining more or less intact throughout life.”

2.5.1.1. Enactive representation. The stage of enactive representation is equivalent to Piaget’s sensorimotor period (Slee & Shute, 2003). Bruner (1966, p. 17) agrees with Piaget (1954) that during this stage things are “lived rather than thought”. The non-representational nature of scribbling in children’s early drawings reflects the fact that early drawing is based in action rather than goal-directed thought.

2.5.1.2. Iconic representation. The second stage, known as the stage of iconic representation, involves representing the world through a mental image (Bruner, 1966). According to Bruner (1966, p. 21), this stage begins when “a child is finally able to represent the world to himself by an image or spatial schema that is relatively independent of action”. Such a mental image is a cognitive representation that represents a body of knowledge (Slee & Shute, 2003). Iconic representation corresponds to the earlier period of Piaget’s preoperational stage. The emergence of the semiotic function - namely the ability to represent things by means of a signifier - which occurs later in this Piagetian stage marks the transition from an iconic mode of representation to the next stage: that of symbolic representation.

2.5.1.3. Symbolic representation. Children in Bruner’s (1966) third stage, termed symbolic representation, are able to use symbols to represent their experience of the world. This type of representation is more developed than that found during iconic representation because symbols such as words can be used that do not resemble their referent, whereas iconic representations such as pictures are more directly related to their referents (Slee &
Bruner (1966) believed that children’s growing ability to use language is responsible for advances in symbolic representation. Using Bruner’s framework, the participants in the present study would have relied on enactive and iconic representation and some would have reached symbolic representation. It should be noted that although the task of drawing a human figure at first seems to rely on iconic representation insofar as the figure resembles an actual person, symbolic representation also plays an important role. As discussed in the section on Vygotsky, the symbolic system of language serves a mediating function between stimulus and response and helps the child to plan and organize his activity. A child who is able to use symbolic representation may therefore be expected to provide a more detailed, complex, and organized human figure drawing than one who relies solely on the iconic mode of representation.

Bruner’s theory was strongly influenced by the work of Piaget and Vygotsky (Slee & Shute, 2003). Bruner (1986, 1990) agrees with Piaget’s concept of cognitive development as occurring in progressive stages, with each successive stage building on earlier stages. He also regards categorization and representation to be critical in cognitive development, as does Piaget. Bruner believes that children develop a representational system and that learning occurs by comparing new stimuli with existing mental structures (Lutz & Huitt, 2004). Cognitive development is the development of more sophisticated mental structures resulting from this ongoing comparison (Driscoll, 2000; Lutz & Huitt, 2004). This aspect of Bruner’s theory is similar to the dual processes of assimilation and accommodation proposed by Piaget.

Conceptual development, also known as the development of representational thought, is a central concept in the present study. Bruner and colleagues (Bruner, Oliver & Greenfield, 1966, p. 1) stated that “conceptual development is characterized by gradually more
sophisticated representations of the world rather than by the gradual acquisition of separately identifiable skills that do not necessarily occur in a sequence as the process unfolds”.

Lutz and Huitt (2004) contend that Bruner’s theories may also be linked to information processing theories in that he believes development to rely on the elaboration and increased sophistication of mental structures that occurs with interaction and experience. His theory also places importance on the role of culture in development. In this sense his beliefs are similar to that of Vygotsky (Lutz & Huitt, 2004). Vygotsky’s influence on Bruner’s views may be seen in his assertion that children are social beings whose competences “are interwoven with the competences of others” (Bruner, 1986, p. 11). Bruner emphasized the role of culture in development, stating that cognitive growth is shaped as much “from the outside in as the inside out” (Bruner, 1966, p. 13). Furthermore, he highlighted that humans are well suited to adapt to their environment by social means instead of morphological means (Bruner, 1986).

2.5.2. The spiral curriculum. Bruner also introduced the concept of a ‘spiral curriculum’. This term refers to fitting the instructional method to students’ developmental level and then revisiting this material in more complex forms as the individual’s cognitive abilities develop (Bruner, 1960). Referring to the spiral curriculum, Bruner (1966, p. 44) stated that “any idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it in a recognizable form” and that “a curriculum as it develops should revisit these basic ideas repeatedly, building upon them until the learner has grasped the full formal apparatus that goes with them” (Bruner, 1960, p. 13).

Lutz and Huitt (2004) propose that the principal difference between Bruner (1986) and Piaget’s (Piaget & Inhelder, 1969) theories center around the notion of cognitive readiness. Piaget argued that learning and development are determined by an individual’s age
and level of biological maturation, whereas Bruner argued that selected aspects of any material can be taught to any child (Lutz & Huitt, 2004). This claim is moderated, however, by adding that it will probably be necessary that this content and material receive additional attention as the individual attains more knowledge and capacity (Lutz & Huitt, 2004). These two viewpoints are therefore not necessarily mutually exclusive: while learning may occur if instruction is tailored to take the individual’s developmental level into account, as Bruner argued, Piaget’s view cannot be discounted since the individual’s capacity to deal with increasingly complex material increases as cognitive and biological structures mature and gain complexity. The impact of biological maturation is supported by the correspondence between neuronal myelination and stage progression as discussed later in this study.

A striking difference between Piaget and Bruner’s theories lies in the notion of progression. Piaget’s (Piaget & Inhelder, 1969) theory is clearly a stage theory, with approximate ages assigned to each stage of cognitive development. It is important to reiterate, however, that Piaget made provision for overlap between stages, and that the stage element of his theory is not as rigid as some critics have contended.

Bruner (1986, 1990) objected to the notion of invariant stages in cognitive development. He argued against the Piagetian idea that cognitive development unfolds in a uniform manner that is unaffected by cultural or social differences. Instead, he held that “intelligence is to a great extent the internalization of ‘tools’ provided by a given culture” (Bruner as cited in Driscoll 2000, p. 236). Lutz and Huitt (2004) make a strong point by arguing that if the tools of a culture are different, categorization and representation would also be different. This would in turn mean that the skills and types of knowledge required at different ages would not be the same as in other cultures. This brings into dispute the validity of the notion of invariant developmental stages as proposed by some stage theorists (Lutz & Huitt, 2004). Empirical research substantiates Bruner’s claim that exact developmental stages
do not occur and that development does not progress uniformly regardless of cultural and societal differences (Renner et al., 1976). This is important for the present study, as it means that the items on the GMDS-ER and the act of drawing a human figure are not independent of culture. Children who have not been exposed to bicycles may have difficulty with item ‘AIV.13 Rides a bicycle (two-wheeler)’, for example, and children who have not been taught to draw or exposed to drawing materials may reasonably be expected to be less proficient in producing a human figure drawing than those who have had practice in the medium.

The influence of culture on development and intelligence as described by Vygotsky and Bruner is widely acknowledged. Experience, especially schooling, and contextual factors exert substantial influence on an individual’s performance on the type of tasks normally included in intelligence tests (Jansen & Greenop, 2008; Nel, 2000). Sperber and Hirschfeld (1999, p. cxxvi) claim that it is generally accepted “that cultural factors enable, constrain, and channel the development of certain cognitive outcomes” and that while “some cultural environments inhibit normal cognitive development” others “promote the elaboration of complex knowledge structures such as modern science by providing the appropriate artifactual and institutional support”.

As is generally true of constructivist thought, Bruner’s theory is critically important insofar as it opens readers to question the existence of one objective reality. While the implications afforded by this perspective can be discussed at length, it is sufficient for the purposes of this study to note the following:

1. The construct of ‘normal development’ is socially constructed and the same term may denote very different things in various contexts.

2. Culture plays a critical role in determining what is learnt and how this is learnt, thereby shaping individual development in a qualitative way.
3. Development is embedded within a socio-historical context. The influence of this context is so pervasive that it is impossible to think about development in isolation.

2.6. Neuropsychological and Information-Processing Perspectives

The stage progression that Piaget and Bruner described in connection with cognitive development and Luquet described in children’s drawings of the human figure is partly dependent on the biological maturation of the brain and nervous system. Such maturation allows children to form “increasingly complex cognitive schemes that help them to construct better understandings of what they have experienced” (Piaget as cited in Shaffer & Kipp, 2010, p. 55). This illustrates the interplay between biological growth and children’s active role in their own development. Over time, if all goes well, this process allows “curious, active children, who are always forming new schemes and reorganizing their knowledge” to “progress far enough to think about old issues in entirely new ways; that is, they pass from one stage of cognitive development to the next higher stage” (Shaffer & Kipp, 2010, p. 54).

As noted earlier, Piaget acknowledged the role of biological maturation in cognitive development. The following section provides an overview of some of the most important biological factors that influence development.

It has been hypothesized that there is an increase in processing speed (Kail & Salthouse, 1994), working memory (Chi, 1977), and “increased dimensional complexity of representations” (Halford as cited in Morra, 2005, p.319) with development. A thorough understanding of cognitive development requires knowledge of childhood representational development (Cherney et al., 2006). Memory performance and cognitive development may partly be explained by the way that knowledge is represented in long-term memory (Schneider & Pressley, 1997). Many of the cognitive processes measured by tests of mental development and intelligence are dependent on representational ability. This “ability to
understand, use, and produce symbols” (Cherney et al., 2006, p. 137) underlies the capacity for communication, abstraction, simplification and generalization, holding information far from the referent, manipulating and transforming information, as well as other skills (Cherney et al., 2006). Children are able to create increasingly complex drawings as they grow older and this growing representational complexity is associated with increases in working memory capacity (Bensur, Eliot, & Hedge 1997; Cherney et al. 2006; Scott, 1981). Case (1985) suggested that increased cognitive capacity (that is, working memory) allows children to differentiate between representations with greater ease. This allows for the progression from simple representations such as stick figures to more complex representations such as clothed persons with detailed facial features (Cherney et al., 2006). Increased attention is another mechanism that accounts for the developmental nature of human figure drawings as seen in Luquet’s (1927) suggestion that the child’s increased attention allows him to progress from intellectual realism to visual realism.

The increased complexity with development that occurs in children’s drawings where the manipulation of spatial components is important may be explained by three developmental variables. These, as discussed by Bensur and Eliot (1993) are:

1. the child’s ability to pay attention to objects’ appearance irrespective of the child’s internal representation of the object;

2. the child’s capacity for recalling figural configurations and holding them in working memory; and

3. the influence of fine motor skills.

Such biological maturational and cognitive mechanisms may account for the improvement seen in children’s human figure drawings, as well as in their performance on
the GMDS-ER and the items of intelligence tests. The neo-Piagetian theorist Pascual-Leone (2000, p. 843), for example, proposes that “[t]he concept of mental-processing capacity […] usually labelled “working memory” […] could be used to explain processing-complexity growth and thus developmental stages”. This author further contends that developmental stages do not occur as a result of changes in the structure of children’s logic (as Piaget argued in his work *The Psychology of Intelligence*), but rather that “stages index the endogenous growth of maturationally driven mental-attention mechanisms” (Pascual-Leone, 2000, p. 843). This “mental-attention capacity appears as a set of innate resources growing in power with chronological age until adolescence” (Pascual-Leone, 2000, p.844) and is more narrowly defined than working memory since it excludes situational learning. The development of mental-attention capacity (which allows the processing of complexity) and learning both increase working memory (Pascual-Leone, 2000). Pascual-Leone argues that the developmental unfolding of this innate mental-attentional capacity leads to an increase in the child’s learning potential, which in turn allows for the emergence of Piagetian stages.

Kail (1992) suggests that the increase in the speed with which the mature brain and nervous system can process information accounts for the important role of biological maturation in cognitive growth. This gradual improvement that occurs with maturation explains age-related improvement in diverse tasks. Zgourides (2000) observes that the attainment of concrete operations, Piaget’s third stage discussed earlier, around the age of 7 is dependent on the maturation of the brain and nervous systems at this age and that the increase in neural connections allows children to progress to more advanced ways of thinking. The importance of this fundamental mechanism is illustrated by Kail and Hall’s (1994) assertion that age has a direct effect on global processing speed; global processing speed then has a direct effect on naming speed, and naming speed in turn influences performance on word recognition tasks. This increase in processing speed that occurs with age may be expected to
manifest most prominently in timed tasks. HFD tests and most items on the GMDS-ER are not timed. It may be hypothesized that this improvement spurs cognitive development by allowing children to process information more effectively thereby speeding up the processes of assimilation and accommodation.

The research discussed above serves to illustrate the growing acceptance within the field of developmental psychology that a combination of nativism and constructivism provides a better fit with reality than either absolute position taken alone. Nativism, in contrast to constructivism, refers to the idea that intellectual abilities and thought patterns are inborn (Matsumoto, 2009). Luquet (1927) appreciated the role that increased attention and the child’s growing ability to hold important aspects of the subject in mind plays in the production of a more accurate representation. His observation in this respect foreshadowed recent developments that link cognitive factors such as attention and working memory to intelligence and mental development. Various underlying biological maturational and cognitive mechanisms such as those suggested by Pascual-Leone’s work (1970; 1978; 1980) may therefore account for developmental change in human figure drawings as well as performance on GMDS-ER and intelligence test items.

2.7. Conclusion

This chapter provided a review of literature from the broad field of developmental psychology and discussed the relevance of these contributions to human figure drawing tests and the GMDS-ER. Important definitions were provided to orientate the reader and the importance of studying child development was discussed. This was followed by a discussion of Piaget’s theory of cognitive development, Vygotsky’s sociocultural theory, Bruner’s theory of cognitive development, and relevant contributions from neuropsychological and information-processing perspectives. These theories were applied to human figure drawing
tests and the GMDS-ER. Luquet’s theory of drawing development was integrated into the discussion as it provided a valuable theoretical link between Piaget’s theory and the study of human figure drawings. The following chapter provides a discussion of the key constructs relevant to the present study, namely intelligence, conceptual maturity and mental development.
Chapter 3
The Relationship between Intelligence, Conceptual Maturity, and Mental Development

3.1. Introduction

It has been suggested that “any description of child development must include in the discussion a review of the concept of intelligence” (Stewart, 2005, p. 97). A discussion of the relationship between the key constructs of the present study is included because it adds depth to the theoretical foundations of the study, assists in the contextualization of the key constructs, and provides further motivation for the research objective of exploring the relationship between human figure drawing test scores and Griffiths Mental Development Scales – Extended Revised (GMDS-ER) general quotients. This chapter clarifies the relationship between conceptual maturity, intelligence, and mental development. In particular, the psychometric approach to intelligence is described and related to human figure drawing tests and the GMDS-ER. The concepts of academic skills disorders, learning disorders, and developmental delays are then discussed and it is proposed that human figure drawings may be useful in the assessment of such conditions. This is followed by psychometric evidence of the overlap between scores on human figure drawing tests, intelligence tests, and developmental tests. The chapter concludes with a discussion of a priori evidence of the relationship between these key concepts.

The study of children’s drawings has been closely linked to the psychometric study of intelligence from the outset (Bekhit, Thomas & Jolley, 2005). Authors such as Burt (1921) incorporated drawing into general IQ tests, while Bekhit, Thomas and Jolley (2005) give the Draw-a-Man test (Goodenough, 1926) the accolade of being the first dedicated IQ test. It was Harris (1963) who reintroduced the notion of development into human figure drawing tests by stating that his revision of Goodenough’s test was a measure of conceptual maturity. The
scope of the current study does not permit a comprehensive discussion of the nature of intelligence, but the concept of intelligence is now discussed in light of the substantial theoretical overlap that exists between intelligence and mental development.

3.2. The Psychometric Approach to Intelligence

Highly abstract and multidimensional concepts feature prominently in social scientific theories. Moreover, such concepts are often linked exclusively to particular theories or models (Mouton, 1996). Emphasis is placed on the psychometric approach to intelligence, as it is into this category that the GMDS-ER falls (Jakins, 2009). The psychometric approach was also chosen because it is currently the dominant perspective in the study of intelligence, has generated the largest amount of research, received the most attention, and is the main approach used in practical settings (Neisser et al., 1996). Intelligence as understood from the psychometric perspective is broadly defined as “how well one scores on an intelligence test” (Berg, 2000, p. 120). In the psychometric approach the nature of intelligence is examined by measuring individual performance on intelligence tests and subsequently investigating the underlying structure of individual performance through statistical techniques (Berg, 2000). Factors that do not cluster together or that follow different developmental trajectories are believed to indicate distinct abilities (Berg, 2000). Berg focuses on three such distinct abilities that have been widely accepted:

1. Fluid intelligence, which refers to “the ability to adapt to new knowledge or information and think in flexible ways. Fluid intelligence also includes the ability to understand and make conceptual relations” (Matsumoto, 2009, p. 208). Fluid intelligence decreases during adulthood (Matsumoto, 2009). Psychometric measures tap fluid intelligence through tasks that require an individual to adapt to a novel situation and tasks in which earlier experience is of little benefit (Berg, 2000). As noted earlier, Harris (1963) believed HFDs to
measure conceptual maturity, which he defined as “the ability to perceive and discriminate similarities and differences, the ability to abstract these, and the ability to generalize or classify objects correctly” (Harris as cited in Cox, 1993, p. 70). The ability to think in abstract terms and to work with concepts that is an important aspect of fluid intelligence is therefore dependent on conceptual maturity. Based on this connection, one might hypothesize that human figure drawings measure fluid intelligence by gaining an indication of the level of conceptual maturity that underlies this ability. The earlier section covering Piaget’s contributions on the development of representational thought illustrated that conceptual maturity is central to mental development. This understanding of the relationship between human figure drawings and conceptual maturity therefore not only helps one to understand the mechanism by which such tests measure intelligence, but also supports the hypothesis that they may be useful in the identification of developmental delays.

2. Crystallized intelligence is defined as the “set of knowledge or skills that are developed within the context of experience or education” (Matsumoto, 2009, p. 144). Crystallized intelligence increases with age but is restricted by an individual’s cultural exposure (Matsumoto, 2009). Psychometric measures use items that draw on problem solving acquired by education and/or acculturation to gauge crystallized intelligence (Berg, 2000). The ability to think in abstract terms and manipulate concepts in novel situations form part of fluid intelligence, but the knowledge base that relies on the storage of representations in long-term memory can be regarded as a fundamental aspect of crystallized intelligence.

3. Everyday intelligence. This refers to adaptive ability within certain areas of everyday functioning, although the extent to which this ability reflects crystallized and fluid intelligence is still under debate (Berg, 2000). The concept is most often used in relation to adult intelligence and age-related cognitive decline (Berg, 2000).
According to Berg (2000) there is currently widespread consensus that intelligence is best conceptualized in terms of three distinct factors, namely Fluid Intelligence, Crystalized Intelligence, and Everyday Intelligence as discussed above. Hunt (2005, p. 6) asserts that “the one-factor versus multifactor debate has very largely been settled”. He justifies this statement by arguing that Carrol (1993) demonstrated that a three-layer model provides the best fit to the psychometric data. Hunt (2005) goes on to state that Carrol’s model is very similar to Cattell (1971) and Horn’s (Horn, 1985; Horn & Noll, 1994) model. The latter model is comprised of three factors, namely (a) Fluid Intelligence, (b) Crystallized Intelligence; and (c) Spatial-Visual Intelligence (Hunt, 2005). This model differs from the one proposed by Berg (2000) discussed above. While both models acknowledge fluid intelligence and crystallized intelligence, Berg includes everyday intelligence whereas the Cattell-Horn model replaces this ability with visual-spatial intelligence, defined as “the ability to reason spatially” (Hunt, 2005, p. 6). The American Psychological Association (APA) established a task force to consolidate research on the nature of intelligence and released a report stating that the most widely held conceptualization of intelligence is that of a hierarchy of abilities with general intelligence (g) at the apex (Neisser et al., 1996). The point here is to show that although some consensus has been reached, psychometric conceptions of intelligence differ and do not represent a single conception of intelligence.

Central to the conceptualization of intelligence in the current study is Spearman’s (1927) g factor. This general factor believed to underlie performance on different cognitive tasks was discovered through the statistical technique of factor analysis. Although g is well established within the psychometric approach it remains a murky concept. As Neisser et al. (1996) put it in their report for the American Psychological Association’s taskforce on intelligence:
one common view today envisages something like a hierarchy of factors with \( g \) at the apex, but there is no full agreement on what \( g \) actually measures: it has been described as a mere statistical regularity (Thomson, 1939), a kind of mental energy (Spearman, 1927), a generalized abstract reasoning ability (Gustafsson, 1984), or an index measure of neural processing speed (Reed & Jensen, 1992). (p. 78)

The general quotient (GQ) of the Griffiths scales was developed by Ruth Griffiths (1954, 1970, 1984) in accordance with the notion of an underlying general factor (Stewart, 2005). Research supports the view that the GMDS-ER measures a single underlying factor (Luiz, Foxcroft, & Stewart, 2001a; Munro, 1968). HFD tests of intellectual ability are similarly based on the belief that performance on a certain task, such as drawing a human figure, will provide an estimate of overall intelligence (or \( g \)). The GMDS-ER is based on the psychometric approach to intelligence, as may be seen in Griffiths’ statement that in developing the scales she had to “cast a wide net to include a large number of different specific abilities, so that \( g \) or general intelligence could be measured in as many as possible of its manifestations” (Griffiths, 1954, p.31). This clearly demonstrates that although the GMDS-ER is a developmental measure, and not an intelligence test, Ruth Griffiths believed it to measure intelligence. The reader is reminded of the striking similarity between the constructs of developmental level and intelligence. An immediate implication is that if Griffiths believed her scales of mental development measure intelligence, perhaps it would not be surprising to find that HFD tests purported to measure intellectual ability provide an estimate of mental developmental level.

3.3. Academic Skills Disorders, Mental Retardation, and Developmental Delays

Academic skills disorders, also referred to as learning disorders, exist when “an individual’s achievement, as determined by the administration of standardized tests in
reading, mathematics, or writing, is substantially below what would be expected for the age, schooling, and level of intelligence for that individual” (Matsumoto, 2009, p. 4). Learning disorders differ from mental retardation as the achievement deficit in learning disorder is not the result of a lack of intelligence (Matsumoto, 2009). The DSM-IV-TR groups these disorders into four diagnostic categories, namely: reading disorder, mathematics disorder, disorder of written expression, and learning disorder not otherwise specified (American Psychiatric Association [DSM-IV-TR], 2000). Without remedial educational intervention, children with learning disorders usually find it exceptionally difficult to keep up with their classmates by their third year (Sadock & Sadock, 2007). Learning disorders not only cause psychological distress to an afflicted child, but may also lead to “demoralization, low self-esteem, chronic frustration, and poor peer relationships” (Sadock & Sadock, 2007, p.1158). Early diagnosis of such difficulties will allow such children to benefit from appropriate intervention, thus reducing the risk of negative outcomes. Human figure drawing tests that provide a global measurement of intelligence or mental development may be useful in the identification of such difficulties if a child’s academic performance falls markedly short of that expected from his HFD score. In this case the discrepancy between general intelligence as measured by the HFD test and academic performance would warrant further assessment to ascertain whether a learning disorder in the domains of reading, mathematics, or writing accounts for the individual’s poor academic performance.

Mental retardation refers to the “state of lacking normal levels of intellectual capacity” (Matsumoto, 2009, p. 305). According to the Cambridge Dictionary of Psychology (Matsumoto, 2009), mental retardation is synonymous with ‘mental deficiency’ and ‘developmental delay’. This definition again illustrates the close association between the concepts of intelligence and mental development. The term ‘developmental delay’ is often used when referring to a deficit in mental developmental level, whereas the term ‘mental
retardation’ is more closely associated with the concept of intelligence, but both refer to the same phenomenon. The DSM-IV-TR (APA, 2000) groups individuals with mental retardation into four categories according to their IQ scores. These are (a) mild mental retardation (IQ level of 50-55 to about 70); (b) moderate mental retardation (IQ level of 35-40 to 50-55); (c) severe mental retardation (IQ level of 20-25 to 35-40) and (d) profound mental retardation (IQ level below 20 or 25). Mild mental retardation may in some cases represent the low end of the normal curve of intelligence, whereas more pronounced delays result from brain abnormalities (Matsumoto, 2009).

Different degrees of mental retardation (or developmental delay) show different developmental characteristics. Those with mild mental retardation frequently show small developmental delays in the preschool years but are normally only identified when academic or behavioural problems appear in the early elementary years (Mash & Wolfe, 2005). Such individuals generally engage readily with peers, but may have moderate delays in expressive language during their preschool years with no or only slight sensorimotor impairment (Mash & Wolfe, 2005). Children with moderate mental retardation are normally identified due to failure in achieving early developmental milestones in their preschool years (Mash & Wolfe, 2005). At school age, such children typically rely on single words and phrases to communicate and their self-care and motor skills are comparable to that of a two to three year old child without developmental delays (Mash & Wolfe, 2005). By adolescence, these individuals regularly have poor relationships with peers as a result of trouble recognizing social conventions such as appropriate dress and humour (Mash & Wolfe, 2005). Children with severe mental retardation are usually identified at an early age due to substantial developmental delays and visible physical features or abnormalities (Mash & Wolfe, 2005). These children’s development is markedly delayed as seen in them reaching milestones such as walking, standing, and toilet training much later than their peers (Mash & Wolfe, 2005).
Organic causes such as genetic defects normally underlie this form of mental retardation (Mash & Wolfe, 2005). Individuals falling in the final category of profound mental retardation show marked developmental delays from infancy, as well as biological abnormalities such as asymmetrical faces (Mash & Wolfe, 2005). They show serious impairment in sensorimotor functioning (for example, their responsiveness by the age of four is similar to that of a one year old without developmental delay) and they can only reach a rudimentary level of adaptive functioning such as communication skills, eating and self-care behaviour (Mash & Wolfe, 2005; Sadock & Sadock, 2007).

Human figure drawing tests may play a most significant role in the identification of individuals with mild mental retardation, since this form is often not easily identified at a young age, and the majority of children with developmental delays (85%) fall into this category (Sadock & Sadock, 2007).

3.4. Psychometric Evidence of Conceptual Overlap

Existing psychometric evidence indicates a correlation between the scores of HFD tests of intellectual ability, individual intelligence tests and developmental tests. Cox (1993) presented an overview of various studies investigating the relationship between scores on the Draw-a-Man test and tests of intelligence. Harris (1963) found correlations ranging from .2 to .8; Goodenough (1926) found correlations between drawing IQ and Stanford-Binet IQ ranging from .699 to .863; Yepsen (as cited in Cox, 1993) obtained a correlation of .6; Williams (as cited in Cox, 1993) reported a correlation of .65; and McElwee (as cited in Cox, 1993) reported a correlation of .72 between the Draw-a-Man test and the Stanford-Binet (Terman, 1916) test. Furthermore, Kline (1993) concluded that Harris’ revision of the Draw-a-Man test provides a reasonable measure of general intelligence; while Reynolds and Hickman (2004) report a statistically significant correlation (p ≤ .01) between DAP: IQ
scores and the three IQ scores on the Wechsler Intelligence Scale for Children Third Edition (WISC-III, Wechsler, 1991). The Goodenough-Harris Test showed significant correlations with both the WISC-R and the Stanford-Binet scale (Abell, Von Briesen, & Watz, 1996; Bensur & Eliot, 1993). Doubt however exists about whether these correlations are high enough to suggest that such tests provide safe measurements of intelligence (Light & Barnes, 1995). Bekhit, Thomas and Jolley (2005, p. 208) disagree with the test developers’ insistence that artistic ability does not influence the test results, arguing that “intelligent children may not draw well, and conversely, some children who are artistically gifted may have a low IQ score”. These authors further note that the human figure drawing test cannot predict the IQ of children beyond 10 years of age, since children older than 10 years usually do not include additional details in their drawings. These results, in general, indicate a clear relationship between the scores of human figure drawing tests and those of individually administered intelligence tests, but also show that these scores are not identical. Significant positive correlations found between these measures may however suggest that they tap similar constructs.

A comparison between the GMDS-ER and the Termin-Merril Scale (a revision of the Stanford-Binet) yielded correlations varying from $r=.79$ to $r=.81$ (Griffiths, 1984). Another study conducted in South Africa by Luiz and Heimes (1994) found high positive correlations between the GQ of the Original Griffiths Scales and the General Intelligence Quotient of the Junior South African Intelligence Scale (JSAIS). This evidence may indicate that the GMDS-ER taps constructs similar to those measured by these two intelligence tests. Further psychometric evidence of a relationship between intelligence and development is found on Neisser and colleagues’ (1996) finding that when adapted to measure individual differences the tasks Piaget developed to gauge a child’s developmental level show a reasonable correlation with psychometric tests of intelligence.
Correlation coefficients must be interpreted with caution, as they do not give an indication of the direction of causality (Field, 2005). This means that an inference regarding which variable causes the other to change cannot be made purely on the basis of statistical evidence provided by correlation coefficients. Correlations also do not exclude the possibility of unknown variables being responsible for the observed relationships. This is known as the third-variable problem, or tertium quid which states that “[i]n any bivariate correlation causality between two variables cannot be assumed because there may be another measured or unmeasured variable affecting the results” (Field, 2005, p. 128). These psychometric findings can therefore not be used as definitive proof of conceptual overlap, although it is argued here that these empirical observations lend support to the hypothesis of conceptual overlap when rationally combined with relevant theoretical considerations. Bearing in mind that the purpose of this study is to investigate the usefulness of a HFD tests in the measurement of mental development, the possible directionality of causal relationships (if any in fact exist) or the effects of unknown intervening variables are of little consequence. If consistent correlations exist between these variables then any one variable may reasonably be used as an indicator of the other. The usefulness of such an indication is dependent on the strength of the correlation. The investigation into the possible existence of such a correlation between HFD test scores and mental development and its strength (if a correlation exists) is of course the subject of the present research study.

3.5. A Priori Evidence of the Overlap between Key Constructs

Piaget (1950, p. 8), referring to intelligence, stated that “its origins are indistinguishable from those of sensorimotor adaptation in general or even from those of biological adaptation itself”. From this early stage then, intelligence and development is intimately related. Earlier chapters have discussed the important role that conceptual maturation (the development of representational thought) plays in mental development and
intelligence. In particular, it has been shown that such conceptual development is crucial for an individual to progress through the developmental stages as outlined by Piaget and Bruner, as well as for the acquisition of language. Britton as cited in Nystrand (1977, p.40) said that “the ability to speak and to reason are … both …dependent upon the ability to generate symbols, the ability to create representations of actuality”. Another ability- the ability to produce a drawing of the human figure, is also dependent on representational thought. In this way, an individual’s drawing of the human figure may provide an indication of both intelligence and development by gauging the level of the representational ability that underlies these processes. Considerable overlap exists between mental development and intelligence on both conceptual and pragmatic levels. These concepts are related to each other in the remainder of this chapter.

On a conceptual level this overlap is illustrated by the simple fact that HFD tests (such as the DAP: IQ), tests of mental development (such as the GMDS-ER), and intelligence tests (such as the WISC-IV) all aim to measure an individual’s performance on selected test tasks and to then relate this performance to other individuals from a selected cohort. To illustrate, the DAP: IQ obtains a raw score providing an absolute indication of performance on the test. With normal development, children’s absolute performance increases with age. This is then transformed into a standardized score that places the individual’s performance in relation to a representative chronological age cohort. The standard score is in turn used to calculate an IQ score, representing the ratio between the test subject’s performance and the average performance of said representative age cohort. A higher IQ score therefore indicates that the subject’s development is relatively advanced, specifically the subject progressed quicker than expected for his age. With a lower score the inverse is true. In a similar vein, the GMDS-ER obtains an absolute indication of the test subject’s performance (items passed), which is then divided by the subject’s chronological age and multiplied by 100. The resultant
general quotient (GQ) is, again, an expression of the subject's performance relative to the expected performance of the representative age cohort. A higher ratio indicates the subject is relatively well developed and a lower ratio (beneath 100) may be indicative of a developmental delay. In a similar vein, the first intelligence test was developed by Alfred Binet in France to identify children with delayed mental development so that they could be provided with special education (Berk, 1997). The Intelligence Quotient (IQ) was developed for this purpose. It expressed the child’s performance relative to his peers as the ratio between his actual performance (Mental Age, which is often abbreviated to MA) and his chronological age (CA). A ratio IQ is therefore expressed as \( \frac{MA}{CA} \times 100 \). The concept of mental age, created by Binet and Simon, is based on the belief that the same developmental pattern is found in all children, but that the rate at which they develop differs. A person of any age that performs as well as a nine year old child is therefore said to have a mental age of nine (Matsumoto, 2009). Mental age is thus defined as the “[l]evel of intellectual development as measured through a range of cognitive tasks and through comparison with chronological age peers. […] Mental age can be expressed as the age at which that level of development is typically attained” (Matsumoto, 2009, p. 21). This method was however of limited use in estimating the intelligence of adults because raw scores begin to level off from the age of 16 (Eysenck, 1994). The deviation IQ was therefore invented to replace the ratio IQ. The deviation IQ utilises a raw score representing the subject’s actual performance and places this performance in relation to a representative age cohort in a normal distribution of IQ scores with a median of 100 and standard deviation of 15 or 16, depending on the specific test (Matsumoto, 2009). It follows from the preceding discussion that although these three types of psychometric tests use different items to measure an individual’s performance relative to his or her chronological age cohort, the underlying principle is essentially the same in all three cases.
3.6. Conclusion

This chapter discussed and clarified the relationship between the key constructs in the present study, namely those of conceptual maturity, intelligence and mental development. The psychometric approach to intelligence was described and brought into relation with human figure drawing tests and the GMDS-ER. Academic skills disorders, mental retardation, and developmental delays were then discussed and related to each other. It was proposed that human figure drawing tests may prove to be useful in the assessment of such conditions. Psychometric evidence was then presented to support the notion that an overlap exists between scores on human figure drawing tests, intelligence tests, and developmental tests. The chapter concluded with a discussion of a priori evidence of the relationship between the key constructs of the present study. The following chapter presents the research methodology utilized in the current study.
Chapter 4

Research Methodology

4.1. Introduction

In this chapter the reader is presented with the methodological considerations made in the study. Information is presented on the research design, participants, sampling procedure, measures used, data analysis techniques employed toward achieving the aims of the study, and ethical considerations pertaining to the present study.

4.2. Research Design

The current study utilised a quantitative exploratory-descriptive research design. The quantitative research paradigm refers to "a formal, objective, systematic process in which numerical data are utilised to obtain information about the world" (Burns & Grove as cited by Cormack, 1991, p. 140). As the term suggests, the exploratory-descriptive research design employed in the present study combines features of exploratory and descriptive research designs. Exploratory research is recommended when there is little existing research on the subject of study (Rubin & Babbie, 2001). Exploratory research is defined as “studies of a field which seek to discover interesting patterns and facts but without preformed hypotheses” (Matsumoto, 2009, p. 198). The research question, namely whether human figure drawings can be used to screen for developmental delays informed the exploratory research aim of investigating whether a linear relationship exists between children’s human figure drawing scores and their general mental development. The present study includes an extensive literature review that examined constructs central to the subject of investigation. A literature review such as is included in this study is one method of exploratory research (Selltiz, Jahoda, Deutsch, Cook, 1965). A review of the existing literature revealed a lack of
theoretical work that integrates the concepts of intelligence and development. Insofar as the limited scope of the study allowed, perspectives from different fields within the broader discipline of psychology (such as the psychometric study of intelligence, neuropsychology and developmental psychology) were consolidated to obtain a better understanding of the core constructs and the way they relate to each other.

Exploratory research is generally conducted for one or more of the following reasons, according to Babbie and Mouton (2006):

(1) to satisfy the researcher’s curiosity and desire for better understanding,
(2) to test the feasibility of undertaking a more extensive study,
(3) to develop the methods to be employed in any subsequent study,
(4) to explicate the central concepts and constructs of a study,
(5) to determine priorities for future research, and
(6) to develop new hypotheses about an existing phenomenon. (p. 80)

The research question arose from the researcher’s observation that although human figure drawing tests display a developmental progression, the non-projective use of such tests is largely limited to estimates of an individual’s intellectual ability. It was also clear that inferences about children’s mental development are made on the basis of such tests, which raised the need to determine whether human figure drawing tests are appropriate for this purpose. A review of pertinent literature did not yield a satisfactory integration of the important constructs that come together in the present study, namely: intelligence, development, intellectual ability, and conceptual maturity. Despite the limited scope of the present study, considerable effort was made to clarify these constructs and to demonstrate
some of the ways in which they are connected. With regards to the aims of exploratory research listed above, the study achieved meaningful results despite the relatively small sample size and unsophisticated methods of data collection. These results are encouraging and support the feasibility of more extensive studies to investigate the use of human figure drawings as tools for developmental screening. The study and research process produced useful recommendations for methods to be employed in future research, which is another reason that exploratory research is often conducted.

In addition to the exploratory nature of the research discussed above, the research design is also descriptive insofar as it was a correlation study aimed at investigating the relationship between human figure drawing scores and general mental development. A descriptive research design refers to “empirical research which seeks to describe, categorize, and count usually in naturalistic settings rather than to control situations to test specific hypotheses” (Matsumoto, 2009, p. 157). In addition to establishing whether a linear relationship exists between human figure drawing scores and GMDS-ER general quotients (an exploratory aim), the study aimed to describe the strength and directionality of such a relationship if one was found to exist. Explanatory studies, the third category of social scientific research, chiefly aims to demonstrate causal relationships between variables or events (Babbie & Mouton, 2006). The present study did not investigate causality and as such did not enter into the domain of explanatory research. A discussion of the participants and sampling procedure of the present study follows.

4.3. Participants and Sampling

Sampling is defined as “the process of selecting a part of a population for measurement” (Matsumoto, 2009, p. 456). The two approaches by which a sample is selected are called probability and non-probability sampling (Zechmeister, Zechmeister &
Shaughnessy, 2001). With probability sampling each individual in the population has the same chance of being included in the sample, whereas with non-probability sampling the chance of a specific individual being selected from the population is not known (Zechmeister et al., 2001). Due to the limited scope of the current study a type of non-probability sampling called convenience sampling was the most feasible method of data collection. Non-probability sampling such as convenience sampling is often used in exploratory research where the aim is to generate hypotheses for further investigation (Babbie & Mouton, 2006). It is the most common sampling method used in psychology (Matsumoto, 2009). Convenience sampling involves the selection of subjects based on their availability without concern of their representativeness of the wider population (Matsumoto, 2009). It is more convenient and cost-effective than probability sampling (Cozby, 2004). This method is contrasted to probability sampling, which refers to “the technique of selecting a subset of a population by a random selection from the population so that each member of the population has a known probability of being chosen” (Matsumoto, 2009, p. 401). The decision to use convenience sampling was informed by the limited scope of the current study as well as the need to obtain the maximum amount of data points from the available sampling pool, namely completed GMDS-ER protocols drawn from a University Psychology Clinic in the Eastern Cape of South Africa that met the inclusion requirements of the study. This approach had the substantial benefit of avoiding the time-consuming and difficult process of obtaining approval from the Eastern Cape Department of Education that would have been necessary to administer the measures at a local school.

In this type of sampling participants are not systematically selected which places limits on the confidence that they are representative of the population (Creswell, 2002; Jackson, 2003). Despite this limitation, non-probability sampling such as convenience sampling provides valuable information for answering questions and testing hypotheses
The principle drawback of this sampling method is that researchers must “exercise great caution in generalizing from [collected] data” (Babbie & Mouton, 2006, p. 166). When interpreting the results the question of how well the sample represents the broader population should be taken into account. In practical terms, it should be considered how well the children who completed the GMDS-ER protocols collected from the specific Psychology Clinic represent the broader population of five to seven year old children in South Africa to which the results will be generalized. Probability sampling is not necessary when research aims to investigate the relationship between variables rather than to generalize the results (Spata, 2003). As the current study is of an exploratory-descriptive nature the value of findings do not lie in generalizing beyond the sampling frame, but in the usefulness of these findings to inform further research into the phenomena under study.

A population is “a collection of objects, events or individuals having some common characteristic that the researcher is interested in studying” (Roscoe, 1969, p. 155). The population that the current sample relates to is therefore all South African children between the ages of 5 and 7 years. The sampling frame “refers to the set of all cases from which the sample will actually be selected” (Mouton, 1996, p. 135). The sampling frame of the current study is all children between the ages of 5 and 7 years that have undergone psychological assessment utilizing the GMDS-ER at the specific University Psychology Clinic in the Nelson Mandela metropole in the Eastern Cape of South Africa.

The final sample size was 30 participants, and not 60 as originally proposed. Of the 30 participants, 21 were male and 9 were female. This smaller sample size was due to a lower than anticipated number of suitable participants that met the inclusion criteria. Another factor is that a preliminary estimate of the obtainable sample size was based on a survey that included versions of the Griffiths Scales prior to the updated and current GMDS-ER. In the interest of uniformity, protocols based on earlier versions of the Griffiths Scales were not
included in the final sample. The large effect size obtained allowed for the detection of a significant correlation at the .01 alpha level. According to Cohen (1992) a correlation with the standard $\alpha$-level of .05 and the recommended power of .8 would require 783 participants to detect a small effect size ($r = .1$), 85 participants to detect a medium effect size ($r = .3$) and 28 participants to detect a large effect size ($r = .5$). The smaller sample size does therefore not compromise the results of the obtained correlations.

**4.3.1. Inclusion criteria.** The minimum age of participants was set at 5 years. This decision was informed by Reynolds and Hickman’s (2004) statement that a linear relationship between age and raw DAP: IQ score is observed between the ages of 4 and 14, as well as Davis’ (2006) finding that the published norms of the DAP: IQ are valid with local South African children between the ages of five and seven years. The maximum age was set at the 7 year mark in order to reduce the possibility of a ceiling effect on the GMDS-ER. Such an effect may occur when advanced children younger than 8 years can perform tasks exceeding the 8 year equivalent ceiling of the GMDS-ER. The age range for inclusion in the sample for the proposed study was therefore 5 years to 7 years of age. This is also the age range at which children will benefit most from developmental testing in preparation for entrance into the formal schooling system. Completed GMDS-ER protocols in which the participant did not reach item ‘DIII.9 Draws a person: Stage 1’ on the eye-hand co-ordination subscale were excluded as human figure drawings could not be obtained from these protocols.

**4.4. Measures Used**

**4.4.1. The Griffiths Mental Development Scales – Extended Revised.** Ruth Griffiths developed the original Griffiths Scales of Mental Development in 1954. The original measure’s upper age range has since been extended to allow the assessment of children up to the age of eight years four months (Luiz et al., 2006a). The measure has also
been revised, but remains true to Griffith’s original aim insofar as it provides a tool for the early diagnosis of mental conditions in children. The Griffiths Mental Development Scales – Extended Revised (Luiz et al., 2004a, 2004b) draws on an extensive study of mental development in order to assess the developmental level of children from birth to 8 years 4 months of age. Assessment of children up to 2 years of age utilises five subscales, namely Locomotor, Personal-Social, Hearing-Speech, Hand-Eye Coordination, and Performance; with a sixth subscale (Practical Reasoning) being added when evaluating children between 2 and 8 years 4 months of age (Luiz et al., 2004b). Material for the test items emerged from the careful observation of children in their natural environments. This material was then incorporated into test items that are placed in order of gradually increasing difficulty (Luiz et al., 2004b). These diverse items tap the main aspects of a child’s development by having each subscale measure “only one avenue of learning or process of development, but measuring this one aspect as completely as possible” (Griffiths, 1970, p. 34). Results on the GMDS-ER are summarised in a global developmental quotient, as well as a developmental quotient for each subscale. Munro (1968) however noted that there is no empirical evidence to suggest that each subscale measures an independent aspect of ability and suggested that the subscales may tend to measure a general factor. This information informed the research design decision of correlating HFD scores with GMDS-ER GQ scores and not to include the individual subscales. This decision is in line with the aims of the study which are to investigate the usefulness of human figure drawing tests in the screening for developmental delays in the South African context.

Griffiths’ (1954, 1970, 1984, 1986) approach to the measurement of the mental development of children was innovative in a number of important respects. She was cognisant of the complex interactions between various avenues of learning and employed a holistic approach that favoured a broad view of mental development. This approach
foreshadowed later developments including Gardner’s (1993) multiple intelligences and the emergence of ecological models (Bronfenbrenner & Ceci, 1994). Her appreciation of the interaction between mental development on the one hand and social and emotional influences on the other prefigured Goleman’s (1996) notion of emotional intelligence. This once novel approach has since been broadly accepted and has become commonplace in the assessment of children (Knoesen, 2005). This popularity is underpinned by numerous research studies which have shown the Griffiths Scales (i.e., both the Original Scales and the GMDS-ER) to be of value in the evaluation and treatment of infants and young children from various cultural backgrounds (Allan, 1988, 1992; Bhamjee, 1991; Brandt, 1983, 1984; Cobos, Rodrigues, & De Venegas, 1971; Collins, Jupp, Maberly, Morris, & Eastman, 1987; Knoesen, 2003; Laroche, Gutz, & Desbiolles, 1974; Luiz et al., 2001a; Luiz et al., 2001b; Mothuloe, 1990; Ramsay & Fitzharding, 1977; Sletten, 1970, 1977). The Griffiths Scales have also been extensively researched in South Africa (Allan, 1988; 1992; Barnard, 2000; Bhamjee, 1991; Jakins, 2009; Knoesen, 2003, 2005; Kotras, 1998; Luiz, 1988a, 1988b, 1988c, 1988d, 1994a, 1994b; Luiz, Folscher & Lombard, 1989; Luiz, Foxcroft & Povey, 2006b; Luiz, Foxcroft & Stewart, 2001a; Luiz, Foxcroft, Wosfold, Kotras & Kotras, 2001b; Luiz & Heimes, 1994; Moosasjee, 2007; Povey, 2008; Sweeney, 1994; Tukulu, 1996; Van Rooyen, 2005; Ward, 1997; Wills, 2011). In addition to this strong research interest, the Griffiths Mental Development Scales are also widely used by trained professionals in South Africa (Povey, 2008). The Original Griffiths Scales are also available in Afrikaans (Allan, 1988) and Xhosa (Tukulu, 1996).

The reliability of the general quotient is .96, with reliability coefficients for the different subscales ranging from .90 to .97 (Luiz et al., 2004a). Content validity was investigated by an extensive literature review, interviews with experts, and a facet analysis of each subscale. This found each item to be representative of its content domain, as well as
having a satisfactory degree of relevance to the construct being measured. A factor analysis
provided further evidence of the construct validity of the Griffiths Scales (Luiz et al., 2004a).
Further research has confirmed the reliability and validity of the GMDS-ER (Beail, 1985;
Griffiths, 1984; Luiz, 1988c; Mothuloe, 1990; Stewart, 1997; Worsfold, 1993).

The human figure drawings utilized in the present study were obtained from the single
human figure drawing of each protocol used to score items “Draws a person: Stage 1” (Luiz
et al., 2006a, p.53), “Draws a person: Stage 2” (Luiz et al., 2006a, p. 56), and “Draws a
person: Stage 3” (Luiz et al., 2006a, p. 59) on the GMDS-ER. These items contribute to the
child’s subscale score on the eye and hand co-ordination subscale of the GMDS-ER. The
average of the six subscales, including the eye and hand co-ordination subscale, is used to
calculate the general quotient of the GMDS-ER.

4.4.2. An adapted administration of the Draw-a-Person Intellectual Ability Test
for Children, Adolescents, and Adults (DAP: IQ). The human figure drawing (HFD)
scores used in the current study were obtained by scoring HFDs from the collected GMDS-
ER protocols according to the scoring criteria of the Draw-a-Person Intellectual Ability Test
for Children, Adolescents, and Adults (DAP: IQ). This section first provides information on
the DAP: IQ. This is followed by a discussion of differences between the administration of
the HFDs used in the current study and standardized administration guidelines of the DAP: 
IQ.

The DAP: IQ (Reynolds & Hickman, 2004) provides a standardised method of
obtaining and scoring human figure drawings. The test is normed for the ages 4 years 0
months 0 days through 89 years 11 months 30 days. The only material required for the
administration and scoring of the DAP: IQ is the examiner’s manual, a scoring form, a
drawing form or blank A4 pages, and 2 sharpened pencils. Scores on the 23 scoring elements
are summed to obtain a raw score which is then converted to standard scores with a mean of 100 and a standard deviation of 15 using manual tables. The manual also provides percentile ranks, z-scores, t-scores, stanines, age equivalents and grade equivalents.

The DAP: IQ has been found to demonstrate “very good reliability, especially considering the brevity of the task and its simple, rapid scoring system” (Reynolds & Hickman, 2004, p. 20). Research revealed a high internal consistency, with a coefficient alpha of .82. Test-retest reliability is reported to be .84, and inter-scorer reliability coefficients were found to range from .91 to .95 (Reynolds & Hickman, 2004).

Validity analysis focused on correlations between the DAP: IQ and other human figure drawing tests of conceptual maturity. A correlation between .85 and .86 was obtained between the DAP: IQ and the Koppitz (1986) system and a correlation coefficient of .86 was obtained between the DAP: IQ and the Goodenough-Harris (1963) system. Correlations between the DAP: IQ and the Weschler Intelligence Scale for Children Third Edition were modest, with a coefficient of .49 with Performance IQ and .33 with Verbal IQ. Although modest, the DAP: IQ correlated at a statistically significant level with all three WISC-III IQs (p <= .01) (Reynolds & Hickman, 2004).

The published DAP: IQ norms are appropriate for use with children in the local South African context (Davis, 2006). In light of the issues surrounding appropriate test use in South Africa as discussed in the introductory chapter, this valuable information further informed the decision to use the DAP: IQ scoring criteria and norms in the current study.

4.5. Research Procedure

The study utilised secondary data, namely archival data collected at a University Psychology Clinic in the Nelson Mandela Metropole. Each data set consisted of a completed
consent form providing permission for the data to be used for research purposes and a completed GMDS-ER protocol. “Draws a person: Stage 1” (Luiz et al., 2006a, p. 53) on the GMDS-ER requires the child to draw a human figure. This HFD is then scored on the number of features present. A circle for a head and two other features is sufficient to ensure a pass at stage 1, while six additional features allow a pass of item “Draws a person: Stage 2” (Luiz et al., 2006a, p. 56). Evidence of creativity is used as criteria for a pass on the item “Draws a person: Stage 3” (Luiz et al., 2006a, p. 59). This simple scoring procedure contributes to the child’s score on the GMDS-ER Eye and Hand Co-ordination subscale. This procedure was not used for the purposes of the current study. Instead, human figure drawings obtained from the GMDS-ER protocols were scored according to the 23 scoring elements provided in the examiner’s manual of the DAP: IQ (Reynolds & Hickman, 2004). This more refined scoring system better reflected the current use of human figure drawing tests and as such provided a more accurate indication of the value of human figure drawing tests in screening for developmental delays.

Participants’ general quotients were obtained from their completed GMDS-ER protocols. The human figure drawings in the GMDS-ER protocols were then scored according to the 23 scoring elements provided in the manual of the Draw-a-Person Intellectual Ability Test for Children, Adolescents, and Adults (DAP: IQ) (Reynolds & Hickman, 2004). These raw scores were subsequently converted to standard scores using the appropriate tables in the DAP: IQ examiner’s manual (Reynolds & Hickman, 2004). DAP: IQ standard scores and general quotients were chosen as the subjects of analysis because it reflects the figures on which decisions are based when the DAP: IQ and GMDS-ER are used in clinical settings. The use of these scores was therefore more appropriate toward meeting the aims of the current study than the use of raw scores would be. Computerised data analysis
was then conducted utilizing SPSS for Windows (Version 19), which is a popular statistical software package.

4.6. Data Analysis

Since the current study utilized an exploratory-descriptive research design, descriptive statistics were used to summarize relevant information regarding sample characteristics and participants’ performance on the two research measures. Descriptive statistics are “methods used to summarize, organize, and describe observations (Sadock & Sadock, 2007, p. 175) by means of a numerical index (Matsumoto, 2009). Descriptive statistics were used to make statements regarding the central tendency and variability in the data. The arithmetic mean, defined as “the sum of a set of numbers divided by how many numbers are in the set” (Matsumoto, 2009, p. 300) was used as a measure of central tendency. Variability in the data was described using the standard deviation (SD), a statistic calculated by obtaining “the square root of the average of the squared differences from the mean of a set of numbers” (Matsumoto, 2009, p. 516). The standard deviation indicates the degree to which scores differ from the mean (Cozby, 2007).

A correlation coefficient is “a mathematical index of association between two or more variables and usually a linear index scaled so that 0 indicates no relationship, +1 indicates a perfect positive relationship, and -1 indicates a perfect inverse relationship” (Matsumoto, 2009, p. 135). Towards achieving the aims of the study, the appropriate correlation coefficient was calculated in order to describe the direction and size of the relationship between participants’ DAP: IQ scores and their GMDS-ER general quotients. The specific statistic chosen to obtain the correlation coefficient was based on the data’s adherence to the assumptions of parametric tests. The procedures followed to test these assumptions are now discussed.
An important consideration in the initial stage of data analysis was to establish whether the data conformed to the assumptions of parametric tests. These assumptions must be met in order to use parametric tests based on the normal distribution (Field, 2005). It is essential to ensure that data conforms to these assumptions before choosing a test because the use of a parametric test on nonparametric data will likely yield an inaccurate result (Field, 2005). The assumptions of parametric tests, as discussed in Field (2005) are as follows:

1. Data must be normally distributed. The data must come from one or more normally distributed populations. This assumption may be tested by calculating whether the sampling distribution significantly deviates from the skewness and kurtosis of the normal distribution (Field, 2005). Skewness refers to the degree of asymmetry in a distribution. A distribution is said to be skewed when the most frequent scores cluster at one end of the scale with the frequency of scores gradually declining towards the other end of the scale (Field, 2005). Kurtosis refers to the peaks of a distribution. A platykurtic distribution is a flat distribution with many scores in the tails while a leptokurtic distribution has fewer scores in the tails and appears pointy when viewed as a histogram (Field, 2005). This was calculated by obtaining z-scores for skewness and kurtosis using the skewness and kurtosis values and their respective standard errors as produced by SPSS. This process is expressed in the following equations:

\[
\begin{align*}
   z_{\text{Skewness}} &= \frac{(S - 0)}{\text{SE}_{\text{Skewness}}} \\
   z_{\text{Kurtosis}} &= \frac{(K - 0)}{\text{SE}_{\text{Kurtosis}}}
\end{align*}
\]

To test whether the data was normally distributed, these values were then compared to the absolute value of 1.96 that indicates a significant deviation from the normal distribution at \(p < .05\) (Field, 2005).
2. Homogeneity of variance. This assumption requires that the variance of one variable should remain stable at all levels of the other variable (Field, 2005). Levene’s test was used to “tests the hypothesis that the variances in different groups are equal” (Field, 2005, p. 736) and whether this assumption was met. Levene’s test was computed for two pairs of variables, namely: (a) Chronological age and human figure drawing raw score; and (b) Standardized human figure drawing score and GMDS-ER general quotient.

3. Interval Data. For this assumption to be met the distance between points on the scale must be equal throughout the scale (Field, 2005). The standardized HFD scores and GMDS-ER GQ scores adhere to this expectation and this assumption was therefore met.

4. Independence. This assumption requires that the behaviour from one participant does not influence the behaviour of others (Field, 2005). The current sample consisted of data from individually administered tests and there was no reason to assume that one participant’s behaviour influenced that of another. This assumption was therefore met.

As discussed above, it was known that the data conformed to the assumptions of interval data and independence before data analysis was conducted. Subsequent data analysis utilizing the statistical package SPSS was conducted to test whether the assumptions of normally distributed data and homogeneity of variance was met. The results of these analyses are discussed in relation to particular variables in the results section. Pearson’s product-moment correlation coefficient is a parametric test that requires the assumptions of such tests to be met (Field, 2005). It was concluded that the data met the assumptions of parametric tests. The Pearson Product-Moment Correlation Coefficient was therefore the statistic used for all correlations. Pearson’s Correlation Coefficient is the most commonly used correlation coefficient (Matsumoto, 2009). It measures the degree of linear relationship between two integer level variables on a scale with 0 indicating no relationship, +1 indicating a perfect
positive relationship and -1 indicating a perfect inverse relationship (Matsumoto, 2009). A Pearson Correlation Coefficient was computed to investigate the relationship between participants’ chronological age and HFD raw scores. The result was then compared to literature discussed earlier that suggests a relationship between age and the complexity of human figure drawings. A second Pearson Correlation Coefficient was then computed to investigate the relationship between standardized HFD scores and GMDS-ER general quotients.

The significance of the obtained correlation was tested to investigate whether the results were due to chance (Matsumoto, 2009). A statistically significant result, that is a result that is not due to chance, does not mean that the result is practically meaningful. The effect size was therefore calculated to investigate the size of the relationship between standardized human figure drawing scores and general quotients. An effect size is “an objective and standardized measure of the magnitude of the observed effect” (Field, 2005, p. 32). Pearson’s Correlation Coefficient can also be used as a standardized measure of the effect size (Field, 2005). The use of such a standardized measure allows for the comparison of effect sizes across different studies that have measured different variables (Field, 2005). With Pearson’s Correlation Coefficient, a value of 0 indicates no effect, with a value of 1 indicating a perfect effect (Field, 2005). Cohen (1988, 1992) made the following widely accepted suggestions regarding effect size, which were used to interpret the resulting statistics in the present study:

- $r = .10$ (small effect): such an effect explains 1% of the total variance
- $r = .30$ (medium effect): an effect of this magnitude accounts for 9% of the variance
- $r = .50$ (large effect): the effect accounts for 25% of the variance
A factor analytic study by Luiz and colleagues (2001a) found that the subscales of the GMDS-ER tap one underlying dimension. A subsequent article identified this dimension as “general intelligence” (Luiz et al., 2006b, p.194). The decision to investigate the relationship between HFD scores and GMDS-ER general quotients was based on these findings, as well as Munro’s (1968) finding that the Griffiths Scales tend to measure a general underlying factor and not distinct abilities as referred to in the section on measures used. The relationship between HFD scores and specific GMDS-ER subscales was therefore not investigated.

4.7. Ethical Considerations

The present study utilised archival data collected at a University Psychology Clinic in the Nelson Mandela metropol in the Eastern Cape of South Africa. As such, written informed consent allowing for the collected data to be used in research had already been obtained when the measures were originally administered. The Faculty of Health Sciences Research Technology and Innovations Committee gave ethics approval and granted permission for the study to be conducted. To ensure confidentiality only the researcher had access to the data and participants’ identification details were not included in the research report. The inclusion and exclusion of participants was based on the criteria set out in this document. No person was inappropriately excluded on the basis of race, gender or religious beliefs.

4.8. Conclusion

This chapter discussed the research methodology of the present study. The study utilized an exploratory-descriptive research design within the quantitative paradigm. Considerations that informed the choice of this research design were discussed. The study may be described as exploratory in terms of the literature review and the research aim to determine whether a linear relationship exists between children’s human figure drawing scores and general development. It is also descriptive insofar as the research aimed to
describe characteristics of the sample and to investigate the strength and directionality of the relationship between human figure drawing scores and GMDS-ER general quotients. The rationale for choosing to employ non-probability convenience sampling and the implications of this decision were discussed. The chapter also presented information on the population, sampling frame, and sample size and provided a discussion of the implication of these sample characteristics on the results of the study. Information was provided on the two research measures used in the current study, as well as the research procedure. The chapter presented the reader with an explanation of the data analysis techniques used to describe the data and draw conclusions towards achieving the objectives of the study. In conclusion, ethical considerations pertaining to the present study was discussed. The results of the research are presented in the following chapter.
Chapter 5
Results and Discussion

5.1. Introduction

This chapter presents the results of the present research study. These results are discussed in the context of the literature reviewed in earlier chapters and related to the research objectives. Before the results of the data analysis described in the previous chapter are provided it is however important to revisit the objectives of the study. The current study aimed to investigate the usefulness of human figure drawings for the measurement of mental development. This primary research objective led to four specific objectives, namely: (a) To explore and describe the mental development scores of the sample; (b) To explore and describe the human figure drawing scores of the sample; (c) To investigate whether there is a relationship between the standardized human figure drawing scores and GMDS-ER general quotients of the sample; and (d) To investigate the directionality and strength of the relationship between standardized human figure drawing scores and GMDS-ER general quotients of the sample. The remainder of this chapter presents empirical findings relevant to these objectives and provides a discussion of these findings in relation to literature reviewed earlier.

5.2. Participants

As noted earlier, the current study utilized archival data collected from a University Psychology Clinic in the Nelson Mandela metropol in the Eastern Cape of South Africa. All GMDS-ER protocols that were completed by participants that met the study’s inclusion criteria were collected during the first half of December 2010. The following results are based on data from these 30 protocols.

5.3. Descriptive Statistics
5.3.1. **Age distribution of the participants.** The age of participants in the sample (n =30) ranged from 5 years 0 months to 7 years 0 months with a mean age of 6 years 0 months and a standard deviation of 6 months and 22 days. These results are presented in Table 1 below and will be followed by a discussion of the results.

Table 1

*Age Distribution of the Participants*

<table>
<thead>
<tr>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>60.60</td>
<td>84.00</td>
<td>72.0967</td>
<td>6.74139</td>
</tr>
</tbody>
</table>

The age distribution of the participants conforms to the inclusion criteria as outlined in the methodology section. Based on their ages, participants in the present study were in Piaget’s second stage, which spans the ages of two to seven years and is known as the stage of preoperational thought (Sadock & Sadock, 2007; Zgourides, 2000). Their mental development at this stage is marked by an increase in symbolic thought, that is, thought that relies on the use of language and other symbols (Sadock & Sadock, 2007; Zgourides, 2000). Children in the preoperational stage still rely on primitive concepts, but their increased mastery of language allows for improved reasoning ability that is also manifested in their drawing productions (Sadock & Sadock, 2007; Toomela, 2002, Zgourides, 2000).

In Bruner’s (1966) theory, the participants would have relied mostly on iconic and symbolic modes of representation. With normal development, the younger participants would have relied mostly on iconic representation, which involves the ability to represent reality in
terms of images or spatial schemas (Bruner, 1966). The older participants are expected to have relied increasingly on symbolic representation, in which they are able to represent their experience by means of true symbols such as words that do not have to resemble the referent (Bruner, 1966; Slee & Shute, 2003).

Finally, the participants would have been in the second stage of Luquet’s (1927) theory of drawing development, namely the pre-schematic stage that includes the ages between 4 and 7 years. Based on their age, children at this stage would already have noticed that their drawings can represent aspects of the world – a realization known as fortuitous realism (Luquet, 1927). These children normally try to make representational drawings instead of the random scribbling associated with earlier stages (Luquet, 1927).

The age range of participants in the sample falls within the range of 4 years and 14 years in which Reynolds and Hickman (2004) reported a linear relationship to exist between chronological age and raw DAP: IQ score. It was investigated whether this relationship was also present in the current sample. The results of this analysis are presented shortly.

5.3.2. Standardized human figure drawing scores. The results presented here provide a conclusion to the first research objective of the present study, namely ‘To explore and describe the standardized human figure drawing scores of the sample’. The standardized human figure drawing scores ranged from 62 to 129 (n=30) with a mean of 95.3 and standard deviation of 20.74. Skewness was calculated as -.336 with standard error of skewness being .427. Kurtosis was -1.027 with standard error of kurtosis being .833. The results are presented in Table 2.
Table 2

**Descriptive Statistics of Standardized Human Figure Drawing Scores**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFD</td>
<td>30</td>
<td>62</td>
<td>129</td>
<td>95.30</td>
<td>20.743</td>
<td>-.336</td>
<td>-1.027</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.427</td>
<td>.833</td>
</tr>
</tbody>
</table>

5.3.3. GMDS-ER general quotients. The following results meet the second research objective of the study which was ‘To explore and describe the GMDS-ER general quotients of the sample’. The GMDS-ER general quotient scores ranged from 31.50 to 120.30 (n=30) with a mean of 88.635 and standard deviation of 19.73297. This variable had a skewness of -.665 with standard error of skewness being .427 and a kurtosis of .995 with standard error of kurtosis at .833. Table 3 summarizes these results.

Table 3

**Descriptive Statistics of GMDS-ER General Quotients**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>GQ</td>
<td>30</td>
<td>31.50</td>
<td>120.30</td>
<td>88.635</td>
<td>19.73297</td>
<td>-.665</td>
<td>.995</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.427</td>
<td>.833</td>
</tr>
</tbody>
</table>

Prior to data analysis, it was already known that the variables ‘standardized human figure drawing scores’ and GMDS-ER general quotients’ met the assumptions of interval data
and independence. The assumptions of normally distributed data and homogeneity of variance remained to be determined. The following calculations, as outlined in the methodology section, were used to test whether these assumptions were met. The results of the analysis of the normality of the data distribution is first discussed, which is followed by the analysis of homogeneity of variance. The standardized human figure drawing score variable produced a standardized skewness coefficient (calculated by dividing the skewness value by the standard error of skewness) of -0.787 and a standardized kurtosis coefficient (calculated by dividing the kurtosis value by the standard error of kurtosis) of -1.233. Following the same procedure, the GMDS-ER general quotient score variable produced a standardized skewness coefficient of -1.557 and a standardized kurtosis coefficient of 1.194. None of the obtained values had an absolute value greater than 1.96, therefore it was concluded that the variables came from normally distributed populations (as suggested by Field, 2005). The assumption of normally distributed data was therefore met.

Levene’s test was used to test whether the variances of the variables ‘standardized human figure drawing score’ and ‘GMDS-ER general quotient’ were equal. The test was conducted using SPSS for Windows (Version 19). Levene’s test produced a statistic of $F = .318$, which was not significant at the standard $\alpha$-level of .05 ($F = .318, p > .05$). A non-significant result on Levene’s test indicates that the variances are not significantly different (Field, 2005). The assumption of homogeneity of variance was therefore not violated, and it was concluded that the variables ‘standardized human figure drawing score’ and ‘GMDS-ER general quotient’ conformed to the assumptions of parametric tests. Based on these results, Pearson’s product-moment correlation coefficient was the most appropriate correlation coefficient to investigate the relationship between human figure drawing scores and GMDS-ER general quotients. The results of this analysis follow.
5.4. The Relationship between Standardized Human Figure Drawing Scores and GMDS-ER General Quotients

The third research objective of the study was to establish whether a linear relationship exists between human figure drawing scores and GMDS-ER general quotients. A scatterplot representing this relationship is provided in Figure 1. This relationship is further illustrated in Figure 2, where the curve estimation command in SPSS was used to insert a diagonal line representing the best fitting linear model. The SPSS output for the regression analysis used to produce this figure is presented in Table 4. Exploration of the data indicated that the variables met the assumptions of normality and the Pearson Product-Moment Correlation Coefficient was therefore used to measure the correlation between standardized HFD scores and GMDS-ER general quotients. The results of the Pearson Product-Moment Correlation Coefficient obtained between standardized human figure drawing scores and GMDS-ER general quotients of the sample are presented in Table 5.

Figure 1

Scatterplot representing relationship between standardized HFD scores and GQ
Figure 2

Scatterplot representing relationship between standardized HFD scores and GQ with line of best fit

![Scatterplot](image)

Table 4

**SPSS Output for Curve Estimation between Standardized HFD Scores and GQ**

<table>
<thead>
<tr>
<th>Equation</th>
<th>Model Summary</th>
<th>Parameter Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R Square</td>
<td>F</td>
</tr>
<tr>
<td>Linear</td>
<td>.575</td>
<td>37.915</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GMDS General Developmental Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
</tr>
<tr>
<td>Linear</td>
</tr>
</tbody>
</table>

Human figure drawing score
The Pearson Product-Moment Correlation Coefficient between standardized HFD scores and GMDS-ER general quotients produced a correlation of $r = .758$, and this correlation was significant at $\alpha = .01$ ($r = .758, p < .01$). This result provided an answer to the third research objective, namely to investigate whether there is a relationship between standardized human figure drawing scores and GMDS-ER general quotients of the sample. This finding indicated that a positive linear relationship existed between standardized human figure drawing scores and GMDS-ER general quotients in the current sample.

According to this finding it is highly unlikely that the correlation was the result of chance, but it did not however indicate that this amounted to a meaningful or important effect (Field, 2005). The effect size was therefore calculated to determine the strength of the relationship between these variables.

Following the guidelines proposed by Cohen and discussed in the methodology section, the finding was indicative of a correlation with a large effect size ($r > .50$) between standardized human figure drawing scores and GMDS-ER general quotients. Other guidelines suggested by Guilford (1946) state that a correlation of this magnitude is indicative of a high correlation with a marked relationship. Squaring the correlation coefficient provides a measure of the amount of variability in one variable that is explained by the other (Field, 2005). The amount of variability in GMDS-ER general quotients

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Table 5

Correlation between Standardized HFD Scores and GMDS-ER General Quotients (GQ)

<table>
<thead>
<tr>
<th>Std. HFD Score</th>
<th>GQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Std. HFD Score</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. ** = p < .01
explained by standardized human figure drawing scores was therefore obtained by squaring $r$ and multiplying by 100 to express this value as a percentage. This revealed that 57.45% of the variability in GMDS-ER general quotients was explained by standardized human figure drawing scores and vice versa.

The finding of a statistically significant correlation between standardized human figure drawing scores and GMDS-ER general quotients provided an answer to the third objective of the study, namely: ‘To investigate whether there is a relationship between the standardized human figure drawing scores and general mental development quotients of the sample’. It was concluded that such a relationship did exist in the present sample.

The fourth objective of the study was ‘To investigate the directionality and strength of the relationship between standardized human figure drawing scores and GMDS-ER general quotients of the sample.’ This objective was reached by two findings. Firstly: a positive linear relationship was found to exist between standardized human figure drawing scores and GMDS-ER general quotients. Secondly: the obtained correlation between standardized human figure drawing score and GMDS-ER general quotient had a large effect size and was a high correlation with a marked relationship.

The literature review chapter of the present study discussed the developmental theories of Piaget, Bruner, and Vygotsky, as well as contributions from neuropsychological and information-processing perspectives. These theoretical contributions were related to the measures used in the study, namely the GMDS-ER and an adapted administration of the DAP: IQ. Theoretical contributions from the broader field of developmental psychology was also applied to human figure drawings in particular and related to Luquet’s theory of drawing development. As discussed in the literature review, several indications suggest that the proficiency with which children produce drawings of the human figure is related to mental
development in general. Statistical and a priori evidence of a relationship between the key constructs of the study were also discussed. The observed relationship between standardized human figure drawing scores and GMDS-ER general quotients may be understood in the context of the literature reviewed earlier. It is hypothesized that various shared factors underlie mental development in general and account for the developmental progression seen in human figure drawings. The theoretical contributions reviewed earlier are now discussed in relation to the observed relationship between standardized human figure drawing scores and GMDS-ER general quotients.

Harris (1963) proposed that human figure drawings provide an indication of conceptual maturity. It has been discussed that conceptual maturity is closely associated with the development of representational thought. The developmental theories of Piaget, Vygotsky, Bruner, and Luquet all describe progressive development in representational thought that allows for cognitive development. Development in representational thought is based on the increased ability to use concepts and symbolic ways of representing experience. It is therefore hypothesized that human figure drawings may measure the mental development of children by measuring their ability to use representational thought that underlies mental development. This possible explanation for the observed relationship between standardized human figure drawing scores and GMDS-ER general quotients will now be discussed in more detail.

Piaget proposed that the semiotic function develops during the preoperational period (Sadcock & Sadock, 2007). The emergence of this function allows children to represent things, including objects, events, or conceptual schemes by means of a signifier (Sadock & Sadock, 2007). A child’s development of the semiotic function is an important milestone in conceptual development. Cognitive development is spurred by this new ability to think in terms of concepts. The degree to which the child has mastered the semiotic function will
influence his performance on the GMDS-ER because many of the measure’s items, for example the naming of objects and the ability to count, rely on the ability to use concepts and think in symbolic terms. Drawing also relies on the ability to use symbols (Sadock & Sadock, 2007). Cherney and colleagues (2006, p. 127) noted that “children’s drawings are thought to be a mirror of a child’s representational development”. A human figure drawing test therefore measures the representational development that underlies general mental development. To this effect, Harris (as cited in Cox, 1993) stated that:

the child’s drawing of an object is an index of his concept of that object, and his concept of a frequently experienced object such as a human being is a useful index of the growing complexity of his concepts in general. (p. 70)

The observed relationship between standardized human figure drawing scores and GMDS-ER general quotients can therefore be explained, at least in part, by the hypothesis that both measures tap the conceptual maturity that underlies mental development.

With respect to conceptual maturity, Reynolds and Hickman (2004, p. 2) noted that “as children mature cognitively and their thought processes become more complex, their drawings of a person become more detailed, complete, and complex”. Harris (as cited in Cox, 1993) believed that a human figure drawing provides an index of a child’s level of conceptual maturity. Piaget used the mechanisms of accommodation, assimilation, equilibrium, and disequilibrium to account for cognitive development (Shaffer & Kipp, 2010). Individuals strive to attain a state of balance between their cognitive structures and the environment – a state that Piaget referred to equilibrium (Shaffer & Kipp, 2010). This state is maintained by the simultaneous operation of assimilation and accommodation. New experiences are incorporated into existing cognitive schemes, but a state of disequilibrium arises when there is a contradiction between experience and existing thought processes (Shaffer & Kipp, 2010).
In such cases the existing cognitive schemes are adapted to incorporate the new experiences – a process known as accommodation (Shaffer & Kipp, 2010). The example of a child’s drawing of a dog mentioned earlier may serve to illustrate this principle. Such a child will accommodate his existing cognitive structures by expanding them to include concepts such as ‘collie’ and ‘poodle’ in addition to the more general concept of ‘dog’. This would allow him to assimilate differences between collies and poodles into his thought processes and account for cognitive development. Of course the processes discussed here are not only relevant to an understanding of dogs, but help the child to adapt to all aspects of his environment. The higher levels of conceptual maturity and increased ability to use representational and abstract thought will allow him to perform better on human figure drawing tests and developmental measures such as the GMDS-ER.

Piaget noted that the emergence of the semiotic function during the preoperational stage allows for rapid progress to be made in the use of language (Sadock & Sadock, 2007; Zgourides, 2000). Vygotsky’s (1978) sociocultural theory proposes that culture transforms elementary mental functions such as attention, sensation, perception, and memory into higher mental functions, such as thought, linguistic ability, mathematical ability, and problem-solving. He believed that these higher mental functions first emerge externally in social interaction with other individuals and that they are only later internalized by means of language (Lutz & Huitt, 2004). In Vygotsky’s (1978) theory, the ability to use symbols such as language is therefore crucial to cognitive development. Vygotsky (1978) referred to drawing as graphic speech and believed that it is based on verbal speech and precedes written language. In Vygostsky’s (1978) theory, language is the most important cultural tool and allows the development of thought. Bruner (1966) believed that cognitive development is driven by language development. The ability to use language, to make representational drawings, and to use words as symbols to refer to something else both depend on the semiotic
function that Piaget described. Since Vygostky regarded drawing to be a form of language, the observed relationship between standardized human figure drawing scores and GMDS-ER general quotients may be due to human figure drawings measuring a child’s proficiency in using the symbolic thought that underlies language, with language in turn driving mental development.

Bruner’s (1966; 2006a) description of the sequential emergence of enactive, iconic, and symbolic modes of thought may further explain the relationship between standardized human figure drawing scores and general mental development quotients. In the enactive stage children’s drawings are non-representational and they would therefore perform poorly on human figure drawing tests. This corresponds to Reynolds and Hickman’s (2004) statement that the linear relationship between age and human figure drawing score only begins at age 4. At this age normally developing children begin to rely more heavily on the symbolic mode of representation than on the iconic mode of representation and begin to develop the semiotic function described by Piaget (Piaget & Inhelder, 1969). As discussed earlier, proficiency in drawing a human figure is not only dependent on the iconic mode of representation (representing the world through the use of a mental image) but also on the symbolic mode of representation that allows a child to select which aspects to include in his drawing and to organize his efforts by means of self-directed speech. The same principle applies to tasks on the GMDS-ER that require the child to produce graphic representations, such as the item “Draws a house: stage 1” (Luiz et al., 2006a, p. 54), and other items such as “Builds ‘gate’ to model using 3 boxes and lids” (Luiz et al., 2006a, p. 72). As children develop, the enactive mode of representation is first supplemented by the iconic mode and later by the inclusion of the symbolic mode of representation (Bruner, 1966; 2006a). This progression may account for the increase in their human figure drawing scores and their ability to pass more advanced
items on the GMDS-ER, and as such it helps to explain the relationship between standardized human figure drawing scores and GMDS-ER general quotients.

Bruner (1986) believed that development can never occur independently of an individual’s cultural and historical context. According to Bruner and Haste (1987), social interaction allows a child to develop a framework that helps him to make sense of his experience and that this process of meaning-making is dependent on cultural requirements. In this way, “culture gives shape to our thoughts” (Bruner, 2006b, p. 4). Vygotsky believed that cognitive development is primarily influenced by society insofar as society determines what is to be learned and how it is to be learned (Lutz & Huitt, 2004). It is therefore clear that Bruner and Vygotsky agreed on the important role of culture and social interaction in cognitive development. Vygotsky (1978) proposed that cultural tools such as language and mathematics are passed on from one generation to the next through social interaction. It may be argued that the ability to create a representational drawing is one such cultural tool. Parents supply children with the materials needed to practice drawing, such as crayons and paper and may encourage them to make increasingly realistic representations. Likewise, many items on the GMDS-ER measure a child’s ability to perform tasks that depend on the individual’s culture and would have been acquired through social interaction. The item “Names 12 objects in a box” (Luiz et al., 2006a, p. 43) on the language subscale is an example of such an item that requires a child to name such objects like a knife and a fork. To pass this item the child would have had to learn the names of these items that occur in his society by means of language (that relies on the semiotic function) and social interaction. Another example is the item “Copies 6+ letters” (Luiz et al., 2006a, p. 55) on the Eye and Hand Co-ordination subscale. It may be reasoned that the ability to make such graphic representations is a cultural tool that is passed on socially in cultures that place importance on literacy. The child’s culture and the success with which he has internalized the cultural tools
of his society therefore influence his performance on human figure drawing tests and the GMDS-ER.

Cognitive development is also dependent on biological maturation of the brain and nervous system. This association between cognitive development and biological maturation is supported by Zgourides’ (2000) observation that concrete operations (Piaget’s third stage) is dependent on the maturation of the brain and nervous system. He also suggests that the increase in neural connections that occurs with maturation allow for more advanced ways of thinking (Zgourides, 2000). Most of the neuronal axons in the brain are insulated by cells called myelin that allow information to be transferred more quickly and efficiently between neurons (Webb et al., 2001). Different regions in the brain mature at different times. Myelinisation occurs earlier in areas associated with vision and motor skills than in areas responsible for higher cognitive functions (Gibson, 1991). The timing of myelination in the prefrontal cortex, for example, explains the emergence of higher cognitive skills such as those referred to in Piaget’s formal operations stage (Couperus & Nelson, 2005; Fuster, 2002). This physiological process of brain maturation may therefore explain developmental stages and the progression from lower to higher complexity in thought.

Piaget (as cited in Shaffer & Kipp, 2010, p. 55) held that biological maturation allows for the development of “increasingly complex cognitive schemes that help [children] to construct better understandings of what they have experienced”. Increases in processing speed (Kail & Salthouse, 1994) and working memory (Chi, 1977) occur with development. The increased complexity of children’s drawings that occurs with advancing age is associated with increased representational complexity (Cherney et al., 2006). Growing representational complexity is in turn related to increases in working memory (Bensur, Eliot, & Hedge, 1997; Scott, 1981). Increases in working memory explain developmental advances in processing-complexity and can therefore account for developmental stages (Pascual-Leone, 2000).
Developmental increases in working memory might therefore account for the observed relationship between standardized human figure drawing scores GMDS-ER general quotients, since working memory is expected to influence performance on human figure drawings as well as on tasks on the GMDS-ER.

Poor motor control and poor attention are other factors that might influence children’s performance on human figure drawing tests as well as on the GMDS-ER. According to Luquet’s (1927) theory, children in the current study are in the pre-schematic stage. He suggested that poor motor control accounts for the incorrect use of line and that poor attention underlies the omission of details frequently seen at this stage of drawing development (Luquet, 1927). Bensur and Eliot (1993) likewise suggest that improved fine motor skills that occur with development influence children’s drawing ability. Poor motor control will also be detrimental to a child’s performance on the GMDS-ER, as such a child may have difficulty with tasks on the GMDS-ER such as the item “Train under bridge successfully” (Luiz et al., 2006a, p. 71) that requires the child to use fine motor skills to push a train of blocks under a bridge without knocking the bridge down. It is also clear that poor attention will impede performance on the GMDS-ER, as such a child will have difficulty focussing on the tasks at hand that would lead to errors.

The obtained correlation between standardized human figure drawing scores and GMDS-ER general quotients in the current sample \( (r = .758) \) was substantially larger than the correlations between DAP: IQ scores and WISC-III Performance IQ \( (r = .40) \) and between DAP: IQ scores and WISC-III Verbal IQ \( (r = .33) \) reported by Reynolds and Hickman (2004). This finding suggests that although the test developers purport the DAP: IQ to measure intellectual ability, this test might provide a better indication of mental development than of intellectual ability. The hypothesis generated by the present study may be further investigated by future research.
5.5. The Relationship between Chronological Age and Human Figure Drawing Raw Scores

The literature suggests that a linear relationship exists between age and raw DAP: IQ score for participants between the ages of 4 and 14 (Reynolds & Hickman, 2004). Exploratory data analysis was conducted to determine whether the variables of human figure drawing raw score and chronological age in months conform to the requirements of parametric tests.

Chronological age in months scores ranged from 60.60 months to 84 months with a mean of 72.1 months and a standard deviation of 6.74 months \((n = 30)\). This variable had a skewness of -.03 with standard error of skewness being .427 and a kurtosis of -.882 with standard error of kurtosis being .833. Human figure drawing raw scores ranged from 0 to 24 with a mean of 10.47 and a standard deviation of 7.413 \((n = 30)\). This variable had a skewness of -.004 with a standard error of skewness of .427. Kurtosis was -1.091 with standard error of kurtosis being .833. The standardized skewness coefficient for the chronological age in months variable was calculated by dividing the skewness value of the variable by the standard error of skewness of the variable. The obtained standardized skewness coefficient was -0.07. Dividing the variable’s kurtosis value by the standard error of kurtosis produced a standardized kurtosis coefficient of -1.06 for the chronological age in months variable. With respect to the human figure drawing raw score variable, the standardized skewness coefficient obtained by following the same procedure while using this variable’s skewness value and standard error of skewness was -0.01. The standardized kurtosis for the human figure drawing raw score calculated by the means described above was -1.31. It was concluded that the skewness and kurtosis of the variables human figure drawing raw score and chronological age in months did not differ significantly from that of
the normal distribution, since the absolute values of none of the obtained statistics exceeded the critical value of 1.96.

Levene’s test produced a statistic of $F = .788$, which was not significant at the standard $\alpha$-level of .05 ($F = .788$, $p > .05$). The assumption of homogeneity of variance was therefore not violated. The variables were both measured on interval level and because the tests were administered individually there was no reason to believe that the performance of one child influenced that of another. The assumptions of interval data and independence were therefore met.

Based on these results, it was concluded that the variables chronological age in months and human figure drawing raw score conformed to the assumptions of parametric tests. Pearson’s product-moment correlation coefficient was therefore the most appropriate correlation coefficient to investigate the relationship between chronological age in months and human figure drawing raw scores.

The Pearson’s Correlation Coefficient between chronological age in months and human figure drawing raw score produced a result of $r = .365$, which was significant at $\alpha = .05$ ($r = .365$, $p < .05$). This result indicated that the observed relationship was most likely not due to chance. According to Cohen, (1988; 1992) a correlation of this magnitude is indicative of a medium effect size. Guildford’s (1946) guidelines describe a correlation of this magnitude as a low correlation with a small but definite relationship.

This finding was consistent with the existing literature. It supports Reynolds and Hickman’s (2004) assertion that a linear relationship exists between age and raw DAP: IQ score. The scoring criteria of the DAP: IQ (Reynolds & Hickman, 2004) consider proportions and placement of body parts, for example, that the head must be smaller in height than the trunk and that the ears are correctly placed and relative to other features. As such, the
obtained correlation between chronological age and HFD raw scores was consistent with Schuyten’s (1904) observation that more realistic proportions of body parts are correlated with a child’s age, as well as with Cherney and her colleagues’ (2006) assertion that the amount of distinctive features included in children’s drawings increases with age. The finding also supports the general notion that children’s drawings of the human figure follow a developmental progression, as noted by Luquet (1927), Goodenough (1926), Harris (1963) and Koppitz (1968).

The correlation between participants’ chronological age and their HFD raw scores was smaller than the correlation between their standardized HFD scores and GMDS-ER general quotients. A possible explanation for this may be found in the fact that the sample was drawn from a pool of children who had undergone developmental assessment at a University Psychology Clinic. It may be reasoned that the psychologists who administered the GMDS-ER did so because they suspected the presence of a developmental problem. As such, the participants in the present study might have tended to perform more poorly on the GMDS-ER than would be expected of the general population. This hypothesis is supported by participants in the current sample’s mean GMDS-ER general quotient of 88.64, which is below the general mean of 100, but still within the average range for this measure. The possibility therefore exists that the presence of developmental delays in some participants led to a reduced correlation between chronological age and raw HFD score. This might further explain the finding that standardized HFD score and GMDS-ER general quotient was more highly correlated than chronological age and HFD score. The results of the study are not conclusive in this regard and further research will be necessary to come to a more definitive conclusion. The finding that there is a stronger relationship between standardized human figure drawing scores and GMDS-ER general quotients than there is between chronological age and human figure drawing raw scores lends support to the hypothesis that human figure
drawing scores provide an indication of a child’s developmental level. In this regard it is fortunate that the sample included children with developmental delays, since this is the population in which human figure drawing tests may be used to identify developmental delays.

5.6. Conclusion

This chapter presented the results of the present study, integrated these results with the literature reviewed earlier, and provided conclusions to the research objectives. Descriptive statistics on participants’ age range, standardized human figure drawings scores and GMDS-ER general quotients were presented. The relationship between participants’ standardized human figure drawing scores and their GMDS-ER general quotients was graphically illustrated by means of a scatterplot, as well as by a scatterplot with a regression line fitted to illustrate the relationship between the general linear model and the actual data points. This was followed by the results of the Pearson Product-Moment Correlation Coefficient calculated between standardized human figure drawing scores and GMDS-ER general quotients. The obtained correlation coefficient was significant at the $\alpha = .01$ level, which indicated that the result was most likely not due to chance. It was shown that the correlation represents a large effect size and that this high correlation is indicative of a marked relationship between standardized human figure drawing scores and GMDS-ER general quotients in the sample. The above results were sufficient to meet the objectives of the current study, but additional information was provided in the interest of future researchers. To this end, descriptive statistics were provided for the variables of chronological age in months and human figure drawing raw scores. The Pearson Product-Moment Correlation Coefficient calculated to investigate the relationship between these two variables indicated a positive relationship between the variables. The correlation was significant at the $\alpha$-level of $.05$ and therefore most likely not due to chance. This low
correlation with a small but definite relationship is consistent with existing literature on the relationship between chronological age and human figure drawing scores. Calculations used to test whether the assumptions of parametric tests were met have been provided where applicable, since these were essential in ensuring the selection of appropriate statistical techniques. The final chapter of the present study in which the conclusions of the study as well as its limitations and recommendations are discussed follows.
Chapter 6

Conclusion, Limitations, and Recommendations

6.1. Introduction

This chapter presents the conclusions of the present study, reviews limitations, and provides suggestions for further research. The present study utilized a quantitative exploratory-descriptive research design to explore the relationship between human figure drawing tests and general mental development in the sample. The present study provided valuable contributions to this area of research. Key constructs of the study were explicated and integrated in the extensive literature review. In particular, it was argued that conceptual development, intelligence, and general mental development are interrelated constructs. The limitations and recommendations that arose through the research process may be useful to inform the priorities of further research in this area, and may provide guidance on methods to be employed in future studies. In general, the present study yielded useful and promising results that support the feasibility of conducting more extensive studies in the future.

6.2. Conclusions

The purpose of the study was to investigate the relationship between human figure drawing tests and general mental development in order to guide clinical practice. More specifically, the study aimed to explore whether there is value in the practice of using human figure drawings in developmental assessment and the screening of developmental delays in children. The first research objective: ‘To explore and describe the standardized human figure drawing scores of the sample’ was met by descriptive statistics on the standardized human figure drawing scores of the sample, as provided in the results chapter. The second research objective: ‘To explore and describe the general mental development quotients of the sample’ was also met by descriptive statistics regarding the general mental development quotients of
the sample, as provided in the same chapter. With regards to the third research objective: ‘To investigate whether there is a relationship between the standardized human figure drawing scores and GMDS-ER general quotients of the sample’ it was found that such a relationship did exist in the present sample. Specifically, the observed correlation between standardized human figure drawing scores and GMDS-ER general quotients was found to exist and this result was most likely not due to chance. With regards to the fourth research objective: ‘To investigate the directionality and strength of the relationship between standardized human figure drawing scores and GMDS-ER general quotients of the sample’ it was found that the observed correlation indicated a positive relationship between standardized human figure drawing scores and GMDS-ER general quotients in the sample. The correlation had a large effect size that indicated a high correlation with a marked relationship. It may therefore be concluded that a strong relationship existed between human figure drawing scores and GMDS-ER general quotients in the present sample. The finding that the correlation between an adapted administration of the DAP: IQ and the GMDS-ER in the present study was larger than the correlations between the DAP: IQ and WISC-III IQ scores reported by Reynolds and Hickman (2004) generated the hypothesis that the DAP: IQ measures mental development to a greater extent than it measures intellectual ability.

Additionally, it was found that a low positive correlation indicative of a small but definite relationship existed between chronological age and human figure drawing raw scores in the current sample. This finding was most likely not due to chance and supports the notion that human figure drawings follow a developmental progression as observed by previous researchers.

In general, the findings of the present study support the use of non-projective human figure drawing tests for the purpose of developmental testing. These tests may be particularly useful in the local South African context where resources available for mental healthcare are
often scarce. This is because they are quick to administer, score, and interpret; may be administered in group format, and their use is not limited to registered psychologists thus allowing more people to assist in the identification of developmental delays. Furthermore, the norms for children aged between 5 to 7 years of the DAP: IQ have been found to be appropriate for use in the local context which places this test at an advantage over many tests that are not appropriately standardized for use in South Africa. Given the multicultural and multi-lingual nature of South African society, a culturally reduced test such as the DAP: IQ that minimizes the effect of language differences between test-taker and test-administrator has strong merits. Finally, the fact that human figure drawing tests may be used with non-reading and non-English speaking children further adds to the suitability of such tests in South Africa. Additional research is needed to ensure confidence in these conclusions, but the findings of the present research suggest that non-projective human figure drawing tests may be immensely valuable in the early identification of South African children with developmental delays. This is a very positive finding as it can help to ensure that these children are provided with appropriate interventions early enough to change the course of their lives for the better.

6.3. Limitations

This section outlines the limitations of the present study. These limitations and the following recommendations may be seen as an outcome of the exploratory research process and may be valuable to future researchers. The limitations of the present study are as follow:

1. The use of non-probability sampling limited the degree to which findings may be generalised.

2. The GMDS-ER instructions for obtaining a HFD are less formalised than that of the DAP: IQ. As explained in chapter 4 the obtained scores are believed to be comparable to
scores that would have been obtained had the standardized administration instruction of the DAP: IQ been followed. Nonetheless, due to this limitation the resultant human figure drawing scores are not true DAP: IQ scores.

3. The study did not include a screening procedure to exclude individuals with severe motor problems that could have rendered candidates unsuitable for human figure drawing tests. The extent to which this affected the findings of the present study is unknown.

6.4. Recommendations for Further Research

Although the DAP: IQ scoring criteria were used, the HFDs used in the current study were not obtained through the standardized administration instructions as outlined in the DAP: IQ manual (Reynolds & Hickman, 2004). For this reason the resulting scores are therefore referred to as human figure drawing scores instead of DAP: IQ scores. Future researchers who wish to make inferences regarding a specific human figure drawing test should exercise more control in obtaining the HFDs. The DAP: IQ is not indicated for individuals with severe motor problems (Reynolds & Hickman, 2004). Future studies will benefit from employing a screening procedure to exclude participants with severe motor problems. Subsequent studies may benefit from the use of probability sampling, as this will allow the results to be generalized to broader populations. Future research may benefit from drawing separate samples or splitting larger samples to allow the investigation of the relationship between human figure drawing scores and GMDS-ER general quotients to be carried out on subgroups. Such studies will be able to build on the findings of the present study by investigating the relationship between HFD scores and GQ in individuals with identified developmental delays as opposed to those with normal development. The sample included children with and without developmental delays and no categorical distinction was made between these groups in the present study. Finally, future studies may contribute to the
research base by investigating the role of culture and ethnicity in the use of human figure drawing tests.

6.5. Conclusion

The present study adds to the knowledge base on human figure drawing (HFD) tests and contributes to a broader restandardization project of the GMDS-ER that is currently being conducted. The findings indicate that HFD tests may be useful to obtain estimates of the mental developmental levels of South African children. These tests are attractive as screening measures in the local South African context due to the existence of appropriate norms for 5 to 7 year old children, the culturally reduced nature of these tests, the ability to use the tests with non-reading or non-English speaking children, and the fact that they may be administered quickly and easily. The study demonstrated the feasibility of further research to investigate the usefulness of HFD tests in the measurement of the mental development of South African children. In general, the findings of the present study suggest that HFDs may be useful in the developmental screening of South African children. If children with developmental delays who could not have been tested with other measures are identified using HFD tests these children can benefit from appropriate interventions. The finding that a higher correlation existed between standardized human figure drawing scores and GMDS-ER general quotients in the sample than the correlation between DAP: IQ scores and WISC-III IQ scores reported by Reynolds and Hickman (2004) is particularly interesting. Although further research is needed, the findings of the present study indicate that HFD tests may provide a better indication of mental developmental level than of intelligence. Subsequent studies to investigate this finding further can provide valuable information that will help to inform the appropriate use of these measures in South Africa.
List of References


Appendix

Consent Form
APPLICATION FOR PROFESSIONAL PSYCHOLOGICAL SERVICES

1. I, .............................................................................., the undersigned, hereby declare that I am:

1.1 * the client; or

1.2 * that I make this Application in my capacity as ......................... of the client, whose full names, Identity No. and residential address are

Name........................................................................................................

Identity No. ............................................................................................

Residential Address...................................................................................

*Delete where not applicable

2. I understand that UCLIN is a Psychology Clinic as well as a Psychology Training and Research Unit, and can therefore not engage in any psycho legal developments (in this case the services of a Professionally Registered Practicing Psychologist must be sought).

3. I agree that:

3.1 all records and information of whatsoever nature which is obtained by or on behalf of UCLIN in rendering any professional services to the client, may be made available to all Psychological Practitioners and Trainee Practitioners who practice at UCLIN from time to time;
3.2 recordings may be made of the consultations and that such information may be used for professional and training purposes, for the facilitation of professional intervention or enquiry, and for the compliance with law;

3.3 UCLIN may contact General Practitioners, other professional persons and/or Clinics to obtain or supply information which UCLIN may regard as being in the interest of the client.

4. I confirm that:

4.1 it is my responsibility to pay all UCLIN accounts regardless of whether I request UCLIN to render invoices to my Medical Aid;

4.2 UCLIN will be entitled to charge me for any consultations which are cancelled less than 24 hours before the scheduled time thereof;

4.3 if legal action is taken by UCLIN for the recovery of any monies owing by me, I shall be responsible for all costs which are thereby incurred, on the attorney and client scale, and to include tracing costs;

4.4 I know and understand the contents of this Agreement, which has been explained to me and is in a language that I understand. I have signed this Agreement on a voluntary basis and I have been given the opportunity to ask questions regarding the contents and the implications hereof.

5. I undertake to promptly notify UCLIN of any change of my residential address.

APPLICANT’S SIGNATURE ..........................................................
(client, parent, or guardian responsible for the account)

Identity No. ............................................................................................................................................

Address ...................................................................................................................................................

Medical Aid Details ...................................................................................................................................

DATE