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PARTICIPATION, ACTIVITY PERFORMANCE AND TASK SUPPORTS OF CEREBRAL PALSIED CHILDREN AGED BETWEEN 4 AND 12 YEARS IN MAINSTREAM SCHOOLING ENVIRONMENTS IN GAUTENG

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment for the degree of Master of Science in Physiotherapy.

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ABSTRACT

The incidence of cerebral palsy has remained relatively constant over time. As medical technology advances survival rates of children born prematurely increase. The trend internationally and in South Africa, is to encourage the integration of children with cerebral palsy into society and to embrace and celebrate diversity. This extends to education, where children with cerebral palsy are increasingly being included into mainstream schooling environments. This is not a simple process as cerebral palsy is extremely diverse in presentation and consists of a number of associated conditions other than the well recognised physical impairments. This has a significant effect on children's ability to participate and be included in mainstream environments. The process therefore requires careful monitoring in order to provide the relevant support and to make changes to the environment

The main aim of the study was to establish participation, activity performance and task supports of children aged between four and 12 years in mainstream schooling environments in Gauteng, South Africa. This was then related to the child's level of impairment.

The School Function Assessment was used to establish the participation, task supports and activity performance of the children with cerebral palsy. The scores of this group were then compared to the scores of the typical population as set out in the user's manual of the School Function Assessment.

The Gross Motor Function Classification System was used to classify the children with cerebral palsy according to their level of impairment. The results of the School Function Assessment were then analysed according to Gross Motor Function Classification level.

The results of the study demonstrate that children with cerebral palsy score lower on a number of aspects of the School Function Assessment when compared to typical students their age. This was particularly true of physical tasks. Children with cerebral palsy in this study generally functioned on a level below that of their typically developed peers with regards to physical tasks in and around the school environment. Children with cerebral palsy performed at or above the level of their typically developed peers with regard to cognitive/behavioural school activities.

As the severity of motor impairment increased, children's ability to participate in the school environment decreased, the amount of task assistance and adaptations required increased and their ability to consistently perform activities decreased.

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Finally, and most significantly, to my parents who have supported me in every way possible and taught me that education is the most valuable resource.

DECLARATION

I declare that this research is my own unaided work, except to the extent indicated in the reference citation and acknowledgements. It is being submitted in partial fulfilment of the degree of Master of Science in Physiotherapy at the University of the Witwatersrand. It has not been submitted previously for any other degree or examination at any other University.

Jeanette Bensted-Smith

This..... day of 2014

LIST OF ABBREVIATIONS

AIDS	-	Acquired Immune Deficiency Syndrome
ANC	-	African National Congress
APCP	-	The Assessment of Preschool Children's Participation
ART	-	Assistive Reproductive Technology
ATD	-	Assistive Technology Device
CP	-	Cerebral Palsy
CVI	-	Cerebral Visual Impairment
GDE	-	Gauteng Department of Education
GMFM	-	Gross Motor Function Measure
GMFCS	-	Gross Motor Function Classification System
HIV	-	Human Immunodeficiency Virus
ICF	-	International Classification of Functioning, Disability and Health
ICP	-	Intracranial Pressure
ISASA	-	Independent Schools' Association of South Africa
IQ	-	Intelligence Quotient
IVH	-	Intraventricular Haemorrhage
LAQ-CP	-	Lifestyle Assessment Questionnaire- Cerebral Palsy
MACS	-	Manual Ability Classification System
NCESS	-	National Committee on Education Support Services
NCSET	-	National Commission on Special Needs in Education and Training
PEDI	-	Paediatric Evaluation of Disability Inventory
PVL	-	Periventricular Leukomalacia
SFA	-	School Function Assessment
SSI	-	School Setting Interview

UMN	-	Upper Motor Neurone
WHO	-	World Health Organisation

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CHAPTER 1: INTRODUCTION

Inclusion in education is based on a value system that recognises and celebrates diversity which may arise from gender, nationality, language of origin, educational achievement or disability (Mittler, 2000 in Lomofsky and Lazarus, 2001). The Salamanca Statement on Special Needs Education of 1994, suggests that every child has a fundamental right to education as well as the opportunity to achieve and maintain an acceptable level of learning. Those with special needs must have access to regular schools which should accommodate them within a child-centred pedagogy capable of meeting those needs (UNESCO, 1994). Inclusive schools are seen as the most effective means of combating discriminatory attitudes, creating welcoming communities and building an inclusive society. As a result of the Salamanca Statement of 1994 which was adopted by 92 governments and 25 international organisations, the South African Government began the process of introducing inclusion in education and particularly the inclusion of physically disabled children.

In July 2001 the South African Ministry of Education launched the Education White Paper 6 on Special Needs Education: Building an Inclusive Education and Training System in South Africa. Since the abolition of the Apartheid system, the South African government has been attempting to redress the inequalities existing in the country. This included a dual system of education comprising of special and mainstream components characterised by racial disparity (Asmal, 2002). For children of other racial groups besides whites, special education was largely unavailable with less than 0.2% being enrolled in special schools as compared to 1.5% of white children. The White Paper 6 demonstrated the disparity in provision for learners with disabilities in special schools.

White Paper 6 outlined how the government aimed to implement inclusion in schools. Five hundred primary schools will be selected for conversion into full service schools, these schools will cater for a variety of disabilities and will also serve children with no impairments. It aimed to strengthen the special schools already existing in South Africa and convert them into resource centres for schools existing within the district, especially those acting as full service schools. As a resource centre, the school provides expertise and support concerning

curriculum, assessment and instruction. Learners who require more intensive levels of support would continue to attend special schools (Department of National Education, 2001).

Between 2001 and 2010, of the 500 schools which were selected for conversion, only eight had achieved this. This poor outcome was attributed to a number of barriers: lack of funding, lack of teacher training and overcrowded classrooms which prevent teachers from being able to spend the necessary time with a disabled learner. (Dunlop, 2011, http://www.parent24.com/Back-to-School/Are-our-schools-disabled-friendly-20110504 online accessed June 2013).

Inclusive education in South Africa is still in the early stages of implementation. Children with physical disability have begun to be accepted into mainstream or regular schools. There is little research to indicate the success of inclusion, particularly of children with cerebral palsy (CP) in South Africa and even internationally (Schenker et al, 2005). In order for inclusive education to continue successfully, it is necessary to gain an understanding of how these children are coping within the mainstream environment. In particular it is necessary to gain an understanding of the functional performance of these children. True inclusion of children with physical disabilities requires that the child is able to participate in school activities (Mancini and Coster, 2004). Rosenbaum and Stewart (2004) state: 'Studies of children with CP should include dimensions of activity and participation, as well as environmental factors, to capture the complex interactional nature of the life experiences of these children and their families'. The concept of participation is recognised by the World Health Organisation (WHO) as being a fundamental component of a person's ability to function.

The International Classification of Functioning, Disability and Health (ICF) provides a framework for the description of health and health related states (WHO, 2001). Functioning encompasses all body functions, activities and participations, while disability is described as a term for impairments, activity limitations and participation restrictions. The current view of disability is that disability results from the dynamic interaction between a person and their environment. Thus, the ability to perform activities and participate in life situations is an essential component of health.

The School Function Assessment (SFA) was developed based on the ICF and enables the description of function among children with a variety of impairments who attend primary school (Mancini and Coster, 2004). It provides a measure for a student's performance of functional tasks which is indicative of participation both socially and academically within the school environment. The tool was designed for use with disabled learners and thus allows for the child to accomplish the given task using alternative methods or support (Davies et al, 2004). It is a criterion-referenced assessment using a judgement-based method of evaluation (Mancini and Coster, 2004). It requires no active participation from the child and can be completed in conjunction with a professional who is familiar with the child. The tool consists of three parts: participation, activity performance and task support. The items are organised hierarchically to represent an increasing level of difficulty. This would allow the examiner to monitor progress of participation and the success of inclusion with readministration of the tool (Hwang et al, 2002). Raw total scores of each scale are transformed into scaled score equivalents (0-100) based on Rasch-based estimates (Schenker et al, 2006).

Standardisation of the tool revealed that internal consistency, test-retest reliability and validity of the SFA have been supported by various studies. The tool is able to detect differences in participation and function in children with different diagnoses which typically differ in the performance of tasks (Hwang et al, 2002).

In keeping with the current understanding of disability, a person's ability to participate in any given environment is likely to range from limited to full participation in activities. This will be affected by personal factors including the nature and severity of the disability (Simeonsson et al, 2001). In order to understand the relationship between a child's participation at school, the nature of the disability and resulting impairments, it is necessary to classify children according to their function. The use of a standardised measure of classification provides a means of communicating the ability of the child which is valid, meaningful and reliable (Rosenbaum et al, 2008). The Gross Motor Function Classification System (GMFCS) for CP has been successfully used for research purposes. The GMFCS is therefore valid and reliable and an accurate tool for research purposes.

Inclusive education in South Africa has begun to be implemented in mainstream schools, but there has been little research conducted to establish how children with CP are coping within this environment. Research in this area is vital to monitor the success of inclusive education and to assist with future inclusive efforts in education.

The aims and objectives of the study were:

Aim of the Study:

To establish the participation, activity limitations and task support of children with CP between the ages of four and 12 years in mainstream schools in Gauteng.

Study Objectives:

i. Establish the participation, activity performance and task support of children with CP between the age of four and 12 years within mainstream schools in Gauteng using the SFA.
ii. Relate participation, activity performance and task supports of children with CP in the mainstream environment to the level of impairment, according to the child's classification using the Gross Motor Function Classification System (GMFCS), the type of CP and additional neuroimpairments.

Significance of the study:

This study aimed to investigate the participation, activity performance and task support of children with CP within the mainstream schooling environment and relate this to their level of disability using the GMFCS. This research is necessary to evaluate how well South African children with CP are being integrated into the mainstream schooling environment and provide relevant information to policy makers, parents, teachers and therapists regarding the process of inclusive education.

CHAPTER 2: LITERATURE REVIEW

The inclusion of children with CP in mainstream schools worldwide is not a new process. In South Africa however, children with CP attending mainstream schools have generally been the exception rather than the rule. In a country hugely influenced by its political past, inclusive education now features prominently in the South African Government's plans for the future. Inclusive education in the South African context will obviously be different and therefore requires local research and commentary. The literature was obtained through a comprehensive search on major databases (PubMed, MD consult) as well as a hand search in the library of the University of the Witwatersrand. Keywords used in the search were: cerebral palsy, participation, gross motor classification system, School Function Assessment and inclusive education.

2.1 Inclusive Education

Inclusive education is generally understood as a progressive shift towards educating learners with special education needs, including physical disabilities, in mainstream classrooms and school communities as opposed to separate education settings (Engelbrecht et al, 2013). There has been some debate internationally however, which suggests that the concept of inclusion is much more complex (Ainscow and César, 2006). There is an increasing trend to recognise that there are other groups who may be vulnerable to discrimination and disadvantage other than those with special education needs. Particularly in South Africa, challenges which inhibit inclusion are multifactorial and include poverty, limited or lack of human and material resources and large numbers of under-qualified or unqualified teachers (Pather and Nxumalo, 2013). Traditional cultural views which view disability as a shame or a curse to the family affect the move towards inclusion (Reiser, 2008 in Pather and Nxumalo, 2013). The Southern African schools system, including neighbouring African countries, have also seen an increase in the number of child headed households as a result of the loss of social structures due to Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) (Yousafzai et al, 2004). All these factors would have an impact on a learner's ability to perform effectively in the school environment and are issues which would affect inclusive education.

The move towards inclusive education internationally was first set out in the Universal Declaration of Human Rights (1948) which entrenched access to education as a basic human right. Various conferences were held internationally to discuss the provision of education for all learners in the 1990's (Mbibeh, 2013). The most significant being the Salamanca World Conference on Special Needs Education (UNESCO, 1994) the outcome of which outlined practical modalities for the implementation of inclusive education internationally in what became known as the Salamanca Statement or Framework for Action (Mbibeh, 2013). The Salamanca Statement argues that mainstream schools with an inclusive policy are 'the most effective means of combatting discriminatory attitudes, building an inclusive society and achieving education for all' (UNESCO, 1994, p. iv). It also goes on to suggest that these schools would ultimately improve the cost-effectiveness of the entire education system (Pather and Nxumalo, 2013). The Salamanca Statement was adopted by 92 governments, including South Africa, as well as 25 international organisations and became the basis for many inclusive policies worldwide.

2.2 Inclusive Education in South Africa

In order to understand inclusive education in South Africa, it is vital to understand it's political history. Pre-1994 a system of education existed in the country which divided learners not only along racial divisions, but also separated learners with special needs from their mainstream peers. As a result of this discrimination in terms of race and disability, there were huge disparities in the delivery of education reflecting the general inequality existing throughout South African society during this time (Engelbrecht, 2012). By the 1980's the general move in the country was towards the establishment of a democratic government and by extension, a democratic education system. In 1994, the first democratic election was held in South Africa where all South Africans, regardless of race were permitted to vote for their government of choice. The African National Congress (ANC) won the election and so began the difficult task of correcting the social inequalities existing in the country.

One of the first tasks of the new ANC government was to rewrite the South African Constitution. The Constitution sought to protect the rights of all citizens and was accepted by the Constitutional Assembly on 8 May 1996 before being passed as law by the Constitutional Court in December 1996. The Constitution has been hailed as being one of the most

progressive constitutions in the world. The commitment to establish a society based on democratic values, social justice and fundamental human rights is firmly entrenched in the Constitution. It also includes a Bill of Rights which in particular entrenches the rights of all South Africans, regardless of race, gender, sexual orientation, disability, religion, culture or language, to basic education as well as access to educational institutions (RSA, 1996). This has paved the way for a new era of inclusiveness in the process of developing social and educational transformation (Engelbrecht, 2012).

The new South African Government is committed to bringing South Africa in line with international standards of the recognition of human rights especially in terms of education (Waghid and Engelbrecht, 2002). A National Commission on Special Needs in Education and Training (NCSNET) and the National Committee on Education Support Services (NCESS) were established in 1997. These two groups produced a report which stressed the need to move away from a medical model which views disability as originating from within the individual and therefore justifies social inequalities because of biological inequalities (Engelbrecht. 2012) towards an approach which acknowledges that participation of children with disabilities is dependent on a complex interplay between the individual and their environment. It therefore stressed the need to identify and address barriers to learning which could exist within the learner, the education system as well as within the broader social, economic and political environment within which the learner exists (Lomofsky and Lazarus, 2001).

In July 2001, the South African Ministry of Education launched the Education White Paper 6 on Special Needs Education: Building an Inclusive Education and Training System in South Africa. The White Paper 6 demonstrates the disparity in provision for learners with disabilities in special schools. The special schools in most areas of South Africa are not able to cope with the large amount of disabled learners. In many cases in South Africa, children are required to travel long distances to reach schools and thus may not attend at all. The inclusive education policy of the South African government outlines a strategic plan which involves 30 designated school districts and the conversion of special schools into resource centres which would provide expertise and support to neighbouring schools. Designated schools in these areas would then be converted into ‘full service schools’ to cater for a wide range of educational needs as well as support other mainstream schools. Other plans to ensure the success of this policy are: curriculum support, teacher training and an advocacy programme (Pather, 2011).

Unfortunately, many of these plans to for support may not be contextually appropriate or sustainable (Pather, 2011).

The process of implementing inclusive education has been slow due to a number of barriers existing in South Africa which researchers are still trying to understand. Maher (2010) conducted a qualitative study in the province of Kwazulu Natal, South Africa. She interviewed teachers in regular and special schools, parents of children with disabilities, aid workers, children with disabilities and management personnel who were involved in some way with the policy and practice of the education of children with disabilities. The major finding of this study was that all participants mentioned high levels of ostracism of the disabled and parents and children themselves expressed fear as a result of this. This study demonstrates that it is not only legislation that needs to be changed, but also society's attitude towards the inclusion of people with disabilities into mainstream society.

Other barriers to the success of inclusive education in South Africa are described by Charema (2007) as: a lack of funding for informative research, lack of resources to equip, facilitate and expand the provision for children with special needs, misdirection of funds, limited personnel training programs, inadequately qualified personnel and the absence of enabling legislation and support services.

Presently, South Africa is still a country of extreme disparity between the public and private education systems. The majority of South African learners being educated in the public sector which is controlled by the provincial Department of Education and supervised by the central Ministry of Education (Wiazowski, 2012). The private education sector services a very small minority of 2.9 % of the learner population (DoE, 2008) and generally tends to service less socio-economically disadvantaged communities due to the higher fee structures employed (Walton et al, 2009). South Africa's constitution affirms the right of independent schools to exist, but these schools need to be registered with the relevant provincial education department and may not discriminate against learners in terms of race (Republic of South Africa (RSA), 1996: section 29(3)). These independent schools are therefore not owned by the state and are generally founded, owned, managed and financed by stakeholders (Walton et

al, 2009). Many of these independent schools which meet the membership requirements and quality criteria belong to the Independent Schools' Association of Southern Africa (ISASA). ISASA has a Diversity and Equity Policy, influenced by the general South African education system's move towards inclusive education, which encourages its member schools to include learners with special education needs (ISASA, 2002).

While the Salamanca Statement of 1994 states that inclusive education should aim to educate individuals through both the private and public sectors (UNESCO, 1994), the White Paper makes no mention of the role that independent schools will play in the process, besides that independent schools will be audited together with special state schools (Walton et al, 2009).

2.3 Cerebral Palsy

The most recent definition of CP acknowledges the diversity of the condition. CP describes a group of disorders of the development of movement and posture, causing activity limitations, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain. The motor disorders of CP are often accompanied by disturbances of sensation, cognition, communication, perception and/or behaviour, and/or by a seizure disorder (Bax et al, 2005). Previous definitions of CP predominantly acknowledged the motor impairments of the condition (Himmelmann et al, 2006). Current thinking acknowledges the effect on function (activity function) and the co-morbid features associated with CP (Carr et al, 2005). While CP manifests most obviously as a disorder of motor function, the growing understanding of the heterogenous nature of CP and the multivariate nature of the accompanying impairments have an effect on the management of children with CP (Wong et al, 2011).

2.3.1 Aetiology and Epidemiology of Cerebral Palsy

With the inclusion of children with CP into mainstream environments, it is necessary to consider the prevalence of CP, as well as the factors contributing to its incidence. In this way, a relative understanding of the impact this condition will have on healthcare and education systems both now and in the future can be gained.

CP is the most common cause of motor disability in children (van Wely et al, 2012). Current literature suggests that the prevalence of CP is 2-2.5 in 1000 live births in developed countries

(Eunson, 2012). The prevalence of CP in developing countries such as South Africa is not well documented, however a number of studies have been conducted in other developing countries. There is an increased risk of disability in developing countries as a result of poverty, poor health and nutrition. (Ibrahim and Bhutta, 2013). Maenner et al, 2012 found that the prevalence of CP also differed across race groups. In the study, Maenner et al, 2012 used a population-based surveillance system in the United States and identified 476 children with CP who were then grouped using the GMFCS, according to severity of CP and according to race. The results found that the prevalence of CP was 3.7 per 1000 black children as opposed to 3.2 per 1000 white children. This was linked to a lower socioeconomic status of this particular race group. A similar study has not been conducted in South Africa, but much of the population experiences significant levels of poverty and low socioeconomic status which may contribute to an increased prevalence of CP amongst certain groups.

The aetiology and epidemiology of CP in developing countries such as South Africa is difficult to ascertain due to a lack of research. It is likely that more cases would be caused by postnatal causes such as meningitis, cerebral malaria, severe neonatal jaundice or maternal rhesus isoimmunisation (Eunson, 2012). This can be related to the differing clinical spectrum of CP found in developing countries. Spastic quadriplegia has been found to be the most common type of CP in developing countries (rates between 36% and 71 %) (Singhi and Saini, 2013).

In developed countries, spastic diplegia is more common (rates between five and 47 %) (Singhi and Saini, 2013). The higher rate of diplegia in developed countries can be related to the improved survival of children born prematurely (Eunson, 2012; Reddihough and Collins, 2003). Therefore, despite advancements in maternal and neonatal care, rather than the prevalence of CP decreasing, the number of children born with more severe forms of CP has increased.

The causes of CP are diverse and interconnected. For this reason researchers now differentiate between risk factors and known causes. This has led to the concept of 'causal pathways' in which it is a sequence of interdependent events rather than a single factor that culminate in a condition (Eunson, 2012; Reddibough and Collins, 2003;).

For the purpose of this review, the causes and risk factors associated with the development of CP will be separated as follows: antenatal, perinatal and postnatal and will be discussed in more detail.

2.3.1.1 Antenatal Causes

Antenatal causes include malformations which may affect cortical migration following an ischaemic injury in the first two trimesters (Eunson, 2012; Kulak et al, 2010). These malformations may also have a genetic component (Reddibough and Collins, 2003). Maternal infections, especially those occurring in the first two trimesters such as rubella, cytomegalovirus and toxoplasmosis are also associated with the development of CP (Swanson and Schleis, 2013; Eunson, 2012). Although there is no single placental pathology associated with the development of cerebral palsy, there are factors which may have an influence on foetal development. These include abnormalities of vascular development, acquired inflammatory lesions and acquired degenerative lesions (Eunson, 2012).

2.3.1.2 Perinatal Causes

Perinatal causes (problems during labour and delivery) especially birth asphyxia was previously thought to be the most significant cause of CP. It has now been established that only about 2-10 % of cases of CP can be attributed to intrapartum asphyxia (Eunson, 2012). In developing countries, this figure may in fact be far higher than this, but limited research has been conducted. (Ellenberg and Nelson, 2013). Apgar score is a measure of the viability of the newborn based on heart rate, respiration, skin palor, muscle tone and reflex irritability (Lie et al, 2010). It has long been considered a definitive sign of birth asphyxia (Ellenberg and Nelson, 2013; Lie et al, 2010). However, current research suggests that low Apgar scores are associated with a number of conditions namely: low birth weight, prematurity, placental pathology and impairments of the central nervous system (Lie et al, 2010). This suggests that pre-existing conditions may have in fact already caused significant damage to the infant before the onset of labour. Thus, in areas where Caesarean section rates have risen as much as 50 % there has not been a decrease in the prevalence of CP (Eunson, 2012). Other factors associated with CP include: meconium-stained liquor and meconium aspiration, assisted deliveries using instruments as well as prolonged labour and breech delivery (McIntyre et al, 2013).

2.3.1.3 Postnatal Causes

Postnatal causes of CP are thought to account for between ten and 17 percent of cases. Infections such as meningitis which are vaccine preventable are particularly significant in developing countries such as South Africa but remain an issue even in developed countries (Mook-Kanamori et al, 2011; Reddihough and Collins, 2003). Damage to the developing infant's brain is caused by increased intracranial pressure (ICP), cytotoxic and vasogenic oedema, herniation, local leukocyte infiltration or abscess formation and cortical necrosis and hippocampal neuronal loss (Mook-Kanamori et al, 2011).

Other postnatal causes include traumatic events such as motor vehicle accidents as well as near drownings.

Additional known causes of CP which occur after birth include untreated neonatal jaundice which can lead to the development of kernicterus and ultimately result in death. Kernicterus has been associated particularly with the development of dyskinetic CP. Acute hyperbilirubinemia affects 60 percent of full term infants and 80 percent of preterm, some of these cases will progress to kernicterus if not managed correctly (Falcão et al, 2007). Kernicterus or bilirubin encephalopathy is a condition associated with cerebral deposition of unconjugated bilirubin (Martich-Kriss et al, 1995). It is a pathological term which describes the yellow staining of the deep nuclei of the brain particularly the globus pallidus (Govaert et al, 2003). Neonatal jaundice is a particularly important health condition in South Africa as it remains a large source of mortality and morbidity, particularly in Sub-Saharan Africa, Asia and Latin America (Egube et al, 2013).

2.3.1.4 Risk Factors Associated with the Development of Cerebral Palsy

It is important to distinguish between known causes of CP and those factors which are associated with an increased risk of the development of CP (Reddihough and Collins, 2003). These factors while not being directly associated with CP may result in a sequence of events which may culminate in CP.

Advances in neonatal care has meant that an increased number of extremely preterm infants are surviving (Ballot et al, 2012). Prematurity is defined as birth occurring at less than 37 completed weeks of gestation (Swamy et al, 2008). In developing countries such as South Africa, the premature birth rate is as high as 25 percent (Steer, 2005). This group is further divided into various subgroups: 'very preterm' refers to infants born at less than 32 weeks of gestation, while 'extremely preterm' is used to describe infants born at less than 28 weeks gestation (Cheong and Doyle, 2012). Research suggests that of infants born before 26 weeks gestation 16-28 % will develop CP. Children born between 32 and 36 weeks are also at risk of developing CP (Eunson, 2012). Prematurity has also been linked to HIV and malaria infections (Steer, 2005) this is particularly significant for South Africa. Prematurity has also been linked with a lower socioeconomic status (Jansen et al, 2009).

Multiple gestations such as twin and triplet pregnancies are at risk of preterm birth. (Kalra and Barnhart, 2011). Increased research into the developmental outcome of preterm infants has come about due to the rapid rise in multiple births, which between 1980 and 2004, had increased by 70 percent (Refuerzo, 2012). This increase in multiple births is directly associated with the advances in assisted reproductive technology (ART) (El-Toukhy et al, 2006).

Birth weight is considered a risk factor for CP. Infants born prematurely and at low birth weight are more at risk of developing severe respiratory disease and are thus more susceptible to white matter damage (Tran et al, 2005). This is due to the fact that between 28 and 32 weeks the brain undergoes myelinogensis. In the preterm brain, the pre-myelin glial cells are more susceptible to injury (Tran et al, 2005). The blood vessels of the germinal matrix, a highly vascularized area are immature and autoregulation in the preterm brain is vulnerable to incidents of hypercapnia or hypoxia. For this reason preterm infants are vulnerable to intraventricular haemorrhage (IVH) (Volpe, 2009). Periventricular leucomalacia (PVL) is the leading cause of CP in preterm infants (Deng et al, 2008). PVL refers to focal necrosis with injury and loss of all cellular elements such as axons and glial cells. This is surrounded by non-necrotic injury to the periventricular white matter with microglial proliferation and astrogliosis. This is thought to cause perturbation of maturation of cells of the oligiodendroglial lineage and ultimately cyst and scar formation (Folkerth, 2005). PVL has also been associated with infections such as acute chorioamnionitis, funisitis or premature

rupture of membranes. There is a resultant systemic foetal inflammatory response and the cerebral white matter is damaged by proinflammtory cytokines (Folkerth, 2005).

2.4 Impairments Associated with Cerebral Palsy

As the most recent definition of CP suggests, CP is a complex condition. There are a number of impairments associated with the condition which have an impact on a child's ability to integrate fully into the mainstream schooling environment. These will now be discussed in more detail.

2.4.1 Motor Impairments Associated with Cerebral Palsy

CP as a condition primarily affects motor control, however there are many other factors that contribute to the movement disorder such as sensory, perceptual, cognitive and musculoskeletal impairments (Mayston, 2001). CP is classified according to the limb distribution and the type of motor impairment (spasticity, dyskinesia or ataxia) (Gorter et al, 2004). Involvement of all four limbs or with the upper limbs being more affected than the lower limbs is classified as quadriplegia. If the lower limbs are predominantly affected it is classified as being diplegia, unilateral involvement of one side of the body is classified as hemiplegia (Mayston, 2001).

Spasticity is defined as a form of hypertonia due to a velocity-dependent increase in tonic stretch reflexes, which results from abnormal processing of proprioceptive input (Sheean, 2002). Spasticity is one part of the upper motor neurone (UMN) syndrome having an effect on the other components namely: weakness, lack of dexterity and fatigue (Richardson, 2002). An UMN lesion, such as that existing in CP disturbs the balance of supraspinal inhibitory and excitatory inputs, producing a net disinhibition of the spinal reflexes. Spasticity can lead to significant problems with regard to function of children with CP including: spasms, decreased range of motion, pain and contractures as well as difficulties with the maintenance of personal hygiene (Davis and Barnes, 2000).

Dyskinesia is defined as a disturbance in normal movement. The group is further divided into dystonia and choreathetosis. In dystonia, the predominant feature is hypertonia and reduced activity. In choreoathetosis, irregular or involuntary movement is noted (O'Shea, 2008). Dyskinesia occurs as a result of damage to the deep nuclei of the brain and in particular the

globus pallidus (Govaert et al, 2003). This can occur as a result of kernicterus. One likely hypothesis to explain the motor dysfunction occurring in dyskinesia as a result of kernicterus, is that by destroying the output of the globus pallidus there is reduced inhibitory input to the motor thalamus. This disinhibition would then lead to the excessive and abnormal movements of athetosis and dystonia as well as inappropriate timing (Tachibana et al, 2008; Shapiro, 2003). Hypoxia and ischaemia are thought to cause damage to the putamen and thalamus (Himmelmann et al, 2006).

Ataxia refers to a loss of orderly muscular co-ordination. As a result movements are performed with abnormal force, rhythm and accuracy (O'Shea, 2008). This disorder of movement is frequently associated with damage to the cerebellum. Damage to the cerebellum is associated with premature birth as the cerebellum's growth and development are rapid during late gestation (Koziol et al, 2012). The cerebellum has reciprocal, segregated connections with nearly every region of the cerebral cortex and in this way contributes to the co-ordination of movement (Koziol et al, 2012).

CP is characterized by the positive and negative features of the UMN syndrome. Positive features include: muscle overactivity, hypertonia, hyperactive tendon reflexes, clonus and flexor spasms. Negative features include: weakness, loss of dexterity and selective motor control as well as balance deficits (Dodd et al, 2003; Sheenan, 2002). In the past, neurodevelopmental therapists considered hypertonia and agonist/anatagonist co-contraction to be the primary cause of motor dysfunction. Muscle weakness was considered to be secondary to the problem of abnormal tone (Mayston, 2001; MacPhail et al, 1995). Recent research has, however demonstrated that strength, rather than spasticity is the most significant limitation in motor function (Mayston, 2001). Ross and Engsberg (2007) demonstrated that strength rather than spasticity accounted for the large degree of variance in gait and gross motor function. This was further supported by the work of Eek and Beckung (2008) in which the level of function of children as described by the GMFCS was proved to be directly related to muscle strength. A high correlation was also demonstrated between the Gross Motor Function Measure (GMFM) and muscle strength. Previously it was suggested that resistance training should be avoided in the treatment of CP as it would serve to increase hypertonus and associated reactions. However, as knowledge of neurophysiology has advanced, advocates of neurodevelopmental therapy now acknowledge that this belief was incorrect and incorporate strengthening into goal related tasks during

therapy. This has been supported by research in the field which demonstrates that strengthening activities do not increase spasticity. Fowler et al (2001) assessed the effect of quadriceps femoris muscle strengthening on resistance to passive knee motion of children with CP immediately following a training session. The results of the study showed that there was no change in the resistance to passive knee motion. As spasticity is defined as a velocity-dependent increase in muscle stretch reflexes resulting from hyperexcitability of the stretch reflex, the findings of this study indicate that there was no increase in quadriceps femoris spasticity following participation in strengthening exercises.

As has already been discussed, it is muscle weakness, rather than spasticity which shows a greater correlation to deficits of motor function in children with CP. Weakness implies a failure or inability to produce or maintain an anticipated level of force (Elder et al, 2003). Muscle weakness in CP results primarily from neurological factors such as the degree of activation of the motor neuron pool. However, it has been shown that muscle morphology is affected due to reduced activity of the muscle, which is related to the degree of spasticity (Ohata et al, 2008, Mayston, 2001). A number of changes occur in the spastic muscle which results in weakness and decreased motor function. In spastic muscle, there is an increased percentage of type I (slow twitch fibres) most likely as a result of atrophy of the type II fibres which affects the muscle's ability to generate quick postural adjustments or powerful movements. In comparison to normal muscle, which show tightly packed and generally uniform size fibres, spastic muscles show variability in the size of the muscle fibres as well as fibres with a 'rounded' or 'moth-eaten' appearance with increased extracellular spaces (Lieber et al, 2004). Generally children with CP present with some degree of altered muscle length which would logically result in altered muscle force generation as muscle generates force most effectively at mid-range (Mayston, 2001). There is also a change in the intracellular and extracellular level with regard to the structural components of collagen and titin, which affects the contractility of the muscle (Ohata et al, 2008).

2.4.1.1 Postural Control in Children with Cerebral Palsy

Impaired postural control is the main component of the definition of CP (Saether et al, 2013). The development of movement and postural control is directly influenced by the other neuroimpairments associated with the condition: spasticity, muscle weakness, co-contraction

and sensory impairments (Saether et al, 2013). Balance ability may even deteriorate over time due to secondary musculoskeletal abnormalities (El-Shamy and El Kafy, 2013). Poor postural control has a significant effect on the ability of children with CP to participate in activities due to fear of falling or injury (El-Shamy and El Kafy, 2013; Girolami et al, 2011; de Graaf-Peters et al, 2007). Posture refers to the relationship between the different parts of the body as well as between the body and a reference frame (Saether et al, 2013). Postural control is required in order to obtain balance which is the act of maintaining the centre of gravity within the base of support (Saether et al, 2013). The three main components of balance are as follows: to maintain a sustained posture; to facilitate voluntary movement between postures and to adjust after an external disturbance (Saether, 2013).

There has been a large amount of research into the development of postural control in typically developing children. Research of late has begun to also focus on the development of postural control in children with CP and the subsequent effect on function as well as possibilities for physiotherapy intervention.

Briefly, in typically developing children, two important stages of postural control can be recognized: the development of direction-specific adjustments and finally, in the second stage, the fine tuning of the basic postural pattern on the basis of multi-sensorial afferent input from somatosensory, visual and vestibular systems (de Graaf-Peters et al, 2007).

In children with CP, there are invariably deficits in the development of postural control. The deficits in the development of postural control are strongly linked to physical impairment with more severely affected children showing more significant postural control difficulties (Hadders-Algra et al, 1999). The major difficulty of children with CP in the development of postural control occurs at the second level of development. Children with CP exhibit multiple forms of disorganisation at the second level, with a predominantly cranio-caudal recruitment pattern, increased antagonistic co-activation and a reduced ability to adapt the degree of muscle contraction to a specific situation (de Graaf-Peters et al, 2007). Thus, it would follow that children with CP would have difficulties in adapting their postural activities to the demands of different environments.

2.4.1.2 Fine Motor Impairment in Cerebral Palsy

In addition to gross motor impairment, the fine motor skills of children with CP are also affected. One particular skill which is associated with participation in the school environment is handwriting. Difficulties in this area can lead to problems with academic performance and subsequently lowered self-esteem (Bumin and Kavak, 2010). In order for children to develop the handwriting skill, sensory-perceptual-motor, cognitive and language function need to be adequately developed, all of which are often affected in children diagnosed with CP.

2.4.2 Sensory Impairments Associated with Cerebral Palsy

Sensory impairment in CP is often difficult to assess due to co-existing cognitive impairment. Sensory impairment may be a primary sensory deficit or difficulties with processing (Mayston, 2001). Research has demonstrated that stereognosis and two-point discrimination of the hands is impaired in 44-51 % of all children with CP (Odding et al, 2006). In addition, spatial and visual perceptual difficulties are common (Mayston,2001).

Perhaps the most common sensory impairment occurring in CP are visual and hearing difficulties. Sensorineural, conductive or mixed hearing loss in children with CP may increase the overall level of impairment. While children with CP may also have a genetic cause for their hearing loss, there are non-genetic risk factors which are common for both CP and hearing loss (Reid et al, 2011). These include: intrauterine cytomegalovirus infection, severe hypoxic-ischaemic insults, low birthweight, kernicterus and neonatal meningitis. A systematic review performed on behalf of the American Academy of Neurology suggested that hearing loss occurs in approximately 12% of children with CP (Ashwal et al, 2004).

CP is also frequently associated with visual impairments. These include ocular disturbances such as strabismus and nystagmus. Low visual acuity was reported in as many as 75% of children with CP in a study conducted by Odding et al, 2006. Cerebral Visual Impairment (CVI) which is caused by the defective function of the retrochiasmatic visual pathway, is particularly common in children with spastic CP (Schenk-Rotieb et al, 1994 in Costa et al, 2012). Opthalmologic problems are reported in as many as 50-90% of children with CP (Ozturk et al, 2013). A study conducted by Ghasia et al, 2008 found that children in each level of the GMFCS had visual deficits at rates 10-70 fold higher than those of the general paediatric population. Ghasia et el, 2008 found that children with greater physical impairment were greatest at risk

for myopia, dyskinetic strabismus, severe gaze dysfunction, optic neuropathy or CVI. Decreased presence of these conditions was noted in children classified at GMFCS level I (Ghasia et al, 2008). Visual impairment can have a negative effect on a child's function, and affects not only the cognitive achievement of children, but also their physical achievement and thus, children, particularly those with spastic CP should routinely be referred to opthalmologists.

2.4.3 Cognitive Impairments Associated with Cerebral Palsy

Besides sensory deficits associated with CP which can affect school function, cognitive deficits have a significant impact on a child's ability to integrate and participate in a mainstream schooling environment (Smits et al, 2011). Intelligence Quotient (IQ) is a critical component in determining participation and success in schooling environments. It is estimated that about 45% of children with CP have an intellectual impairment which is defined as a significantly sub-average intellectual functioning (Yin Foo et al, 2013). There is also a link between motor impairment and cognitive involvement: children with minimal motor involvement having higher IQs than those with more severe motor involvement. Many of the standardized paediatric tools used to assess IQ have generally been developed for use on typically developing children without physical impairments (Yin Foo et al, 2013). As a result, the tools do not accommodate the large number of additional impairments, such as motor, visual and communication difficulties. Children with CP may therefore receive a lower score on the IQ test which may not be an accurate reflection of their cognitive ability. This is problematic as it can affect school placement and mainstreaming of children with CP.

2.4.4 Epilepsy Associated with Cerebral Palsy

Epilepsy is a common condition associated with CP and can often be more disabling than the physical condition itself. Studies have reported that the incidence of epilepsy occurs in 15-41.8 % of children with CP (Singhi et al, 2003). Epilepsy was found to be most common in hemiplegia (65.9%) and in quadriplegia (42.6%) and least common in diplegia (15.8%). These findings are supported by other studies (Zelnik et al, 2010). Generalised seizures are most common, followed by partial seizures, infantile spasms and myoclonic jerks (Singhi et al, 2003).

2.4.5 Communication Difficulties with Cerebral Palsy

Children with CP are at risk of communication difficulties due to motor, language, cognitive and/or sensory perceptual impairments (Light and Drager, 2007). These communication difficulties influence the child's ability to interact and engage with their environment. Children with CP and complex communication difficulties demonstrate reduced participation in social activities compared to their non-disabled peers (Thirumanickam et al, 2011).

2.5 Participation

Traditionally, the management of children with CP has focussed on the management of motor impairments (Majnemer et al, 2008). The ICF (WHO, 2001) acknowledges that disability is more complex than physical impairment and thus identifies the constituents of health (WHO, 2001). The ICF provides a unified, standard language and framework for the description of health and health-related states. This model is used to describe disability and function. The model identifies three relevant dimensions: body structure and function, activity and participation (Mancini and Coster, 2004). It therefore focuses on functioning at an internal level and functioning and participation at a social level. It also acknowledges the role of external or contextual factors such as the role of environmental and personal factors and their effect on function.

Functioning and disability is therefore a dynamic interaction between health conditions and contextual factors (Hemmingson and Borell, 2002). Rehabilitation has now begun to focus on enhancing functional success and participation in society despite existing deficits (Majnemer et al, 2008). A social model of disability, as described in the ICF (WHO, 2001) proposes that it is the environment in which a person with physical, learning or sensory impairments lives which will influence the extent of their participation (Majnemer et al, 2008; Simeonsson et al, 2001).

Participation is defined as the involvement of a person in everyday life (Eriksson, 2005 and Law, 2002). The ICF categorises participation into the following domains: learning and applying knowledge; general task and demands; communication; mobility; self care; domestic life; interpersonal interactions and relationships; major life areas such as work or school, community, social and civil life (WHO, 2001).

There has been extensive research into the way in which children with disabilities participate. Participation of children with disabilities has become a focus of research due to the fact that while participation is known to enhance quality of life, evidence suggests that reduced participation can lead to poor health and well being (Law, 2002). It is therefore a key component of health. Children with disabilities have been shown to be vulnerable to limited participation, and that participation results from a complex interaction between the child and the physical and social environments in which they exist (Law et al, 2006 in Harding et al, 2009; Forsyth and Jarvis, 2002; Law et al, 2002).

Research demonstrates that there are indeed differences in participation between children with and without disabilities (Palisano et al, 2009). Majnemer et al (2008) found that while children with CP participated in a wide range of leisure activities, these activities were less diverse and generally home based. This study also noted that active participation in activities which are meaningful to the child was essential for the promotion of health, personal autonomy, the development of skills, integration into the community and overall life satisfaction.

A number of studies have investigated the link between social and community participation and the functional status of children with CP. Morris et al (2006) found that social integration could be predicted using the GMFCS as well as the Manual Ability Classification System (MACS). Thus, children with more severe impairments had decreased participation. These findings were supported by the research of Donkervoort et al (2007) which found that participation was most accurately predicted using the GMFCS. This research was however conducted amongst an older group of adolescents.

One of the key factors identified as having an impact on the ability of children with CP to participate is the effect of factors existing within the various environments in which a child exists. This is particularly significant when examining the participation of children with CP in the school environment. A child's ability to participate in different areas of school life is strongly influenced by their ability to meet both the physical and cognitive/behavioural requirements which are characteristic of a particular setting (Mancini and Coster, 2004). The social model of disability, as represented in the International Classification of Functioning, Disability and Health (World Health Organisation 2001) suggests that 'the environment in

which those with physical, learning, or sensory impairments live will significantly influence the extent of their participation.' There are a number of factors which have an impact on a child's ability to participate in society. These will now be discussed in more detail.

2.5.1 Products and Technology

Children with CP present with a wide range of impairments which affect motor and cognitive function which have been discussed in detail. The severity of neuromuscular and musculoskeletal impairments associated with the condition are extremely variable and thus motor function ranges from independent mobility to complete reliance on caregiver assistance for all aspects of mobility and self-care (Palisano et al, 2003).

Assistive Technology Devices (ATDs) are used within educational settings to enable children with physical or cognitive disabilities to participate more fully in various activities (Hemmingson et al, 2009). ATDs also enable students to maintain an adequate posture to promote optimal performance, concentration and endurance during classroom activities as well as to travel within the school (Egilson and Traustadottir, 2009). For this reason, the benefits of including ATDs have been acknowledged as an essential intervention early on in the rehabilitative process (Wiart and Darrah 2002; Cox 2003 in Huang et al, 2009). Simeonsson et al (2000) surveyed 1180 teachers of students with disabilities in the United States to examine the nature and extent of participation disabled students in the context of the physical, social and psychological features of the school. A significant finding in this research was that while children with more severe impairments more often required ATDs to enhance or enable function, the ATD had the effect of increasing their participation within the school environment. These findings are supported by Schenker et al, 2006 who concluded that devices which support a child's ability to perform required physical and cognitive/behavioural tasks within the school environment are necessary to enhance participation in academic and social tasks. Pivik et el, 2002 concluded that students with disabilities found environmental modifications were more effective in promoting participation in the school environment than a personal assistant.

A predominantly qualitative study conducted by Hemmingson et al (2009) provides interesting insight into the way in which children with disabilities perceive the use of ATDs.

Twenty students with physical disabilities and varying types of ATDs were observed and interviewed. Students described devices that enhanced their function and diminished the performance gaps between themselves and their peers as being most appreciated, while devices which did not provide immediate improvements in function regardless of the long term benefits were often disregarded and not used. This is particularly interesting as it emphasises how children with disabilities need to play a part in the selection of devices. Many children also disliked ATDs and were less likely to use them if it made the children feel different.

Studies which have analysed the psychological aspects of the use of ATDs have found that the use of these devices are an extremely sensitive issue and very often are directly attached to their body perception (Brooks, 1991 in Huang et al, 2009). One child in the study preferred to use a walker even though this was immensely difficult for her as using a wheelchair made her feel less like her ambulatory classmates. Some children expressed that the use of an ATD made them vulnerable to conflict amongst their peer groups with other children viewing the ATD as an unfair advantage. Hemmingson et al (2009) points out that in this way an aid which would be perceived as beneficial would actually create more difficulties in terms of social participation.

Another factor which appeared to influence the use of ATDs is the ability of the class teacher to integrate the device effectively into the classroom. Devices which required use in a separate room or were simply not used in learning activities were more likely to be disregarded. This research suggests that children need to be a part of decision making processes with regards to the use of ATDs. Support needs to be provided to the child using the device within the school environment so that the device is used to its full potential. These findings were further supported by the research of Huang et al (2009). Of particular interest in this study were the strategies adopted by teachers to facilitate the integration of children's ATDs in daily school life. These included increasing opportunities for the use of the devices, protecting their safety and providing education to peers on ways in which to assist. These suggest helpful strategies to counter the difficulties found by Hemmingson et al (2009).

Huang et al (2009) identified a second area of interest, the fact that many class teachers of children with disabilities included in the mainstream environment have little to no experience in the area of special education and had not received adequate in-service training to learn to cope with the needs of these children. These teachers also identified a lack of interdisciplinary co-operation with therapists which affects the ability of the ATDs to be integrated effectively into the school environment.

Independent mobility has been identified as an important aspect of participation for children and results in a reduction in dependence on caregivers and the environment (Fernandes, 2006). Wheelchair use, both powered and manual is a method of mobility particularly for children with more significant motor impairment. Rodby-Bousquet and Hägglund (2010) conducted a cross-sectional study using 562 children from a Swedish register and healthcare programme for children with CP. Twenty nine percent of children used wheelchairs for indoor mobility while 41% required a wheelchair for outdoor use. This suggests that the physical environment has an impact on children's ability to mobilise without the use of an ATD. Powered wheelchairs were found to significantly improve independent mobility even in children with significant motor impairment. The researchers suggested that wheelchair mobility should be considered from a very early age to increase a child's ability to participate.

2.5.2 Changes to the Physical Environment

Article 13 of the 2006 United Nations Convention on the Rights of Persons with Disabilities asserts the obligation of governments to ensure the equal access of persons with disabilities to the physical environment, to transportation and to information and communications. The physical environment consists of objects and spaces in which a person interacts (Hemmingson and Borell, 2002).

Children with CP who have significant motor impairments have been shown to have decreased access to their physical environment (Colver et al, 2011). Lawlor et al, 2006 conducted 13 in-depth interviews with parents of children with CP. The findings of this study confirmed that the main facilitators of mobility were ATDs, as has already been discussed, but also found that structural modifications which would allow access to indoor and outdoor

environments enhanced the participation of children with CP. The main barriers to participation arising from the environment included: steps, lack of lifts or ramps and poor path surfacing which affected the use of ATDs (Lawlor et al, 2006).The finding that participation is enhanced by changes to the physical environment is further supported by the findings of Colver et al, 2012. An interesting finding of this research is that the environment of a child with CP which has an effect on participation is not only limited to the physical environment but also the attitudinal environment in which a child finds themselves.

2.5.3 Attitudes and Social Support

Social participation emphasises the importance of engagement in social situations and is seen as an important method in which children gather information and skills which they need to interact, play and live with other people (Piškur et al, 2012). As has already been discussed, the physical environment in which a child finds themselves is an important factor influencing participation, but a supportive social environment of parents, peers, teachers, communities and friends is also important (Khetani et al, 2013). The social environment consists of social groups and occupational forms (Hemmingson and Borell, 2002). Piškur et al, 2012 conducted a review of literature available to establish the actions, challenges and needs of parents with a child with a physical disability. The results of this review found that parents in particular play a very active role in facilitating the participation of their children through a number of strategies. Most notably, these strategies included: structuring the child's timetable to include time for meaningful activities, educating their children regarding how to cope with certain situations, educating school staff regarding their child's condition, modifying the child's environment or tasks to facilitate performance, networking with other parents and actively advocating for additional resources required by their child at the school. The study also examined the barriers which prevent parents of children with CP from being able to facilitate participation of their children. These included: the attitudes of others, insufficient system support, financial and time constraints and barriers in the physical environment. There has been a large amount of research to examine the health and well-being of caregivers of children with CP. Given that parents of children with CP play a significant role in facilitating participation, a decline in health and functioning of the caregiver would negatively affect this role. There is evidence to suggest that caregivers of children with disabilities exist in environments with multiple stressors, but often have very little support which leads to

caregiver strain and therefore affects their ability to facilitate participation of their children (Maul and Singer, 2009; Brehaut et al, 2004).

Research into the friendships and social relationships of children with CP in mainstream schools demonstrate that they have fewer reciprocated friendships, increased social isolation and victimization (Nadeu and Tessier; 2006). More favourable attitudes of family, friends and classmates has been shown to be associated with improved social participation (Colver et al, 2012). Therefore negative attitudes would result in decreased levels of social participation and has also been associated with poor academic performance (Lindsay and McPherson; 2011).

Strategies to facilitate social inclusion include the creation of awareness of disability as negative attitudes towards people with disabilities often arise from a lack of knowledge of disability (Lindsay and McPherson; 2011). Health professionals have a vital role to play in this regard. Other strategies suggested by Lindsay and McPherson, 2011 would be to build awareness of bullying and the development of a peer support network.

2.6 Gross Motor Function Classification System

The GMFCS was developed in response to the need to have a standardised system to measure the severity of CP (Morris and Bartlett, 2004). The GMFCS was first conceptualised using data collected from the GMFM and validated by Palisano et al (1997) using Delphi Survey methodology. The GMFCS provides a method of describing the functional abilities of children with CP in one of five levels:

I: Walks without restrictions; limitations in more advanced gross motor skills

II: Walks without assistive devices; limitations in walking outdoors and in the community

III: Walks with handheld assistive device; limitations in walking outdoors and in community

IV: Self-mobility with limitations; children are transported or use power mobility outdoors and in the community

V: Self-mobility is severely limited even with the use of assistive technology

Previously, the tool was only designed for children aged 2-4 years; 4-6 years and 6-12 years, however recently a 12-18 years band was added.

There is a high correlation between GMFCS level and GMFM (Rosenbaum et al, 2008; Morris and Bartlett, 2004;) which supports its construct validity. Construct validity was also supported using the Delphi Survey technique (Morris and Bartlett, 2004). The GMFCS has been shown to be valid and reliable (Oeffinger et al, 2004).

The tool can help families understand a child's current abilities and prognosis and plan for future equipment needs and types of intervention (Morris and Bartlett, 2004) as well as improve communication between families and professionals (Palisano et al, 2008). It was specifically developed for clinical research and is available in numerous languages. The GMFCS was selected for the current study as no formal assessment of the child was needed and the child could be classified based on the information gathered from the class teacher.

2.7 Outcome Measures used in Cerebral Palsy Research

There are many tools which measure functional performance of children with disabilities. Standardised assessment tools are useful in documenting change over a period of time (Majnemer and Snider, 2005).

The Assessment of Preschool Children's Participation (APCP) is a measure which can be used to assess activity participation of children aged two to five years and 11 months (Law et al, 2012). The APCP uses 45 drawings of everyday activities which are then used to ask parents and children about the nature and frequency of participation in various areas including: play, skill development, physical recreation and social activities. Initial validation data demonstrated that the internal consistency of the APCP is good to excellent for diversity of participation scores and moderate for intensity of participation scores (Law et al, 2012). The construct validity is also supported with medium to large effect sizes across activity types between children classified at different levels of the GMFCS. The APCP assesses participation of preschool children, however it does not assess activity performance.

The GMFM is a standardised observational instrument designed and validated to measure change in gross motor function over time in children with cerebral palsy (Russell et al, 2002). Two versions are available: GMFM-88 and GMFM-66**.** The original GMFM-88 is a criterion-referenced, observational measure designed to measure changes in gross motor function over time in children with CP (Josenby et al, 2009). The GMFM is designed to measure quantity of movement rather than quality. The GMFM-88 has five dimensions: lying and rolling, sitting, kneeling and crawling, standing and walking. The GMFM-66 was developed and validated by use of Rasch analysis to create a unidimensional motor ability score with interval-level measurement properties. The GMFM-66 estimates the difficulties of the items so that a child's total ability score can be easily related to the probability of attaining motor milestones (Hanna et al, 2008). GMFM-88 has been shown to be more sensitive than other scales such the Peabody Developmental Motor Scale to reflect changes of gross motor function in children with CP and meets the criteria for reliability and validity with respect to responsiveness to change. (Shi et al, 2006).

2.8 School Function Assessment

The SFA measures a student's performance of functional tasks that support his or her participation in both the academic and social aspects of school function (Davies et al, 2004). It was designed for use with children from kindergarten to grade 6. It is a standardized criterion referenced tool which was developed with a diverse population of children with and without disabilities in the United States of America (Coster et al, 1998).

The SFA consists of three parts: participation, task supports and activity performance. The participation component measures the level of participation in six school settings: general or special education classroom, playground, transportation to/from school, bathroom, transitions to/from class and mealtimes. The task support component assesses physical task support assistance and adaptions as well as cognitive/behavioural task support and adaptions. The activity performance component provides a measure of school-related tasks such as use of school materials, following school rules and the communication of needs (Davies et al, 2004). The SFA was developed on the basis of Rasch measurement model which yields an estimated order of difficulty of items in each scale.

Table 2.1 Overview of the SFA

Section	Content	Rating
Part I: Participation	Six settings: • Classroom • Playground/recess • Transportation • Bathroom/toileting • Transitions • Mealtime/snack time	Six point scale for each setting: 1 = Participation extremely limited 2= Participation in a few activities 3= Participation in all aspects with constant supervision 4=Participation in all aspects with occasional assistance 5= Modified full participation 6=Full participation
Part II: Task Supports	Two types of tasks: • Physical Tasks • Cognitive/Behavioural tasks Two types of supports for each task: • Assistance • Adaptations	Four point scale for each task: *Assistance:* 1= Extensive assistance 2=Moderate assistance 3=Minimal assistance 4=No assistance *Adaptations* 1=Extensive adaptations 2=Moderate adaptations 3=Minimal adaptations 4=No adaptations
Part III: Activity Performance	Two types of tasks: • Physical Tasks - Travel - Maintaining/Changing position - Recreational Movement - Manipulation with movement - Using Materials	Four point scale for each task: 1=Does not perform 2=Partial performance 3=Inconsistent performance 4=Consistent performance

	- Set-up and Cleanup - Eating and Drinking - Hygiene - Clothing management - Up/Down Stairs - Written Work - Computer and equipment use • Cognitive/Behavioural - Functional Communication - Memory and Understanding - Following Social Convention - Compliance with adult directives and school rules - Task Behaviour/Completion - Positive interaction - Behaviour regulation - Personal care awareness - Safety	

Each raw score total is converted to a criterion score. Criterion cut off scores are provided for each age group K-3 and 4-6. The criterion cut off score was developed from the performance of the regular school population (Coster et al, 1998). It was established that only five percent (5%) or fewer typically performing students would be expected to have scored below these cut off scores.

The SFA can be interpreted in two ways. In the basic level interpretation, the child's scores are compared to the criterion cut-off score for the age group to establish if the child is performing

at grade level. For more advanced interpretation, the child's scores can be plotted on item maps provided in appendix C of the SFA for each item (See Appendix V). Patterns of functional performance can then be identified and used to plan interventions.

This tool was selected as it was developed based on the ICF and enables the description of function among children with a variety of impairments who attend mainstream schools (Mancini and Coster, 2004). It provides a measure for a student's performance of functional tasks which is indicative of participation both socially and academically within the school environment. The SFA can therefore be used to identify areas of limitation and prioritize amongst areas in need of programme planning and assist in monitoring interventions to facilitate inclusion (Egilson and Traustadottir, 2009). The tool was designed for use with disabled learners and thus allows for the child to accomplish the given task using alternative methods or support (Davies et al, 2004). The tool has been shown to be valid and reliable (Coster, 1998 in Davies et al, 2004; Hwang et al, 2002).

Hwang et al, 2002 examined the validity of the SFA using the known-group method. Convergent and construct validity was supported. Davies et al, 2004 examined the reliability and the validity of the SFA and established that interrater reliability was moderate at .68-73. It was also shown that the SFA is sensitive to differences between groups. One criticism of the SFA is that it presents with a significant burden for the user in that it is very time consuming to administer (Sakzewski et al, 2007).

2.9 Conclusion

There has been extensive research examining the causes, risk factors and impairments associated with CP. More recently, the research has also begun to examine how children with CP are integrating and coping in society. Much of this research has been concentrated on examining how children with CP are able to participate in various activities. There are limited studies however with regards to inclusive education and how children with CP are functioning in mainstream schooling environments. In particular, there is a lack of research in developing countries. With inclusive education forming part of education plans for the future in many

countries, this opens many potential avenues for future research to examine and monitor the process of inclusive education.

CHAPTER 3: METHODS

In this chapter the methods used to conduct this research will be described. Demographic information will be presented first, followed by the assessment procedure.

3.1 Location

This study was conducted at various independent and public schools around the province of Gauteng, South Africa. Children with CP between four and 12 years were recruited. Physiotherapists, occupational therapists, speech and language therapists and paediatric neurologists were contacted to provide the details of parents of children with CP treated at their practices who were being educated in mainstream schools. These parents were then contacted to establish their willingness to be involved in the study.

3.2 Ethical Clearance

Prior to data collection commencement, ethical clearance was obtained from the Committee for Research on Human Subjects of the University of the Witwatersrand. Ethical Clearance Certificate Number: M091123. See appendix I.

3.3 Pilot study

Before commencing data collection, a pilot study was conducted using five typical students from the same schooling environments as the children with CP. Due to the fact that the SFA has not been used in the South African context, it was necessary to establish whether this tool was appropriate for use with South African children. The children recruited as typical students were identified by their class teacher as being children who fitted the following criteria:

3.3.1 Inclusion Criteria

- No known learning or behavioural problems
- Between the ages of four and 12 years
- Currently attending a mainstream school in Gauteng

3.3.2 Exclusion Criteria

- Other neurological conditions ie: traumatic brain injury, spina bifida

Informed consent (see Appendix II) had been obtained from the principal of the school, the parents of the children as well as assent from the child. The SFA was then completed by the researcher together with the class teacher.

3.3.3 Results of the Pilot Study

All five of the typical students came from the same schooling environments as the CP children. All five children achieved scores at or above the criterion cut-off score for their relevant age group. This suggests that the criterion cut-off score for each age group can be used as a measure of the CP child's performance as compared to typical students from within the same environment.

3.4 Study Sample

The data for 15 children with CP between the ages of four and 12 years was analysed. Informed consent was obtained from the parents and principal of the school prior to data collection. Child assent was also obtained (see Appendix II). The sample was a sample of convenience. Therapists and medical specialists were contacted in the area to establish whether they had any children currently in their practices who were attending a mainstream school. It is unknown how many children with CP are currently attending mainstream schools in Gauteng and every effort was made to locate as many children as possible.

3.4.1 Inclusion Criteria

- Diagnosis of CP.
- Between ages of four and 12 years.
- Currently attending a mainstream school in Gauteng.

3.4.2 Exclusion Criteria

- Other neurological conditions ie: traumatic brain injury, spina bifida
- Children with CP in remedial schools or schools catering specifically for learning or physical disabilities.

3.5 The study population

The data of 15 children with CP between the ages of four and 12 years attending a mainstream school in Gauteng who matched the inclusion and exclusion criteria was analysed. Due to the fact children with CP are a heterogenous group with a variety of clinical presentations the GMFCS (see Appendix VI) was administered to determine the level of impairment.

3.6 Assessment Tools

3.6.1 School Function Assessment

This tool was chosen as it can be used to measure a student's performance of functional tasks that support his or her participation in academic and social aspects of school function (Davies et al, 2004). All the scales in the SFA were developed using the Rasch Item Response Theory Methodology. The SFA has been shown to have content and construct validity (x^2=9.28 to 20.55, $p<0.01$), internal consistency and coherence of the scales, test-retest reliability ($r>0.09$) and inter-rater reliability ($r>0.63$) (Schenker et al, 2007). The SFA can be used to assess school function from kindergarten to grade 6.

3.6.2 The Gross Motor Function Classification System

Due to the fact that children with CP are a heterogenous group with a diverse range of clinical presentations, the level of impairment was established using the GMFCS. The GMFCS has been successfully used for research purposes. This system classifies children with CP based on functional abilities and limitations as laid out by the World Health Organisation (McDowell, 2007). The validity and reliability of the tool is well established (Wood and Rosenbaum, 2000 in Oeffinger et al, 2007; Oeffinger et al,

2004; Morris and Bartlett, 2004). The GMFCS can be used to classify children with CP between the ages of two and 18.

3.7 Procedure

The children with CP in mainstream schools were identified by their treating physiotherapists, occupational therapists, speech therapists or paediatric neurologists. The parents were asked by the treating professional if they would like their child to be involved in the study. The contact details of the parent were then given to the researcher. The researcher contacted the parent telephonically and explained the nature of the study. An information sheet (Appendix II) was then faxed or e-mailed to the parent as well as an informed consent document (Appendix II). This was completed and returned. The relevant school authorities were then contacted telephonically. In each case, the nature of the study was again explained and a date for collection of data was established. On the date of the data collection, a meeting was first held with each principal and the principal was also given an information sheet as well as permission to conduct research document (Appendix II) which was signed and stamped. The researcher then met with the class teacher in the child's classroom to complete the SFA. This also allowed the researcher to observe the child in certain tasks if the scoring of a particular task was questioned. The child was introduced to the researcher and it was explained that the researcher was going to be speaking to his or her teacher about how he or she was doing in class. A child assent document (Appendix II) was then signed. Upon completion of the SFA, the researcher again met with the principal of the school to provide feedback regarding the SFA and to make suggestions where possible to facilitate changes in the school environment. The parents of the child were also contacted and provided with feedback regarding the outcome of the SFA.

Each child with CP was also classified according to the GMFCS by the researcher. This classification was done in consultation with the referring therapist or specialist who worked with the child and confirmed by the researcher by child's functional status as defined by the SFA and by direct observation of the child in the classroom and on the

playground. This classification was related to performance as assessed by the researcher using the SFA.

3.8 Data Analysis

Due to the small sample size, descriptive statistics were used to summarize the data. The composition of the sample will be described in terms of age, sex, CP classification and GMFCS level.

The data collected was then analysed as follows: The raw score for each scale was calculated. For Part I Participation the raw score consisted of the student's participation in 6 settings. Part II Task Supports raw scores were calculated for each of the four task support scales: physical tasks-assistance, physical tasks-adaptations, cognitive/behavioural tasks- assistance, cognitive/behavioural tasks- adaptations. Six other task support areas were also included as applicable to their school situation and this information was used for additional descriptive purposes. These optional items are up/down stairs- assistance, up/down- adaptations, written work- assistance, written work- adaptations, computer and equipment use- assistance and computer and equipment use- adaptations. Part III consists of 12 scales grouped under Physical Activity Performance and 9 scales grouped under Cognitive/Behavioural Performance. The total raw score was then transferred to the Summary Score Form.

Each raw score was then converted to a criterion score using the appropriate table in Appendix B of the SFA (Coster et al, 1998) (Example of which can be seen in Appendix IV). A standard error value for each criterion score was also obtained from the same table.

A graphic representation of each student's performance was plotted using the criterion score on the profile graph of the summary score form.

The children were separated into two groups grades K-3 and grades 4-5 as the tool provides criterion cut-off scores for each scale according these defined groups and the data can therefore be analysed accordingly. These cut-off scores were derived from frequency analysis of a sample of typical students in mainstream education upon development of the tool (Coster et al, 1998). Using these scores, it has been proven

that 95 percent of typical students would attain this score or better. In this way the mean and standard deviations calculated for study group could then be described in relation to the test norms.

Due to the small sample size, non parametric Pearson Correlation statistics were used to compare if there was a correlation between GMFCS level and participation.

For those items in the tool where the student did not perform at age expected values a more detailed analysis was conducted to obtain a more detailed understanding of the child's functional performance as follows:

- Confidence intervals were calculated by either adding or subtracting 1.96 times the standard error from the criterion score. These were then plotted on Item Maps provided for each scale from appendix C of the SFA (See Appendix V). In this way unexpected trends in performance could be noted and analysed.

CHAPTER 4: RESULTS

In chapter four, the results of the study will be presented. The data from 15 subjects was analysed.

4.1 Chronological Age and Sex

Chronological age ranged from 50 to 127 months. The mean age being 92 months (SD 25.32).

There were six male subjects and nine female subjects. In table 4.1 the demographic information of the subjects is presented.

Table 4.1: Sample study composition

	Age (months)	Gender	CP Classification	Grade	GMFCS
1	79	Male	Ataxia	K-3	II
2	77	Female	Hemiplegia	K-3	I
3	74	Female	Hemiplegia	K-3	I
4	125	Female	Diplegia	K-3	III
5	52	Female	Diplegia	K-3	I
6	71	Male	Hemiplegia	K-3	I
7	87	Female	Ataxia	K-3	I
8	102	Male	Hemiplegia	K-3	I
9	104	Female	Ataxia	K-3	III
10	112	Male	Diplegia	K-3	I
11	82	Male	Quadriplegia	K-3	III
12	50	Female	Hemiplegia	K-3	I
13	115	Male	Hemiplegia	K-3	I
14	121	Female	Diplegia	4-6	III
15	127	Female	Diplegia	4-6	III

4.2 Gross Motor Function Classification System

The GMFCS was used to obtain information regarding the severity of CP as well as to describe the relative functional abilities of the child (Morris and Bartlett, 2004).

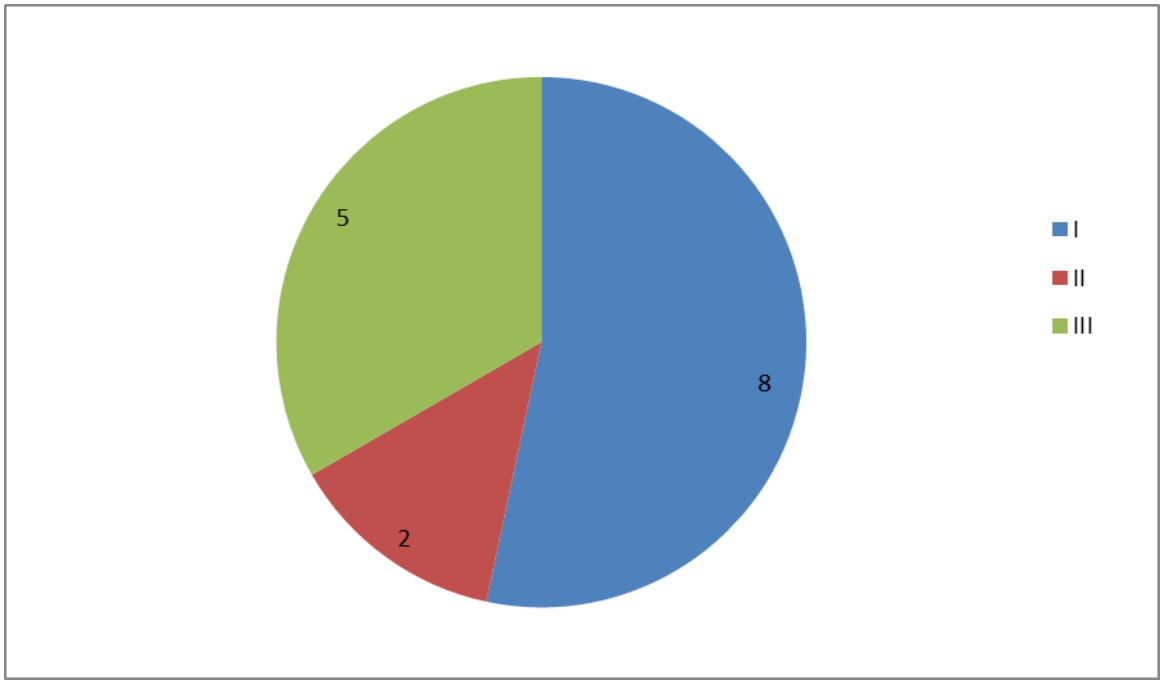

Figure 4.1 Number of children at each GMFCS level

Figure 4.1 shows the distribution of children with regards to GMFCS level. The sample was made up predominantly of children classified as being GMFCS level I. Eight children were classified as being GMFCS level I. Two children were classified as GMFCS level II. Five children were classified as GMFCS level III. There were no children classified as GMFCS level IV or V in this sample.

4.3 Classification of Cerebral Palsy

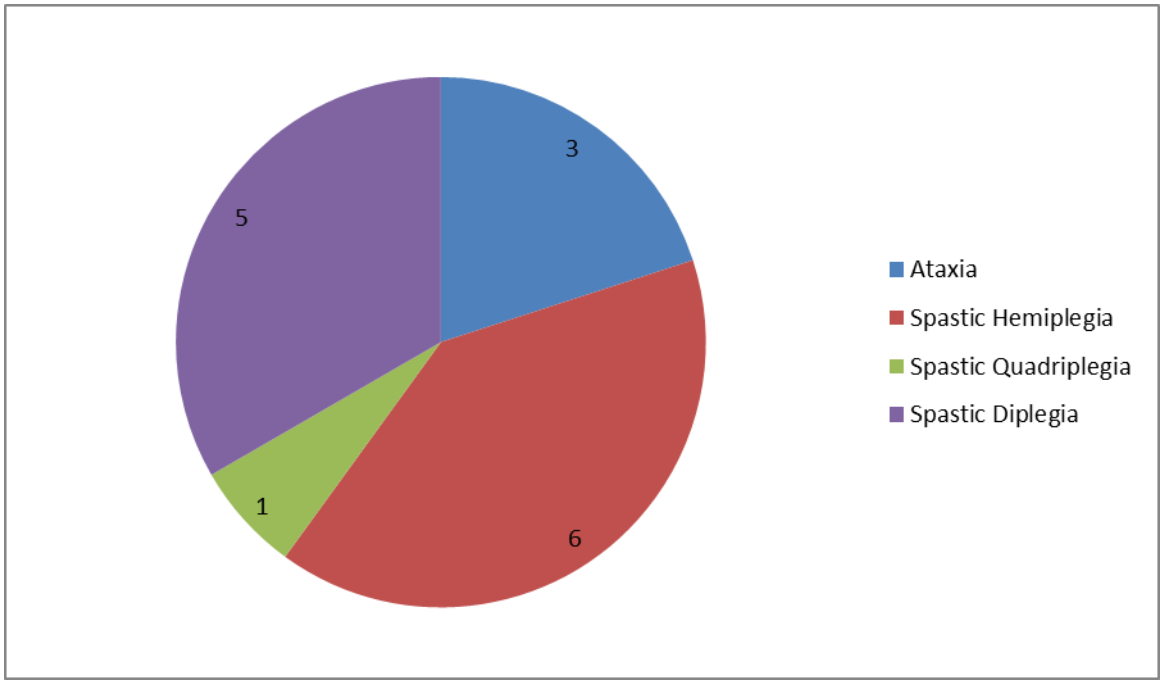

Figure 4.2 Distribution of CP Classification

In this sample, six children were classified as spastic hemiplegics with one side of the body being affected. Five children were classified as spastic diplegics with the lower limbs more affected than the upper limbs. Three children were classified as ataxic with deficits in co-ordination of motor function. One child was classified as a spastic quadriplegic.

4.4 School Function Assessment

The SFA was used to determine the student's performance of functional tasks and activities that support his or her participation in school. For the purpose of presenting the results of the SFA the tool will be divided into the three components of the tool: Participation, Task Supports and Activity Performance.

4.4.1 Participation

This section of the results documents the scores obtained for Part I Participation of the SFA. This score is used to examine the student's level of participation in six major school activity settings: regular or special education classroom, playground or recess, transportation to and from school, bathroom and toileting activities, transitions to and from class, and mealtime or snack time.

Figure 4.3 demonstrates the participation of the children with CP in the regular classroom and five settings.

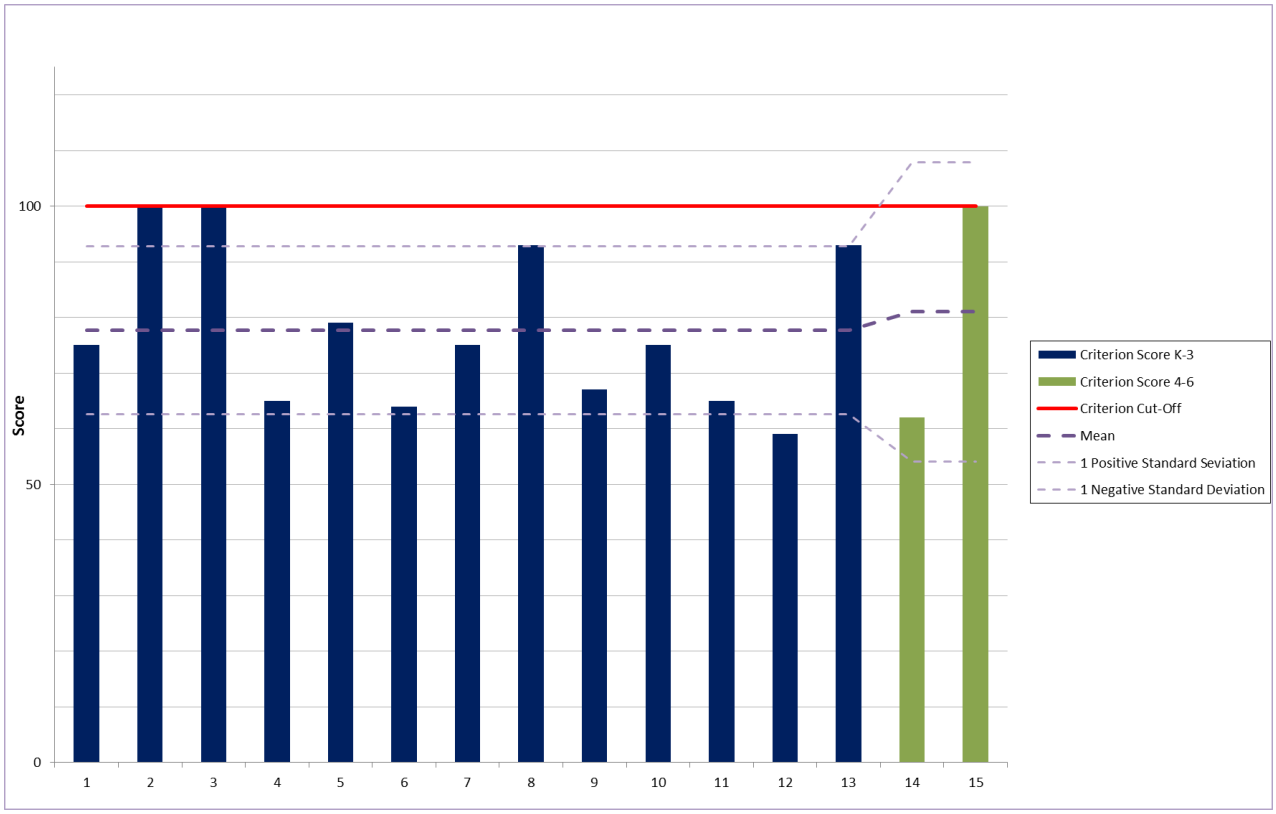

Figure 4.3 Part I Participation: Regular Classroom + 5 Settings

The raw total score was converted to a criterion score using the appropriate table in Appendix B in the SFA (Coster et al, 1998). The criterion cut off score for the grade K-3 group and the grade 4-6 group was 100 with a standard deviation of 13.

The mean score for the grade K-3 group was 78 with a standard deviation of 15.12 and the mean score for the grade 4-6 group was 81 with a standard deviation of 26.87.

As is demonstrated in Figure 4.3, only three of the children obtained the criterion cut off score. This suggests that the majority of the sample is not participating fully in all aspects of the Regular Classroom + 5 Settings.

4.4.2 Task Supports

This section of the SFA examines the supports provided to the student during school related activities which are necessary for the child to participate fully within the school environment. Two types of task supports are examined, Physical Tasks and Cognitive/Behavioural Tasks. The two types of supports which are examined are:

- the extent to which the student's performance is supported by adult assistance
- the extent to which the student's performance is supported such as which specialized equipment or adapted materials.

The Physical Tasks – Assistance component of Task Supports measures the amount of adult assistance required by the children in the following areas: travel, maintaining and changing position, recreational movement, manipulation with movement, using materials, setup and clean up, eating and drinking, hygiene and clothing management. The results of this component are demonstrated in Figure 4.4.

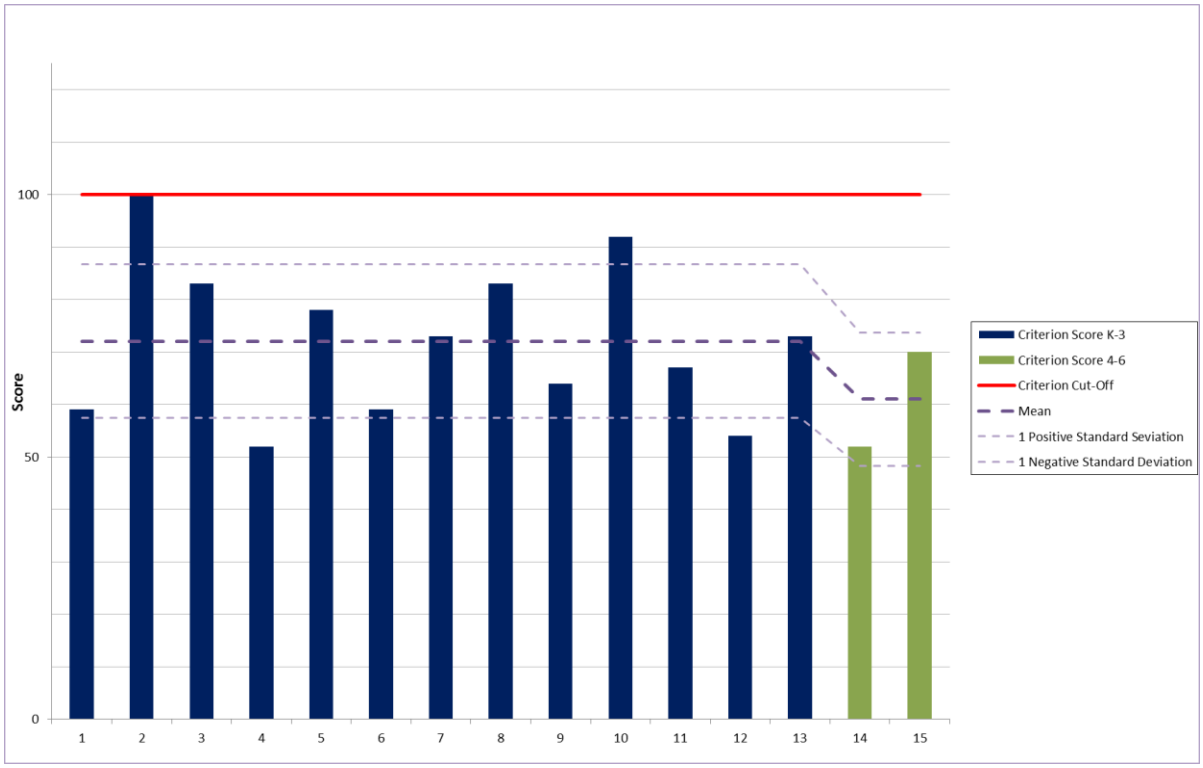

Figure 4.4 Part II Physical Tasks – Assistance

The raw score was converted to a criterion score using Appendix B of the SFA. The criterion cut off score for the grade K-3 and grade 4-6 was 100 with a standard deviation of 6.

As can be seen in Figure 4.4, the mean score for the grade K-3 group was 72 with a standard deviation of 14.61 and the mean score for the grade 4-6 group was 61 with a standard deviation of 12.73. The mean scores for both groups were significantly below the criterion cut off score for their respective age groups. Only one student achieved the criterion cut off score. This suggests that the 14 of the 15 children required more adult assistance to perform school related tasks.

The Physical Tasks – Adaptations component of the SFA measures the extent of adaptations required by the children in the following areas: travel, maintaining and changing position, recreational movement, manipulation with movement, using materials, setup and clean up,

eating and drinking, hygiene and clothing management. The results of this component of the SFA are shown in Figure 4.5.

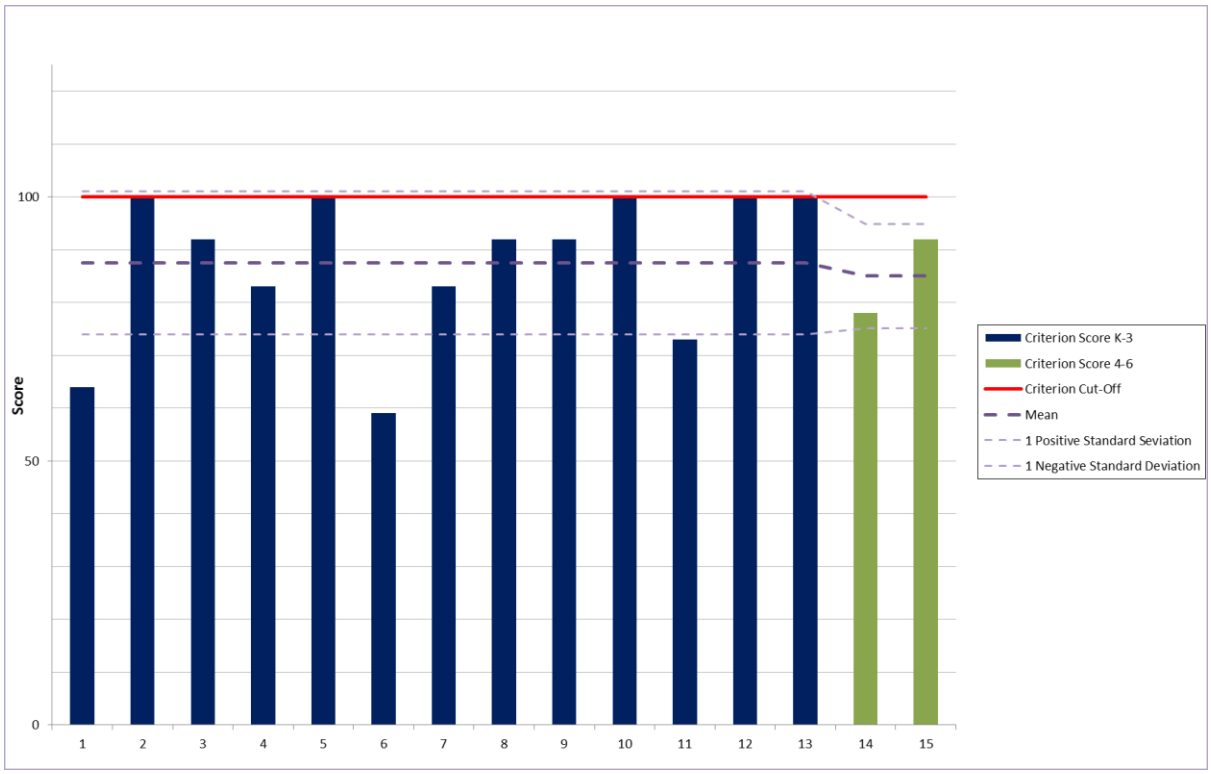

Figure 4.5 Part II Physical Tasks – Adaptations

The raw score was converted to a criterion score using Appendix B of the SFA. The criterion cut off score for grade K-3 and grade 4-6 was 100 with a standard deviation of 11.

As can be seen in Figure 4.5, the mean score for the grade K-3 group was 88 with a standard deviation of 13.54 and the mean score for the grade 4-6 group was 85 with a standard deviation of 9.90. The mean scores for both groups are significantly below the criterion cut off score for their respective age groups. However, in comparison to the assistance component of this section, five students achieved the criterion cut off score. This finding will be discussed in chapter five.

The Cognitive/Behavioural Task-Assistance component of the SFA measures the amount of assistance required by children in the following areas: functional communication, memory and understanding, following social conventions, compliance with adult directives and school

rules, task behaviour/completion, positive interaction, behaviour regulation, personal care awareness and safety. The results of this component are demonstrated in Figure 4.6.

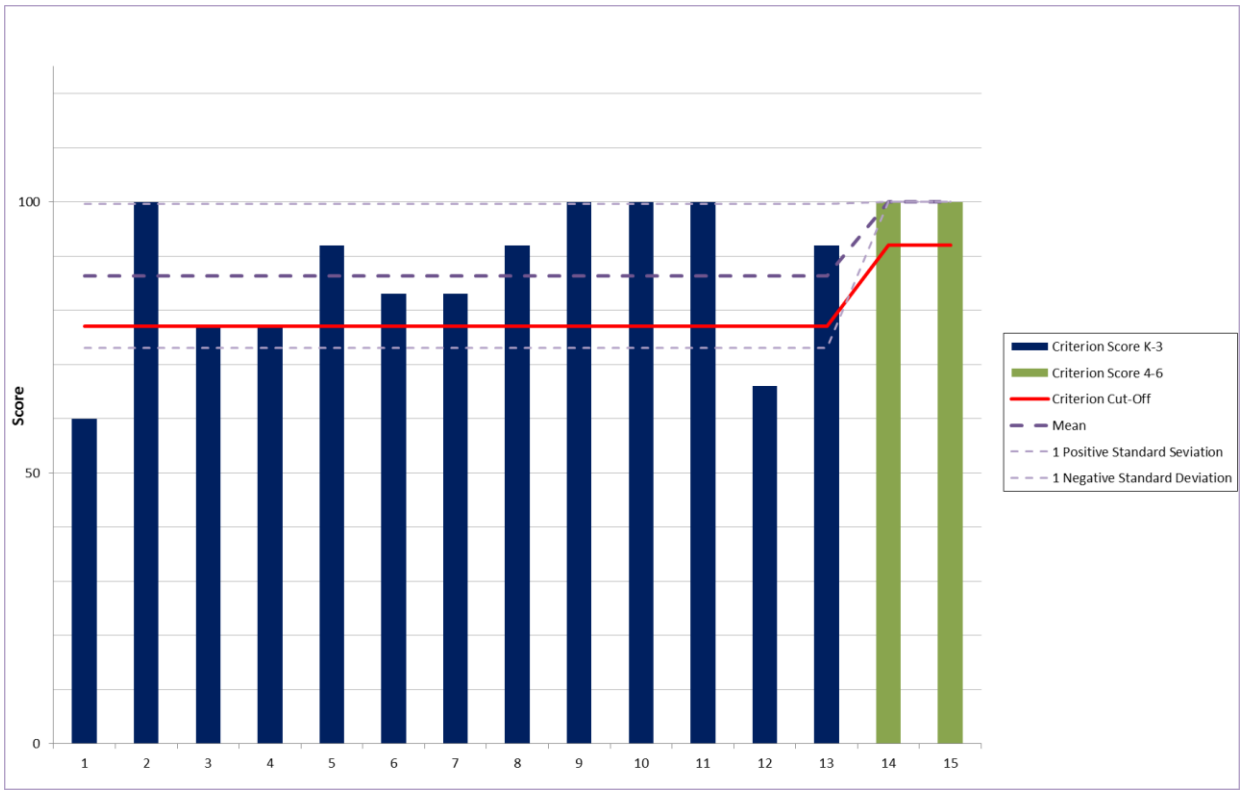

Figure 4.6 Part II Cognitive Behavioural Tasks - Assistance

The raw score was converted to a criterion score using Appendix B of the SFA. The criterion cut off score for the grade K-3 group was 77 and for the grade 4-6 group was 92 with a standard deviation of 16.

As can be seen in Figure 4.6, the mean score for the grade K-3 group was 86 with a standard deviation of 13.29 and the mean score for the grade 4-6 group was 100 with a standard deviation of 0. The mean scores for both groups are well above the criterion cut off scores. This suggests that both groups were performing well above their typically functioning peers and required less adult assistance for cognitive behavioural tasks.

The Cognitive/Behavioural Task Support component of the SFA measures the extent of adaptations required by children in the following areas of cognitive function: functional

communication, memory and understanding, following social conventions, compliance with adult directives and school rules, task behaviour/completion, positive interaction, behaviour regulation, personal care awareness and safety. The results of this component of the SFA are shown in Figure 4.7.

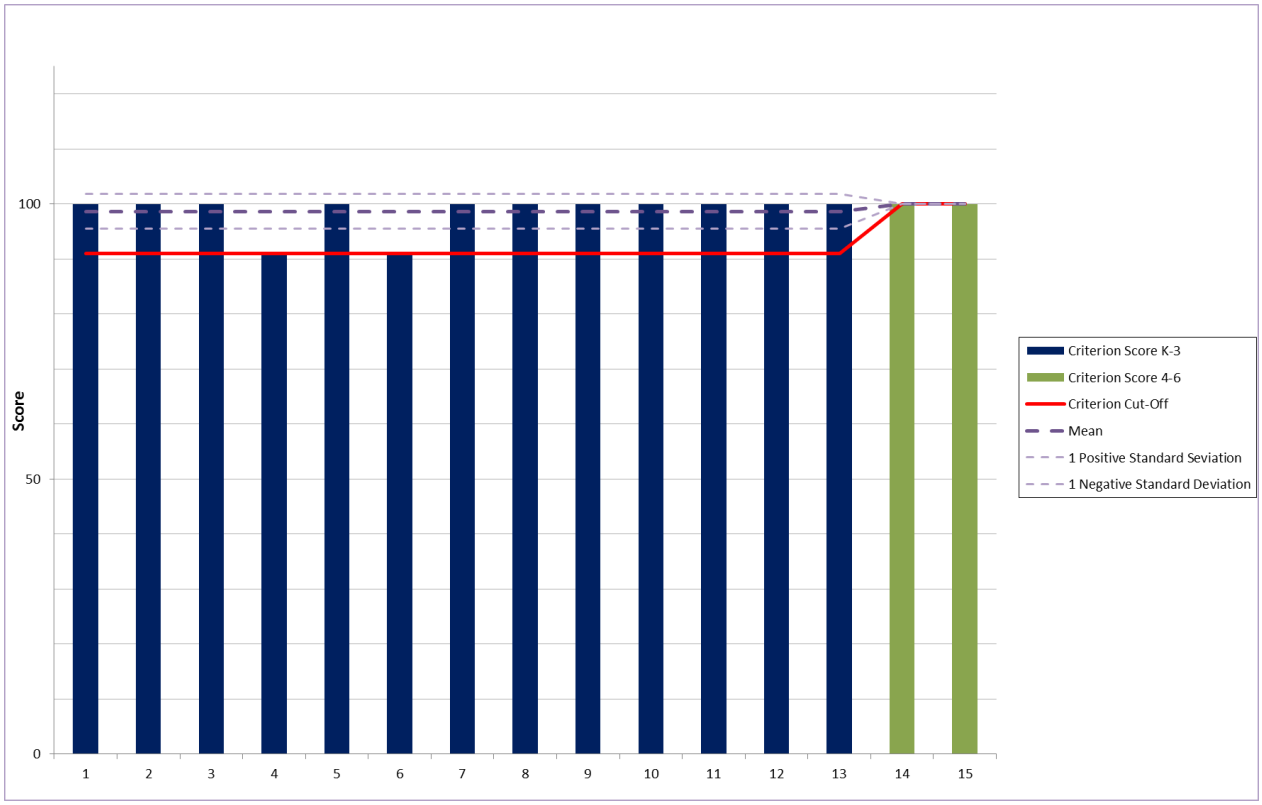

Figure 4.7 Part II Cognitive Behavioural Tasks – Adaptations

The raw score was converted to a criterion score using Appendix B of the SFA. The criterion cut off score for the grade K-3 group was 91 and for the grade 4-6 group was 100 with a standard deviation of 17.

The mean score for the grade K-3 group was 99 with a standard deviation of 3.17 and the mean score for the grade 4-6 group was 100 with a standard deviation of 0. The mean scores for both groups are well above the criterion cut off scores. This suggests that both groups were performing well above their typically functioning peers and required little adaptations to perform tasks when compared to typical students.

4.4.3 Part III Activity Performance

This section of the SFA is used to determine the student's ability to initiate and complete functional activities within the school environment.

Activity Performance is further divided into physical and cognitive/behavioural tasks. Due to the fact that this section consists of specific functional tasks, the mean score of the respective groups will be compared to the criterion cut off scores.

The Activity Performance –Physical Tasks component of the SFA comprised of the following tasks: travel, maintaining and changing position, recreational movement, manipulation with movement, using materials, set up and clean up, eating and drinking, hygiene and clothing management. Optional tasks which were only scored if the child was routinely required to perform the activity were: up/down stairs, written work and computer and equipment use.

The Activity Performance – Cognitive/Behavioural component of the SFA comprised of the following tasks: functional communication, memory and understanding, following social conventions, compliance with adult directives and school rules, task behaviour/completion, positive interaction, behaviour regulation, personal care awareness and safety.

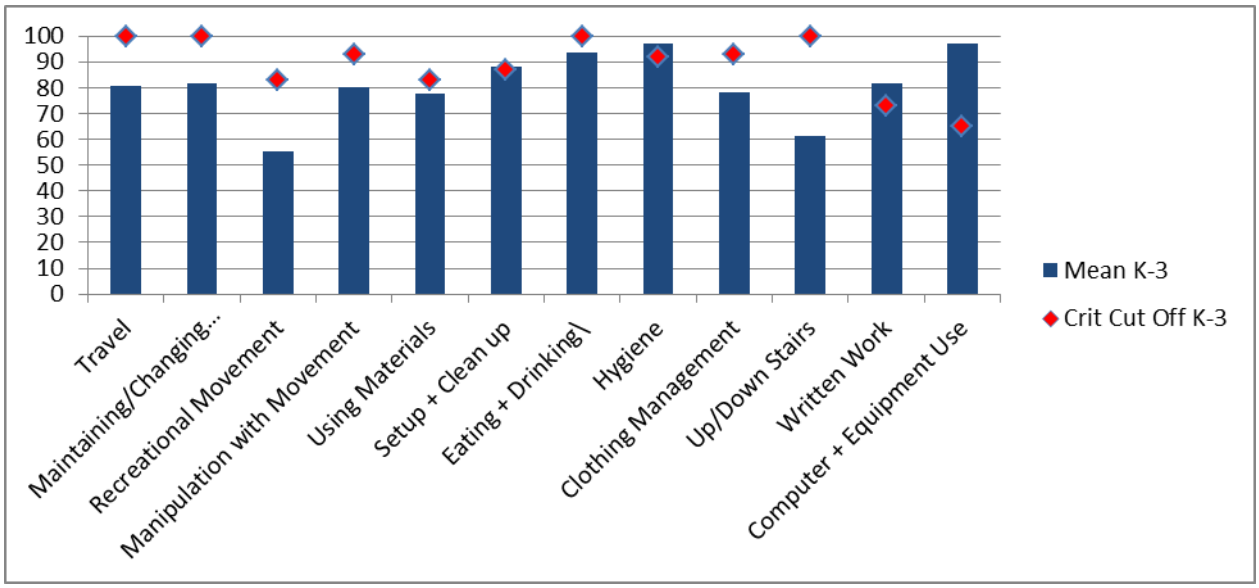

Figure 4.8 Part III Activity Performance: Physical Tasks K-3

Figure 4.8 shows the mean criterion scores for the grades K-3. Generally, the children achieve scores significantly below that of children their age in all areas except written work and computer and equipment use.

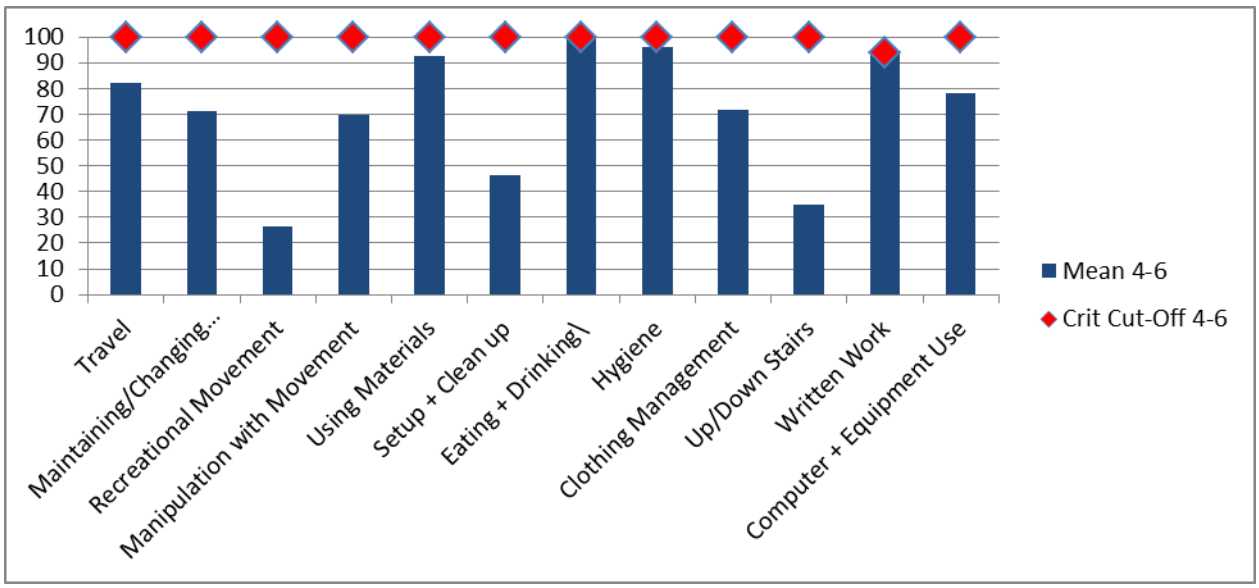

Figure 4.9 Part III Activity Performance: Physical Tasks 4-6

Figure 4.9 shows the mean criterion scores for the physical task component of Activity Performance grades 4-6. Once again, as in the K-3 group, the children score below that expected for their respective age in the majority of tasks.

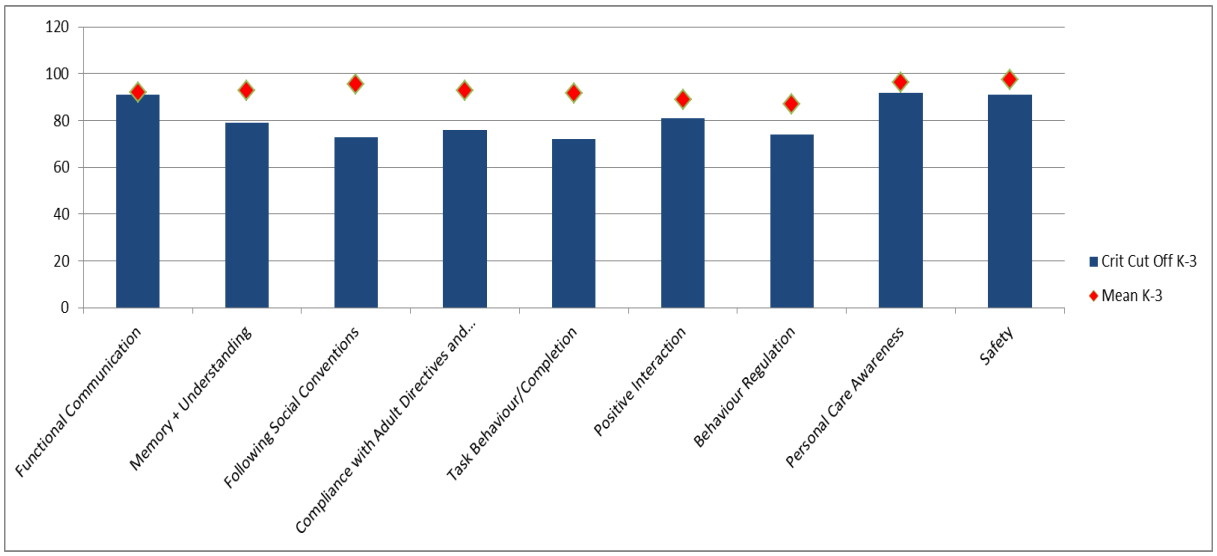

Figure 4.10 Part III Activity Performance: Cognitive/ Behavioural Tasks K-3

Figure 4.10 shows the mean criterion scores for the cognitive /behavioural component of Activity Performance for the grades K-3. The mean scores of each cognitive behavioural task are with the exception of functional communication below the criterion cut off score. This means that the children are performing below that expected for their age.

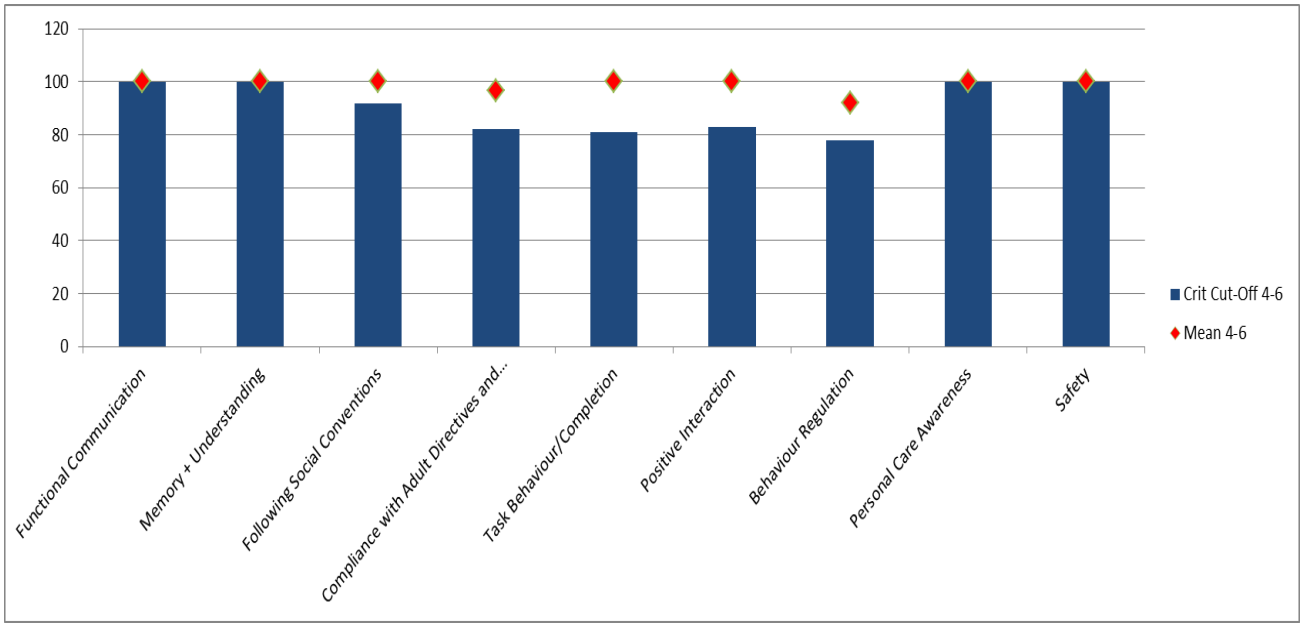

Figure 4.11 Part III Activity Performance Cognitive/ Behavioural Tasks 4-6

Figure 4.11 shows the mean criterion scores for the cognitive/ behavioural component of Activity Performance for grades 4-6. The children performed at age appropriate level for functional communication, memory and understanding, personal care awareness and safety. They performed significantly below that expected for their age in the tasks: following social conventions, compliance with adult directives and school rules, task behaviour/completion, positive interaction and behaviour regulation.

4.5 GMFCS compared to SFA scores

The results of the SFA were then analysed according to the GMFCS. It was expected that children classified as being less severely affected physically would achieve higher scores according to the SFA.

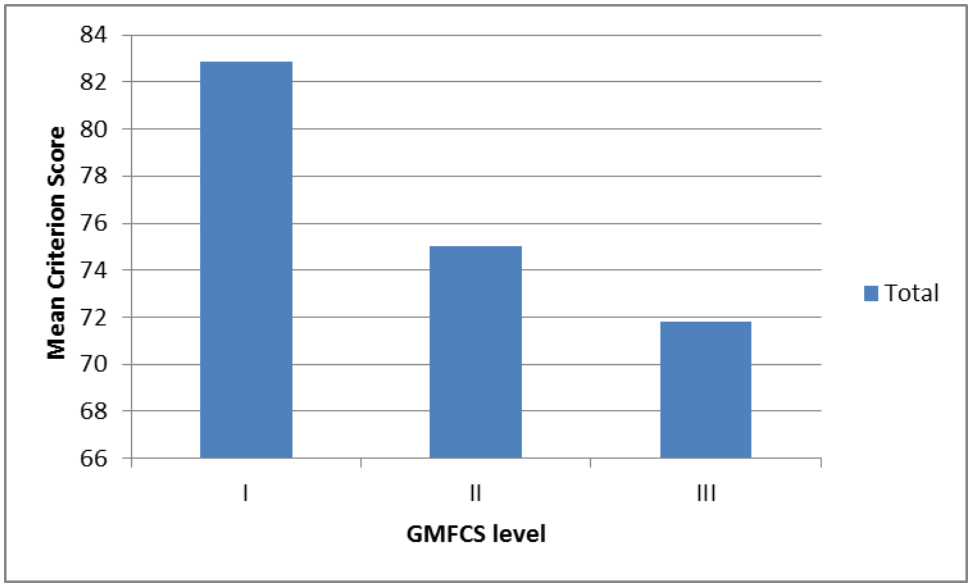

Figure 4.12 Part I Participation mean criterion score compared to GMFCS level

As can be seen in Figure 4.12, children less severely affected as classified using the GMFCS were able to participate more fully in the school environment. Children more severely affected scored lower on participation.

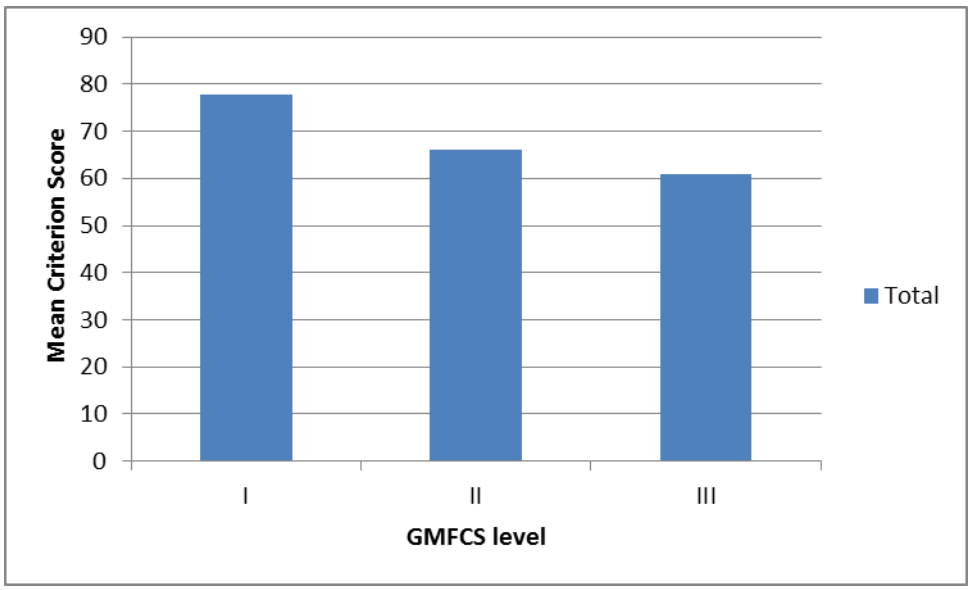

Figure 4.13 Part II Physical Tasks Assistance mean criterion score compared to GMFCS level.

As can be seen in Figure 4.13, children classified as GMFCS I required less assistance than children classified as GMFCS II and III.

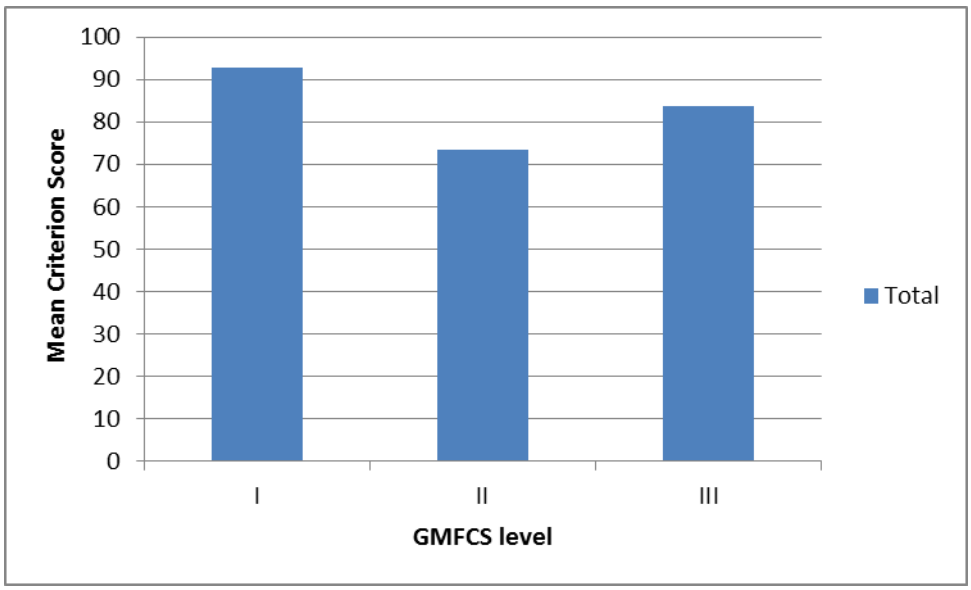

Figure 4.14 Part II Physical Tasks Adaptations mean criterion score compared to GMFCS level.

As can be seen in Figure 4.14, -children classified as being GMFCS I made use of the least amount of physical adaptations. An unexpected trend in this particular sample was that the GMFCS III group made use of fewer adaptations than the GMFCS II group. This trend will be discussed further in chapter five.

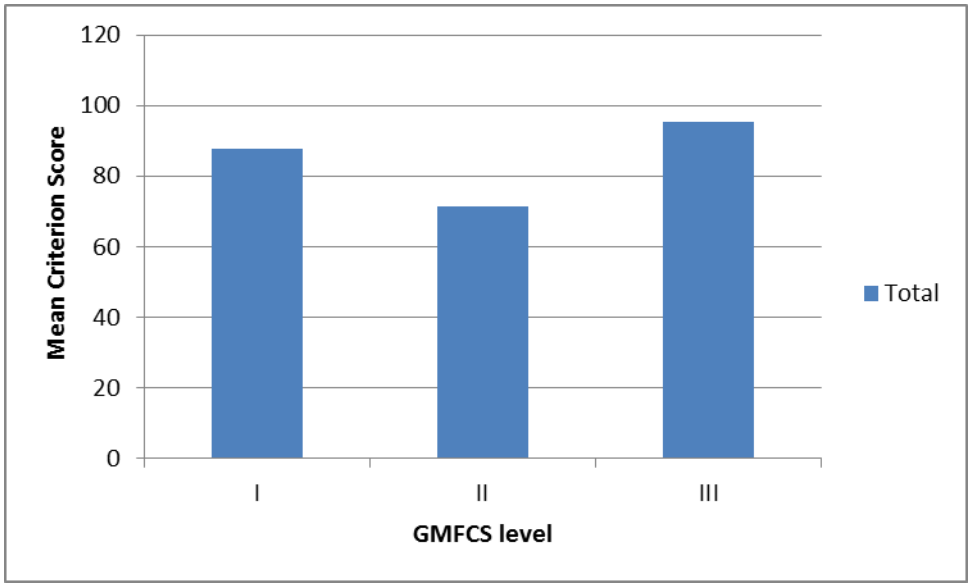

Figure 4.15 Part II Cognitive/Behavioural Tasks Assistance mean criterion score compared to GMFCS level

Figure 4.15 demonstrates that the group classified as GMFCS III required the least amount of assistance when performing cognitive behavioural tasks. This will be discussed in further detail in chapter five.

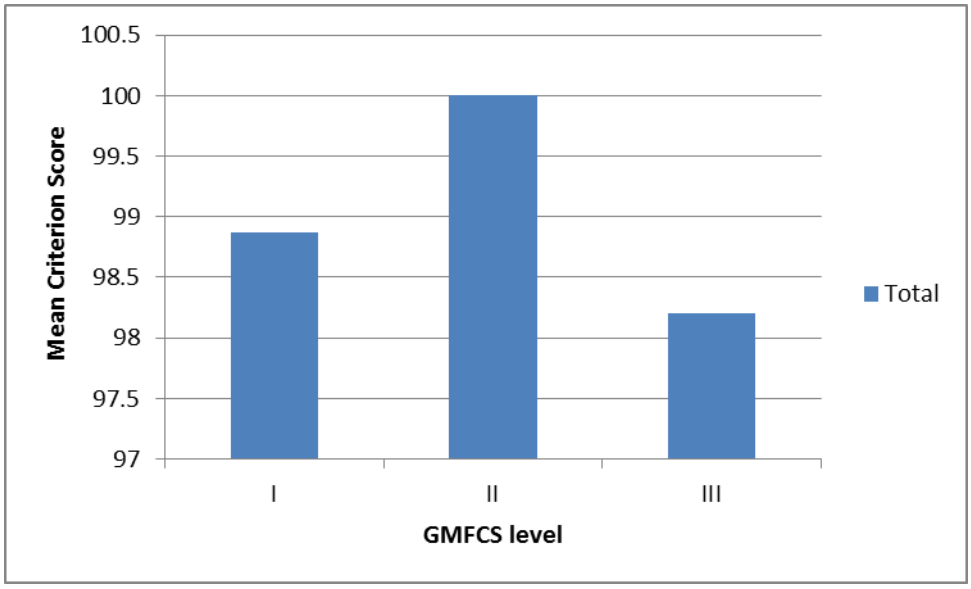

Figure 4.16 Part II Cognitive/Behavioural Task Adaptations compared to GMFCS level.

Figure 4.16 demonstrates that children classified as being GMFCS II made use of fewer adaptations when compared to the less physically impaired group, GMFCS I. Once again, this is an expected as one would have expected the more physically impaired group to make use of more adaptations. This will be discussed more fully in chapter five.

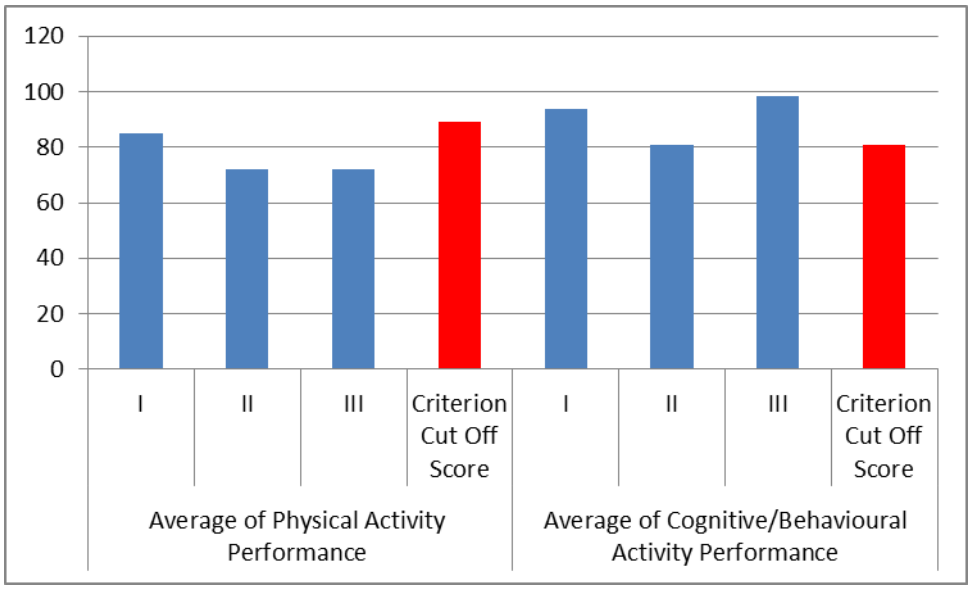

Figure 4.17 Part III Activity Performance K-3 compared to GMFCS level.

Figure 4.17 demonstrates the activity performance of the K-3 group compared to the GMFCS level. For this analysis, the K-3 group were separated according to their GMFCS classification. An average score was calculated using all the Physical Activity Performance and Cognitive/ Behavioural Activity Performance items for each GMFCS level. As can be seen in Figure 4.17 with regard to Physical Activity Performance, GMFCS I scored the highest score which suggests that this group more consistently completed the tasks than those of GMFCS II or III. There was very little difference between GMFCS II and III. However all the groups scored lower than the average criterion cut off score for their age group.

With regards to cognitive/behavioural activity performance, it can be seen that all the groups were performing at or above the criterion cut off score for their age group. This is in keeping with the other findings that the children in this study appear to be functioning well at a cognitive level.

4.6 Conclusion

These results show that children with CP generally performed below typical students of their age as assessed by the SFA. In addition, children with more severe gross motor impairment as assessed by the GMFCS scored lower on the SFA than less severely affected children.

Generally, children with CP performed at the level of their peers in cognitive/behavioural tasks. The children with CP performed below the level of their peers with regard to physical tasks.

CHAPTER 5: DISCUSSION

In this chapter, the results obtained in this study will be discussed. The results will be compared to those recorded in previous studies. The implications and limitations of this study will be highlighted and recommendations for future research and practice will be made.

5.1 Sample composition

5.1.1 Age and Sex

The majority of the subjects in this study were female (n=9). The age range of the subjects in this study was 50 to 127 months. The mean age being 92 months (SD 25.32). The SFA was designed for use with children in Kindergarten to Grade 6. This mean age is slightly below that of similar studies conducted. Other studies conducted by Schenker et al, 2006 and Schenker et al, 2005 found the mean age of the sample to be 115 months and 118.82 months respectively. The mean age of the current sample was also lower due to the decreased number of children recruited to the grade 4-6 group. The majority of the children were from the grade K-3 group.

The higher number of children in the grade K-3 group could be due to the fact that the sample size was small. A more likely explanation however is that the academic demands placed on children in the younger school grades is far less than in the higher grades. A child with CP is therefore more likely to integrate into the mainstream schooling environment in these early years. While there is no definitive research to support this theory, in the South African context it appears that as the academic demands increase, the children are less likely to cope and may seek alternative schooling options. Kerr at al, 2011 conducted a study using a representative sample of 184 children with CP with a mean age of 10 years 9 months. Data was collected on two occasions with an interval of 1 year 7 months between. On each occasion the following tools were used: GMFCS, GMFM, Paediatric Evaluation of Disability Inventory (PEDI) and the Lifestyle Assessment Questionaire-Cerebral Palsy (LAQ-CP). Energy efficacy during gait was assessed using oxygen cost calculations. The results of the study indicated that gait is most inefficient at age 12 while other gross motor tasks decline after the age of 13. The researchers related these changes to an imbalance between physiological capacity and environmental demands. The researchers suggested that these environmental

demands may include changes in academic demands placed on the children as they became older and in particular changes in the school set up which required that the children change classes more often and were often required to move around more frequently on larger school grounds. This study also noted that the regression of motor abilities was more evident in children classified as being GMFCS level II-IV. The findings of Hemmingson and Borell, 2002 also suggest that older students experienced more barriers to learning than younger students as a result of the way in which the school was organised for older children.

Another likely reason that there was such a small number of children in the grade 4-6 group may be that because inclusive education is a relatively new concept in South Africa, older children with CP may already have been placed in specialised schools. Parents may be reluctant to relocate their children to mainstream schools later on in their education.

In the current study it is useful to analyse the scores of a participant in the study which illustrates the point that as academic demands increase, children with CP find it more difficult to keep up with the demands the environment places on them. Participant Four was 10 years and 4 months at the time of data collection and was classified as being GMFCS level III. The participant mobilised using a K-walker independently. This participant scored below the criterion cut off score appropriate for the relevant age group in the majority of the components of the SFA, most notably: Participation, Physical Task Supports and Physical Task Performance. Particular areas of concern raised by the class teacher were transitions between classes. It was noted that while this pupil had previously been coping academically in the younger grades, school performance had deteriorated as the pupil had progressed from kindergarten. While in the lower grades the pupil had not been required to move large distances around the school grounds, the year in discussion however, required movements between classes frequently during the day. As a result, the pupil was frequently late for class which was having a negative effect on school function. In addition, this pupil's fine motor function was increasingly having a negative effect on academic performance as she was now expected to write more frequently as part of her academic programme. While in the lower grades where writing demands were far less, this pupil had not struggled as obviously with academic work, but as she progressed through the grades, this began to be a problem.

5.1.2 Cerebral Palsy and Gross Motor Function Classification System

The most common CP classification of the children in this study was spastic hemiplegia classified as GMFCS level I. The children in this study were unequally distributed between the levels of the GMFCS. In this sample % were classified as being GMFCS level I, % were classified as being GMFCS level II and % were classified as being GMFCS level III. There were no children classified as being GMFCS level IV or V.

Other studies involving CP children in mainstream schooling environments have found similar results. Generally, children being integrated into mainstream schooling environments tend to be less severely physically affected. Schenker et al, 2006 found that the children in fully included classrooms comprised mainly of children with spastic hemiplegia and diplegia and were classified as being GMFCS level II. This study also investigated another group of children with CP in self-contained classes with some degree of mainstreaming, but who were provided with a lot more support. This group was comprised mainly of children classified as being GMFCS level III or IV. While the current study was mainly comprised of children classified as GMFCS level I, similarities between the composition of the sample groups in the two studies can be seen. Generally, children who are less severely affected physically tend to be integrated more easily into mainstream schooling environments. This is supported by the findings of Beckung and Hagberg, 2002 who found that the GMFCS as well as the BFMF were statistically highly correlated with additional neuroimpairments, learning disability, epilepsy and impaired vision as well as restrictions in participation ($p<0.001$). Thus, as the severity of motor impairment as classified by the GMFCS and BFMF increased the child was more likely to present with additional impairments which would affect school performance. These findings are further supported by the findings of Dalvand et al, 2012 and Himmelmann et al, 2006,who found that the level of physical impairment as defined by the GMFCS was strongly correlated to the presence of learning disability ($p<0.1$).

The sample size of this study was small, but it is clear from the composition of the sample that a similar trend is present. The majority of the children in this study in a mainstream schooling environment were children classified as GMFCS level I. This is most likely due to the fact, as previous research supports, that these children are less physically affected as well as likely to present with additional impairments which would affect their integration into a mainstream

classroom environment. The increased number of children at level III in this study is most likely due to the small sample size. The sample was not a random sample, but rather a sample of convenience. The absence of children classified as being GMFCS level IV or V is most likely due to the fact that inclusive education in South Africa is still in the early stages of implementation and children who lack some kind of independent mobility or who are more severely disabled would generally attend a more specialized school for children with physical disabilities. In addition, accessibility to school buildings as well as nursing care would also mean that children with more complex physical and medical needs would not be able to attend mainstream schools.

5.2 Effects of Cerebral Palsy on School Function.

5.2.1 Effects of Cerebral Palsy on School Participation

It was shown in this study that children with CP demonstrate reduced levels of participation. The Kindergarten to grade 3 group (K-3) had a mean participation criterion score of 78 (±15.12) while the grade 4-6 group (4-6) had a mean participation criterion score of 81 (±26.87). In both cases the criterion cut off score was 100. Therefore children in both groups demonstrated reduced levels of participation in the school environment when compared with typical students of their age. Using Pearson Correlation a mild negative correlation (r= -0.33) was found between GMFCS and participation. While it is not a strong correlation it does suggest that as GMFCS level increases, the level of participation decreases.

The area of school participation as set out by the SFA in which the participants most frequently experienced difficulties was Playground/Recess. This component of the tool assessed the way in which the children spent their free time. This included playing games involving physical activity, using playground equipment and interacting with their peers. Sixty six percent of the sample experienced some difficulties with playground/recess. This relates strongly to findings in the literature. Schenker et al, 2005 found that the greatest differences in participation between typical students and students with CP in fully included classroom setting as well as in self-contained classes, were found in the environment of playground/recess. The researchers suggest that this is most likely due to the fact that this environment demands the greatest degree of physical performance and therefore children

with significant physical impairment will find this environment most challenging. These findings were further supported by research on participation in Icelandic children which found that children with special needs experienced the lowest levels of participation on the playground (Egilson and Coster, 2004). In the current study it is also interesting to note that as physical impairment increased as defined by the GMFCS, scores on the SFA for participation decreased. While the SFA did not examine sports activities specifically, Egilson and Hemmingson, 2009 found that another significant area in which children with physical limitations demonstrated decreased levels of participation was in sporting activities. This particular study made use of a tool known as the School Setting Interview (SSI) and examined school activities where adjustments need to be made to accommodate pupils with disability to enable participation. The researchers note that while decreased participation in sporting activities did not directly affect academic performance, it would impact opportunities for contacts and relations with friends which may contribute to increased isolation. As was demonstrated in the literature review, children with CP experience difficulties with postural control and therefore balance, particularly in challenging environments. This would explain the finding that children with CP most frequently had difficulties on the playground. Other areas in which participants consistently showed difficulties were in the Regular Classroom Setting, Transitions and Transportation component of the tool. In a South African based review on inclusive education in independent schools conducted by Walton, 2009, 106 independent schools were examined. It was found that less than half of the schools indicated that their school buildings were accessible to people who use wheelchairs, while over half the sample schools indicated that their grounds were entirely accessible to wheelchairs. This would suggest that children who experience postural control difficulties would therefore also find negotiating the school grounds and buildings challenging. This was also true in the current study, in only certain schools, adaptations were made to the architectural environment to accommodate learners with physical disabilities which would account for the decreased levels of participation

The environment in which the children showed the best levels of participation was in the environment of Mealtime/Snacktime. Schenker et al, 2005 also found this to be the case in their study sample. This can be explained by the fact that eating and drinking are not as physically challenging and make less demands on the postural control and stability than

the playground environment and recreational activities. The children in the current study were also not severely physically affected and were able to eat independently as a result of this.

These findings suggest that participation is strongly linked to the physical abilities of the children. In this sample, when school participation was further analysed, differences were found across groups as classified by the GMFCS. The criterion cut off score for participation was 100. GMFCS level I scored an average criterion score of 82.87, GMFCS level II scored an average criterion score of 75 and GMFCS level III an average criterion score of 71.8. This suggests that as physical impairment increases, the child's ability to participate fully is affected. Children classified as GMFCS I achieved the highest scores while children classified as GMFCS III achieved the lowest scores. This is in agreement with other studies which investigated the link between social and community participation and the functional status of children with CP which found that the GMFCS was an accurate predictor of participation (Donkervoort et al, 2007; Morris et al, 2006).

This finding is consistent with other research findings. In a study conducted by Schenker et al, 2005, participation and activity performance of children with CP was investigated and the association between activity performance and participation explored. This is in line with the current study except that Schenker et al study compared children with CP in mainstream classes to typical students as well as to students with CP in self-contained classes. The current study assessed only children with CP in mainstream classes and compared the scores to the criterion cut off scores for their age. Schenker et al, 2005 did however find that participation is increased as severity of motor disability decreases. As in the current study, the lowest scores for participation were also found in the environment of Playground/Recess. The researchers suggested that this was due to the fact that this environment in particular challenged the physical abilities of the children and therefore children with more severe physical impairment are more at risk of decreased participation in this environment. In the current study it was also noted in the Adaptations Checklist component of the SFA that very few adaptations were made to the architectural environment, and particularly to the playgrounds at school which could further have impacted the participation scores. Adaptations and Assistance will be discussed in further detail.

Schenker et al, 2005 also found that children with CP showed the greatest level of participation during Mealtime/Snacktime a finding supported by another study by Østensjø et al, 2003 which examined everyday functioning of children with CP using the three scales of the PEDI: Functional Skills, Caregiver Assistance and Modifications of the Environment.

5.2.2 Effects of CP on Task Supports required within the mainstream school environment.

For the purpose of this discussion, Physical Task Supports and Cognitive/ Behavioural Task Supports will be discussed separately.

5.2.2.1 Physical Task Supports

It was shown in this study that children with CP require more assistance when performing physical tasks than their typically developing peers. The mean score for the grade K-3 group was 72 with a standard deviation of 14.61 and the mean score for the grade 4-6 group was 61 with a standard deviation of 12.73. The mean scores for both groups are below the criterion cut off score for their respective age groups. Only one student achieved the criterion cut off score. This suggests that the 14 of the 15 children required more adult assistance to perform school related tasks as compared to other children of their age.

When the results are more closely analysed, once again, the majority of children had difficulty with recreational movement and required varying amounts of adult assistance with 73 % (n=11) of the sample requiring some level of assistance. The majority of the sample, 67% (n=10) required assistance for Clothing Management. The GMFCS is used to classify gross motor function, but this finding may suggest that the children are struggling with this particular task due to fine motor difficulties. The current study did not classify the children's fine motor function, however there is some evidence to suggest that the GMFCS does correlate with a relevant classification of fine motor function in children with CP. Beckung et al, 2002 developed a 5-point bimanual classification system (BFMF) to correspond with the GMFCS and found that the correlation between the two was very high. The study concluded that severity of gross and fine motor function runs in parallel. Therefore a child classified as

having a more severe gross motor impairments would also present with more severe fine motor impairments.

In the current study, children classified as being less severely affected physically using the GMFCS required less physical assistance than those who were more severely affected. In addition, the group which required less physical task assistance (GMFCS level I) also demonstrated higher levels of participation. Children with more severe physical impairments will obviously require more assistance with regards to physical tasks.

Schenker et al, 2005 investigated 148 elementary school children. One hundred were children with CP in mainstream classroom and 48 were children with CP in self-contained classrooms. The SFA was used to determine levels of participation and task performance. The study found that the children within the mainstream, fully included classroom required less physical task assistance than the children in the self contained classroom. The children in the mainstream classroom were less severely affected according to the GMFCS than the children in the self-contained classroom. This finding that children with less severe motor impairment require less assistance is true for the current study.

An interesting observation in the current study was that while many of the children required significant physical assistance when completing tasks, in most cases, very little to no adaptations were made. Adaptations or modifications refer to specialized equipment or environmental modifications that enhance or support function (Schenker et al, 2005). As a result the data series for Physical Task Support-Adaptations looks falsely positive. This was due to the fact that the SFA scored a child with full points where no adaptations were made to the activity despite the fact that the child was not functioning well in that particular task. These children more frequently required more adult assistance as a result to perform an activity. In the current study, adaptations which needed to be made to accommodate the child with the physical disability often needed to be funded by the school itself, this obviously becomes quite costly to the school and may act as a barrier to inclusive education, with schools being reluctant to accept children with disabilities due to the financial implications. An interesting study conducted by Pather, 2011 which examined inclusive education in a rural secondary school in South Africa found that partnerships between local businesses as well as with parents themselves was a way in which to access funding for the necessary modifications

required for inclusion in the absence of government funding. Unfortunately this does require a proactive approach from the school and parent bodies.

While adult assistance is one environmental factor that can support the performance of students with disabilities at school, a full time assistant is not often available to children in the South African setting and is not provided for by the state. In the current study only one child had a full time assistant who was employed by the parents of that child. All other children were either helped by a general classroom assistant or the teacher who would then also need to be available to the rest of the class. In the review on inclusive education conducted by Walton, 2009, it was found that of 104 South African schools investigated, only 14 indicated that a classroom aide was available to teachers 'often' while 55 indicated 'not at all'. In addition, a finding of the study was that the number of support personnel in primary schools, and particularly specialised support personnel such as remedial teachers or therapists was strongly linked to the fees charged by the school. More affluent schools independent schools who charged higher fees were therefore found to have more support personnel. International research into inclusive education has found that teachers need the help of support personnel and specialists to meet the additional demands of an inclusive classroom (Walton, 2009). What is particularly concerning about the finding of this component of the SFA in the South African context is the fact that the government intends to keep specialist support personnel at the district level to provide support to schools rather than being specifically at certain schools. Not having support personnel on site would obviously have an effect on the school's ability to include children with special needs.

While classroom assistance is thought to improve participation, a study by Pivik et al, 2002 which examined the barriers and facilitators to inclusive education, students with disabilities reported that they found adaptations and modifications to the environment and tasks to be more effective than personal assistants for promoting full participation. Evidence suggests that having an assistant may actually limit independence and increase isolation from the rest of the class (Hemmingson et al, 2003). In the current study, the student who had an assistant did not show increased levels of participation and scored a criterion score of 65 with the criterion cut off score for their age group being 100. This suggests that despite having being provided with an assistant, this student is performing very much below average for his age. In

this particular case, very few adaptations to tasks were made and instead the child was provided with increased physical assistance. Research in developing countries suggests that one of the largest barriers to the implementation of inclusive education is a lack of knowledge and ongoing education for teachers. As of 2001, the curriculum in South African universities had not been adapted to equip teachers with the knowledge to handle students with disabilities in the mainstream classroom setting (Engelbrecht et al, 2001). In many cases, teachers are not equipped with the knowledge to support the needs of children with disabilities. As a result, assistance is often assigned to students rather than adapting or equalizing curriculum or settings (Giangreco and Broer, 2005). This was true in the context of the study, in very few cases adaptations were made to facilitate the performance of tasks and children were more often provided by assistance.

5.2.2.2 Cognitive/Behavioural Task Support

The results of the Cognitive/Behavioural Task Support Assistance component of the SFA suggests that as opposed to assistance provided for Physical Tasks, fewer of the children required adult assistance. The mean score for the grade K-3 group was 86 with a standard deviation of 13.29 and the mean score for the grade 4-6 group was 100 with a standard deviation of 0. The mean scores for both groups are well above the criterion cut off scores (77 and 92 respectively). This suggests that both groups were performing well above their typically functioning peers and required less adult assistance for cognitive behavioural tasks.

These findings suggest that children with CP in mainstream schooling environments in Gauteng, South Africa present predominantly with physical rather than cognitive impairment. This finding is further supported by the fact that during the completion of the SFA in this study 80% of the children (n=12) were reported as performing at or above grade level. These findings are in keeping with that of Schenker et al, 2006 who found that children with CP in mainstream schools were frequently provided with physical task supports, but required less cognitive/behavioural task supports.

An interesting trend in the current study was that children classified as GMFCS level II (n=2) required more assistance with regards to cognitive/behavioural tasks. When this was more closely investigated it was noted that one of the children in this group performed particularly poorly with regard to the cognitive/behavioural task support component of the SFA and

achieved a criterion score of 60, which below the criterion cut off score of 77. Due to the small sample size this affected the mean score of the group.

In the current study, the children were provided with very few cognitive/behavioural task support adaptations. As a result, the sample scored well above the criterion cut off score for their respective age groups.

5.2.3 Effects of CP on Physical Tasks Activity Performance

In the current study it was clear that children with CP are able to perform physical tasks less consistently than their typically developing peers. The physical activity performance scales are used to examine the performance of activities that have a significant physical component. Each rating judges the actual physical performance.

The performance of physical activities was strongly influenced by the children's classification according to the GMFCS. With children classified as GMFCS level I performing better than those classified as GMFCS levels II or III. Schenker et al, 2005 found a similar trend and also related difficulties with activity performance to decreased levels of participation. The same was true for the current study as the children classified as GMFCS level I also scored higher in the participation section of the SFA. In all cases, the children with CP consistently performed below the criterion cut off score for their respective age groups.

5.2.4 Effects of CP on Cognitive/Behavioural Activity Performance

An interesting trend again emerged in the current study. The majority of children performed at or above grade level as defined by the criterion cut off scores for their respective age groups. As was discussed previously, children with CP mainstreamed in Gauteng appear to present more predominantly with physical rather than cognitive impairments. This finding conflicts with the research of Coster and Haltiwanger, 2004 which found that in a sample of 62 children with physical impairments included in mainstream classrooms, 40% of children performed below grade level for six of the seven scales of part III, Activity Performance Cognitive and Behavioural Tasks of the SFA. This study was conducted in the United States of America, a country which has a well established inclusive education system. The fact that this sample did not perform well on the scales of Cognitive Behavioural Task Performance may be due to the fact that the children in this study presented with more significant physical

impairments. This was true for this study as only 12 of the 62 subjects mobilised independently while the rest of the sample used manual or electric wheelchairs, crutches or walkers or other aids. As has been discussed previously, an increased severity of motor impairment is associated with increased cognitive impairment.

5.3 Limitations of the Study

- The sample size in the current study was small. This was mainly due to the fact that mainstreaming of children with CP in South Africa is not common. The sample was one of convenience and relied on identification of subjects by paediatric neurologists and therapists in a small geographical area. It is therefore likely that a number of children not currently receiving therapy were not identified to be part of this study.
- Due to the small sample size, there were also very few children classified at each level of the GMFCS. As a result, the scores of one child had a large impact on the general performance of the group at each level of the GMFCS particularly at GMFCS level II.
- There were elements of the SFA which were not always applicable to the South African schooling environment. A large emphasis was placed on the children's function within a school cafeteria which is not an environment which generally exists within the South African schooling environment.
- In the context of this study, while the children required a lot of assistance for Part II: Physical and Cognitive Behavioural Task Supports, the children were not provided with task adaptations, despite the fact that they may have required them. According to the tool, if no adaptations were used, the child would score full points for that particular component. This meant that even though the child was not functioning at optimal level due to a lack of environmental adaptations, they scored the maximum amount of points.
- There were no children classified as being GMFCS level IV or V in this study which meant that the sample was not a true representation of the CP population. However, given that inclusive education is still in the early stages of implementation in South Africa, it is unlikely that more severely affected children would be easily integrated into mainstream schooling environments.
- The SFA did provide for a brief assessment of the school architecture, but this was very limited. A more detailed architectural assessment of the students' school

environments was not performed. This would have been useful to assess the children's ability to participate in school activities and to relate this to their function.

- This study was quantitative in nature, a qualitative assessment of the children and their parents' perception and experience of inclusive education would be useful to gain further insight into inclusive education in the South African context.

5.4 Implications of the findings

Inclusive education in South Africa is a relatively new phenomenon, one that requires a great deal of monitoring in order to ensure that children with CP are successfully integrated into mainstream environments.

The findings of this study reveal that children with CP are generally performing below that of their typically developed peers in all aspects of school function other than cognitive/behavioural function. As physical impairment increases, school function, as set out by the student's ability to participate and perform physical or cognitive behavioural tasks independently and successfully decreases. In most of the schools assessed there was very little interaction between the therapists of the children with the teacher or school management in order to facilitate the child's successful integration into the school. This resulted in very few adaptations being made to the school environment. Instead, the children were provided with a large amount of adult assistance which essentially limits their independence and participation. An integrated team approach as well as regular use of tools such as the SFA would assist schools to monitor children's progress and identify areas in which the children require support.

The majority of the children in this study (n=13) were educated within ISASA schools, while only two of the children were educated at schools run by the GDE. This may be due to the fact that the sample was obtained through therapists and specialists practicing in the private health sector to which the general population do not have access due to financial constraints. While the financial position of the subjects was not assessed, it is generally accepted that children from families of a higher socioeconomic status have better access to private education. ISASA schools generally have smaller classes and better facilities. While this is true, in the majority of cases, very few adaptations or changes were made to the school

environment in the case of the ISASA schools. In most cases structural changes to the environment were the financial responsibility of the family concerned and not the school. This brings to question the ability of the government run schools or to provide changes to the environment for their students, in an education sector poorly resourced and funded.

It was difficult to recruit older participants for this study and for this reason there were only two children in the grade 4-6. This lack of participants in the grade 4-6 group may be explained by the fact that as academic demands increase, the children with CP find it more difficult to keep up with their peers.

5.5 Recommendations based on the results

In this study, participation, task support and activity performance of children with CP in mainstream schooling environments was assessed. Adequate performance in all these areas is necessary for the child with CP to function effectively in the school environment. Due to the fact that children with CP may experience difficulties in these areas, it is vital that all professionals involved in the management of the child's condition be part of efforts to educate the child in the mainstream environment. In order for inclusive education to be successful, there needs to be an integrated team approach. Therapists, teachers and school management need to work cohesively to ensure the successful inclusion of children with CP. Flexibility with regard to generally accepted school practices need to be reassessed and amended to accommodate differences in function of children with CP.

5.6 Suggestions in terms of future research

A qualitative study to examine the experiences of children and their parents integrated into the mainstream schooling environment would be useful to assess the success of inclusive policies in South Africa. In addition, a study to compare the school function of children with CP in ISASA and GDE schools will be beneficial, as the two groups of children come from different socio-economic backgrounds and their school experience is therefore different.

A study to assess the children's participation, task supports and activity performance over time would be useful to assess changes in function over time.

CHAPTER 6: CONCLUSION

The purpose of the current study was to examine the participation, task supports and activity performance of CP children between the ages of four and 12 in mainstream schooling environments in Gauteng, South Africa. This was established using the SFA. The extent of physical impairment was established using the GMFCS. The scores on the SFA were then related to the scores on the GMFCS.

The findings of this study support previous research which has demonstrated that children with CP show decreased levels of participation, increased need for task support and reduced activity performance when compared to typical students their age. The level of motor impairment as classified by the GMFCS is directly related to the scores on the SFA, particularly the physical task component of the tool. Thus as the level of motor impairment increases, the child's ability to participate in the school environment is reduced and the child needs more task support to perform various activities required. A weak correlation was found between GMFCS and participation (r=-0.33). Thus, as the level of impairment increases as defined by an increasing GMFCS level, participation decreases. This trend needs to be explored in future research.

The current study also found that the children with CP required less cognitive/behavioural task assistance and adaptations than physical assistance and adaptations. This is in agreement with previous research.

Further research is necessary to monitor and evaluate inclusive education in order to provide support for schools, learners and parents and therefore ensure the success of inclusive education in South Africa.

Inclusive education in South Africa is still in its infancy, but it is encouraging that children with special needs are beginning to be included in mainstream classroom settings. Inclusive education has been shown to be successful in other, generally first world countries. It remains to be seen whether it will be possible in South Africa given the huge discrepancies between

the public and private schooling sectors as well as a public schooling sector failing to meet the needs of typical students it currently caters for.

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APPENDIX I: Ethical clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Miss JH Bensted-Smith

CLEARANCE CERTIFICATE	**M091123**
PROJECT	Participation, Activity Performance and Task Support of Cerebral Palsied Children Aged between 5 and 12 Years in Mainstreat Schools in Gauteng
INVESTIGATORS	Miss JH Bensted-Smith.
DEPARTMENT	Department of Physiotherapy
DATE CONSIDERED	2009/11/27
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 2009/11/30 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : J Potterton

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

APPENDIX II: Informed Consent

RESEARCH INFORMATION SHEET

Participation, activity performance and task support of cerebral palsied children aged between 5 and 12 years in mainstream schools in Gauteng.

My name is Jeanette Bensted-Smith, I am a qualified physiotherapist, currently studying towards a Masters degree in physiotherapy at the University of the Witwatersrand.

I am asking for permission for your child to participate as a control subject in a research study. This means that your child will be used as a means to compare findings and draw conclusions.

I am researching the participation, activity performance and task support of children with cerebral palsy aged between 5 and 12 years in the mainstream schooling environment. The South African Department of Education has adopted a policy for the inclusion of children with disabilities into mainstream schools. The success of this process needs to be assessed in order that necessary changes may be made to facilitate this process of inclusion.

The study will involve the use of a tool called the School Function Assessment (SFA) which has been used very successfully in other countries to assess the process of inclusion. This tool assesses how well children are coping in the school environment with regard to physical tasks, school work and adaptations made for him/her in the environment. Your child will also be assessed using the School Function Assessment (SFA) in order to be able to compare findings with the child with cerebral palsy. In conjunction with the class teacher this assessment will be completed. Your child would not need to be assessed directly, only through an interview with the class teacher and observation in the school environment as he/she continues with school work.

There are no risks involved in this study as there will be no physical assessment of your child.

The benefits of being included in this study include:

- The identification of areas which could be improved upon for the child with cerebral palsy.
- Identified problems with regard to function of the in the school environment could then be communicated to the relevant school authorities who could then make necessary changes to the school environment to improve your child's ability to function.
- Information gained from the study could be used to facilitate other children with disabilities into mainstream environments and aid the process of inclusion.

Participation is voluntary and refusal to participate will not result in any penalty or loss of benefits to which you and your child are otherwise entitled. You may also choose to withdraw your child at any point during the course of the research.

Every effort will be made to keep personal information confidential.

Contact details of the researcher:

Jeanette Bensted-Smith

Cell: 083 277 0714

Work: 011 683 3390

RESEARCH INFORMATION SHEET

Participation, activity performance and task support of cerebral palsied children aged between 4 and 12 years in mainstream schools in Gauteng.

My name is Jeanette Bensted-Smith, I am a qualified physiotherapist, currently studying towards a Masters degree in physiotherapy at the University of the Witwatersrand.

I am asking for permission for your child to participate in a research study.

I am researching the participation, activity performance and task support of children with cerebral palsy aged between 4 and 12 years in the mainstream schooling environment. The South African Department of Education has adopted a policy for the inclusion of children with disabilities into mainstream schools. The success of this process needs to be assessed in order that necessary changes may be made to facilitate this process of inclusion.

The study will involve the use of a tool called the School Function Assessment (SFA) which has been used very successfully in other countries to assess the process of inclusion. This tool assesses how well your child is coping in the school environment with regard to physical tasks, school work and adaptations made for him/her in the environment. In conjunction with the class teacher this assessment will be completed. Your child would not need to be assessed directly, only through an interview with the class teacher and observation in the school environment as he/she continues with school work. A questionnaire would need to be completed by you, as the caregiver, regarding birth history, relevant medical history and socio-economic status of the family.

There are no risks involved in this study as there will be no physical assessment of your child.

The benefits of being included in this study include:

- The provision of detailed information regarding how well your child is able to function in his/her environment.

- The identification of areas which could be improved upon.

- Identified problems with regard to function in the school environment could then be communicated to the relevant school authorities who could then make necessary changes to the school environment to improve your child's ability to function.

- Information gained from the study could be used to facilitate other children with disabilities into mainstream environments and aid the process of inclusion.

You as the guardian will be given relevant information regarding the outcome of the study.

Participation is voluntary and refusal to participate will not result in any penalty or loss of benefits to which you and your child are otherwise entitled. You may also choose to withdraw your child at any point during the course of the research.

Every effort will be made to keep personal information confidential.

Contact details of the researcher:

Jeanette Bensted-Smith

Cell: 083 277 0714

CONSENT FORM

Participation, activity performance and task support of cerebral palsied children aged between 4 and 12 years in mainstream schools in Gauteng.

Name of Researcher: Jeanette Bensted-Smith

Please tick to confirm:

- I confirm that I have read and understand the information sheet for the above study ☐
- I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
- I understand that participation is voluntary and that I am free to withdraw my child at anytime, without giving any reason, without his/her medical or legal rights being affected. ☐
- I understand that relevant sections of any medical notes and data collected during the study may be reviewed by other individuals for the purposes of the study. ☐
- I agree that my child may take part in the above research study. ☐

_____

Name of Child

_____ _____ _____

Name of Parent/Gaurdian Date Signature

_____ _____ _____

Researcher Date Signature

PERMISSION TO CONDUCT MSC PHYSIOTHERAPY RESEARCH

I _____, Principal of _____

hereby consent for _____ pupils at this school to be assessed for the purposes of research relating to: participation, activity performance and task support of cerebral palsied children aged between 4 and 12 years in mainstream schools in Gauteng.

Signed this _____day of_____, 20__ at _____

PRINCIPAL _____

RESEARCHER_____

JEANETTE BENSTED-SMITH

Registered Physiotherapist
PR No: 072 000 0350230

Bryanston Gate Block 1
Cnr Main and Curzon Road **Cell: 083 277 0714**
Bryanston

E-mail: jeanettebs@gmail.com

To: The Principal of _____

RE: Permission to conduct research

My name is Jeanette Bensted-Smith, I am a Master of Science in Physiotherapy student at the University of the Witwatersrand, Johannesburg. I am investigating the inclusion of children with cerebral palsy, aged between 4 and 12 years in mainstream schooling environments in Gauteng. As you are aware, the South African Government introduced the Education White Paper 6 on Special Needs Education in 2001. This paper outlines the government's planned inclusion of children with special needs in traditionally mainstream school settings. The goal of my research, therefore, is to examine how well children with cerebral palsy are coping within this mainstream environment.

For this study, a tool known as the School Function Assessment (SFA) will be used. This tool does not involve any active participation by the child. It is administered in conjunction with a class teacher. It assesses three key areas of function namely: participation, activity performance and task support relating to activities in the school environment. Charlie Graham and Abigail McIlree has been identified as a candidates for this study. I am requesting permission for this child, as a pupil of your school to be used for this research. The school's name, as well as the details of the pupil will remain strictly confidential and will not be divulged to anyone not directly involved with this research.

Agreeing to be a part of this study will allow you, as the principal, to have access to information regarding the pupil's ability to function in the mainstream environment. If necessary, this will also identify areas in which the pupil may require additional help or adaptations or may simply provide a measure of how well your school is implementing inclusion.

I hope that you will agree to be a part of this very relevant and necessary research into the success of inclusion. Please be so kind as so complete, sign and affix the school stamp to the attached consent form. Please do not hesitate to contact me with questions.

Yours Faithfully

Jeanette Bensted-Smith
BSc (Physiotherapy) University of the Witwatersrand

Contact details: (Cell) 083 277 0714

CHILD ASSENT

Dear _____

My name is Jeanette Bensted-Smith, I am a physiotherapist. I am doing research about children like you who have cerebral palsy and who go to schools like yours. I will be speaking to your teacher about how you are doing in class.

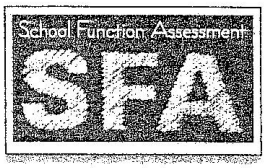
_____ _____ _____

Name of Child Date Signature

_____ _____ _____

Researcher Date Signature

Appendix III: School Function Assessment (SFA)



School Function Assessment
RECORD FORM

Student Information

Name: _____ Date of Assessment: Yr ____ / Mo ____ / Day ____

Gender: Male _____ Female _____ Date of Birth: ____ / ____ / ____

School: _____ Grade: _____ Age at Assessment: _____

Primary Classroom Teacher: _____

Student rated relative to peers in: ☐ Regular Education Program ☐ Special Education Program

Respondent Information

Name: _____ Relationship to Student: _____

Name: _____ Relationship to Student: _____

Name: _____ Relationship to Student: _____

SFA Coordinator: _____

Student Information

Language(s) used by student _____

_____

Primary means of communication (if more than one means is used, number according to frequency: 1=most frequent, 2, 3, etc.)

	Receptive	Expressive
verbal	☐	☐
written/pictorial	☐	☐
sign/fingerspell	☐	☐
gesture/body movements	☐	☐
communication board	☐	☐
computer/electronic	☐	☐

Primary means of mobility (if more than one means is used, number according to frequency of use: 1=most frequent, 2, 3, etc.)

☐ walks on own ☐ crutches, cane, or walker
☐ wheelchair (manual) ☐ wheelchair (electric)
☐ other (specify) _____

_____

Primary method used for written work (if more than one means is used, number according to frequency: 1=most frequent, 2, 3, etc.)

☐ writing by hand ☐ computer
☐ dictation ☐ Braille writer
☐ other (specify) _____

_____

Primary means of transportation to/from school

☐ regular school bus ☐ adapted vehicle
☐ car ☐ walk
☐ other (specify) _____

_____

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Student Information *(continued)*

Conditions that may affect student performance: (check all that apply and describe briefly)

- ☐ Mental retardation _____
- ☐ Specific learning disability _____
- ☐ Speech or language impairment _____
  - ☐ Limitations in receptive communication _____
  - ☐ Limitations in expressive communication _____
- ☐ Autism _____
- ☐ Emotional disturbance or serious behavioral difficulties _____
- ☐ Attention disorder (ADD, ADHD) _____
- ☐ Visual impairment _____
- ☐ Hearing impairment _____
- ☐ Deafness _____
- ☐ Deaf-Blindness _____
- ☐ Other sensory impairments _____
- ☐ Movement impairments _____
  - Lower limbs: ☐ both ☐ single _____
  - Upper limbs: ☐ both ☐ single _____
- ☐ Multiple disabilities _____
- ☐ Traumatic brain injury _____
- ☐ Other neurological disorder _____
- ☐ Other health conditions (e.g., cardiac disorder, asthma) _____

School Information

Is the student currently performing academically at or near grade level?

☐ Yes ☐ No (describe areas of strength and limitations) _____

School type:

- ☐ public elementary
- ☐ public special needs alternative (special school owned and operated by the school district)
- ☐ public special needs collaborative (special school run jointly by two or more districts)
- ☐ other (describe): _____
- ☐ private special day
- ☐ independent
- ☐ private special residential
- ☐ hospital

Classroom setting:

The student receives most of his/her ACADEMIC instruction in the following setting:

- ☐ regular classroom
- ☐ special education classroom

The student receives the following services: (check all that apply)

- ☐ regular education
- ☐ special education
- ☐ adult aide ☐ in-class ☐ other activities
- ☐ academic support ☐ in-class ☐ pullout
- ☐ occupational therapy ☐ in-class ☐ pullout
- ☐ physical therapy ☐ in-class ☐ pullout
- ☐ speech therapy ☐ in-class ☐ pullout
- ☐ medical assistance ☐ in-class ☐ pullout
- ☐ other (describe): _____

School layout:

Complete this section if the student's functional performance is likely to be affected by features of the physical environment (e.g., if student has a mobility, endurance, or visual impairment).

Approximate size of school:

- ☐ fewer than 10 classrooms
- ☐ 10–25 classrooms
- ☐ more than 25 classrooms

Physical features of school:

- ☐ school is on one level only—no stairs or steps
- ☐ all areas within the school are wheelchair accessible via elevators or ramps
- ☐ all outside areas are wheelchair accessible (e.g., field, playground)
- ☐ most areas within the school are wheelchair accessible via elevators or ramps
- ☐ pathways between major areas have guides, landmarks, signs
- ☐ Braille signage
- ☐ Other features of the school that may be relevant for the student being assessed:

_____

_____

_____

PART I Participation

Directions: Read the description of each setting provided below. Then refer to the rating criteria for Part I provided in the *Rating Scale Guide* to determine the rating that best describes the student's current level of participation in each setting. Circle the appropriate rating next to each setting below. Rate six activity settings: either regular or special education classroom (depending on where the student receives most of his or her academic instruction) and all of the remaining five settings. Each rating should reflect the extent to which the student actively participates in all relevant activities of the setting, in the same context as his or her peers, and should consider all aspects of the tasks and activities involved (physical, cognitive, social, etc.). Sum the six ratings to obtain the total raw score and record the score in the box labeled Participation Raw Score.

Rate ONE of the following settings:

Regular Classroom: (Defined as the classroom setting in which most students are typically educated.) Includes tasks and activities associated with the classroom environment, such as moving around the classroom, handling tools and materials, setup/cleanup routines, completing independent and group assignments, following directions and rules, and maintaining appropriate social behavior. **Do not consider academic functioning in determining the rating.**	1 2 3 4 5 6
Special Education Classroom: (Defined as a setting separate from that in which most students are typically educated.) Includes tasks and activities associated with the classroom environment, such as moving around the classroom, handling tools and materials, setup/cleanup routines, completing independent and group assignments, following directions and rules, and maintaining appropriate social behavior according to the norms of that particular Special Education Classroom. **Do not consider academic functioning in determining the rating.**	1 2 3 4 5 6

Rate ALL of the following settings:

Playground/Recess: Free time spent in the classroom, gym, or on the playground (excluding structured P.E. classes) including both physical and social-emotional aspects of participation. Includes playing games involving physical activity, using playground equipment, following rules, and playing cooperatively with peers. If the student has recess in a place separate from all or most peers, the student's participation should be rated as "1—Participation extremely limited."	1 2 3 4 5 6
Transportation: Getting to and from school under all conditions (such as weather or traffic) using one or more methods (e.g., bus, car, van, walking). Includes moving in and out of vehicles, entering and exiting the school building, and maintaining appropriate social behavior both while on vehicles as well as transitioning into and out of the building. *(Note: Traveling within the school is addressed in Transitions setting.)*	1 2 3 4 5 6
Bathroom/Toileting: Toileting tasks performed in a bathroom environment, including managing clothing, using a catheter or diapers, flushing the toilet, taking care of personal hygiene (e.g., washing hands), and the physical acts of getting to/from the bathroom and on/off the toilet. If the student never uses the bathroom, the student's participation should be rated as "1—Participation extremely limited."	1 2 3 4 5 6
Transitions: Moving from one area or room of the school to another, including lining up, moving in crowded corridors or aisles, negotiating doorways, following directions and rules, and maintaining appropriate social behavior. *(Note: Transitioning from activity to activity within the classroom is addressed in the Classroom setting.)*	1 2 3 4 5 6
Mealtime/Snack Time: Tasks and activities associated with eating at school, whether eating occurs in the cafeteria or classroom, such as obtaining or organizing lunch or snack, eating and cleaning up, and maintaining appropriate social appearance and behavior while eating. If the student is tube fed, rate the extent of his or her participation in the regular mealtime/snack time environment. If the student eats or is fed in a place separate from peers, the student's participation should be rated as "1—Participation extremely limited."	1 2 3 4 5 6
Respondent's Initials	**Participation Raw Score (sum of six ratings)**

Reminder: Refer to *Rating Scale Guide* for rating definitions and examples.

Ratings Key for Settings:

1: Participation extremely limited **2:** Participation in a few activities **3:** Participation in all aspects with constant supervision
4: Participation in all aspects with occasional assistance **5:** Modified full participation **6:** Full participation

PART II Task Supports

Directions: Read the description of each task provided below. Then refer to the rating criteria for Part II provided in the *Rating Scale Guide* to determine the rating that best describes the student's needs for additional help or for modifications to perform school-related functional tasks. Circle the appropriate rating next to each task. Sum the ratings within each scale to obtain the total raw score. Record the total raw score for each scale in the appropriate box

Physical Tasks	ASSISTANCE	ADAPTATION
Travel: moving on all different types of indoor and outdoor surfaces; moving around obstacles, through congested or narrow spaces, or in a line; moving all distances required in school, including to and from transportation or playground; keeping pace with peers in all school situations, including evacuating the building as necessary.	1 2 3 4	1 2 3 4
Maintaining and Changing Positions: moving self to and from positions, (including chair or wheelchair, standing, floor, and toilet); maintaining stable seated position on floor or toilet; maintaining functional position in seat for 1/2 hour of class instruction or seat work; boarding and disembarking from all vehicles.	1 2 3 4	1 2 3 4
Recreational Movement: playing games involving physical activity, including throwing and catching during ball games; playing kickball; running, jumping, and climbing; and playing on both low and high playground equipment.	1 2 3 4	1 2 3 4
Manipulation With Movement: transporting materials or belongings within and to and from classroom and in mealtime setting; carrying fragile objects or containers with spillable contents; picking up and setting down large and small objects; retrieving objects from table, storage space, or floor; opening and closing all types of doors.	1 2 3 4	1 2 3 4
Using Materials: using all classroom tools effectively, including pencils, erasers, markers, scissors, stapler, tape, and glue; opening, closing, and turning pages in books; folding and securing papers; using art materials; and manipulating small game pieces.	1 2 3 4	1 2 3 4
Setup and Cleanup: retrieving, gathering, and putting away materials in classroom and lunchroom; opening food or classroom containers; setting up equipment or materials; disposing of waste; wiping up or tidying table top or desk.	1 2 3 4	1 2 3 4
Eating and Drinking: using all needed utensils; eating and drinking a typical meal, including drinking from a cup without spilling; using a napkin to wipe face and hands; completing mealtime/snack time tasks in the time allowed; drinking from student-accessible water fountain.	1 2 3 4	1 2 3 4
Hygiene: toileting control; completing toileting tasks including wiping, flushing, or managing equipment; washing and drying hands; completing tasks within typical time limits; managing nose care; covering mouth when coughing or sneezing.	1 2 3 4	1 2 3 4
Clothing Management: putting on and taking off clothing as required for indoor and outdoor use, including fasteners (e.g., small buttons and zippers) and shoes; managing clothing for toileting purposes.	1 2 3 4	1 2 3 4
Respondent's Initials	Physical Tasks	
	Assistance Raw Score	Adaptations Raw Score

Complete any of the following three tasks that are applicable to this student in this school. Record raw scores in the optional tasks section of the Summary Score Form. Do not add these scores to the total raw scores on this page.

Up/Down Stairs: moving up and down a full flight of stairs (at least 12 steps); carrying objects up and down stairs; maintaining regular speed on stairs.	1 2 3 4	1 2 3 4
Written Work: producing written work (letters, words, and numbers) of acceptable quality; organizing items on lines, in columns, or on a page; copying from a textbook or blackboard; sustaining physical effort on written tasks; maintaining speed to keep up with peers.	1 2 3 4	1 2 3 4
Computer and Equipment Use: operating switches; using keyboard or mouse to carry out basic functions; inserting or removing tapes or diskettes; completing work on computer in a timely fashion.	1 2 3 4	1 2 3 4

Reminder: Refer to the *Rating Scale Guide* for rating definitions and examples.

PART II Task Supports (continued)

Cognitive/Behavioral Tasks	ASSISTANCE	ADAPTATIONS
Functional Communication: communicating all types of information to peers and adults clearly and appropriately, including expressing basic needs, choices, and needs for assistance; identifying objects and their locations; giving complex directions; communicating messages to and from others.	1 2 3 4	1 2 3 4
Memory and Understanding: understanding and remembering directions, locations, routines, and use of classroom materials; following a series of three or more related instructions.	1 2 3 4	1 2 3 4
Following Social Conventions: recognizing when permission is required and appropriately asking in the classroom, during mealtime, and in social contexts; using acceptable eating manners; respecting others' privacy, property, and social and physical boundaries; observing conventions regarding unintentional mistakes, using appropriate language.	1 2 3 4	1 2 3 4
Compliance With Adult Directives and School Rules: cooperating with adult directives in all contexts; observing rules regarding talking, moving about, restricted areas or materials, and organization of own belongings; following classroom, mealtime, and playground routines; cooperating when asked to help.	1 2 3 4	1 2 3 4
Task Behavior/Completion: maintaining attention to and concentration on individual and group tasks; demonstrating independent work habits; communicating when information or assistance is needed; modifying approach to tasks or materials as appropriate; responding constructively to feedback or to failure.	1 2 3 4	1 2 3 4
Positive Interaction: initiating and participating in interactions (both social and task oriented) with peers; working cooperatively with others, including sharing materials, negotiating and compromising; observing conversational norms, modulating tone and volume of voice, taking turns, and listening to others.	1 2 3 4	1 2 3 4
Behavior Regulation: accepting changes in routine; refraining from provoking others; resolving conflicts either independently or with adult assistance, as appropriate; maintaining control around large groups of students; handling frustration; refraining from self-stimulatory behavior.	1 2 3 4	1 2 3 4
Personal Care Awareness: monitoring and maintaining appropriate appearance; wiping/cleaning face, nose, and hands as needed; cleaning self and rearranging clothing after toileting.	1 2 3 4	1 2 3 4
Safety: demonstrating appropriate caution in vehicles, around traffic areas, or while using or being near equipment (including computers, VCRs, adaptive equipment), electrical outlets, and sharp objects; regulating eating to avoid choking, refraining from putting inedible materials in mouth; avoiding dangerous situations on playground; reporting accidents; responding to established emergency signal.	1 2 3 4	1 2 3 4
Respondent's Initials	Cognitive/Behavioral Tasks	
	Assistance Raw Score	Adaptations Raw Score

Ratings Key for Assistance

1: Extensive Assistance **2:** Moderate Assistance **3:** Minimal Assistance **4:** No Assistance

Ratings Key for Adaptations

1: Extensive Adaptations **2:** Moderate Adaptations **3:** Minimal Adaptations **4:** No Adaptations

PART III Activity Performance
Physical Tasks

Directions: Read the description of each functional activity provided below. Then refer to the rating criteria for Part III provided in the *Rating Scale Guide* to determine the rating that best describes the student's functional performance of each activity. Sum the ratings within each scale to obtain the total raw score. Record the total raw score for each scale in the appropriate box.

Travel

1. Moves on flat surfaces, including sidewalks, linoleum, blacktop, etc.	1 2 3 4
2. Moves across classroom.	1 2 3 4
3. Moves through doorways or narrow openings.	1 2 3 4
4. Moves moderate distances (e.g., length of three classrooms).	1 2 3 4
5. Moves to adjacent classroom.	1 2 3 4
6. Moves to any location/area within building (one level only—no stairs).	1 2 3 4
7. Moves in aisles.	1 2 3 4
8. Moves up and down inclines and ramps.	1 2 3 4
9. Moves around room freely with no or infrequent bumping into obstacles.	1 2 3 4
10. Keeps pace with peers for short distances (e.g., 20 or 30 feet).	1 2 3 4
11. Enters room and takes seat/place without bumping into obstacles or people.	1 2 3 4
12. Moves on uneven surfaces (e.g., lawns, gravel, doorsills).	1 2 3 4
13. Moves in a line with classmates.	1 2 3 4
14. Maneuvers around ruts, holes, and other dangerous surfaces.	1 2 3 4
15. Moves through congested areas (e.g., crowded hallways) without bumping into people or objects.	1 2 3 4
16. Exits building to designated area (in the event of evacuation) within time frame required by school.	1 2 3 4
17. Keeps up an appropriate pace (e.g., keeps up with peers) and adapts pace to setting when needed.	1 2 3 4
18. Moves around areas surrounding the school, including crossing traffic areas (e.g., parking lot, school driveway, playground, field).	1 2 3 4
19. Moves on slippery surfaces (e.g., wet or newly polished floor, icy pathways).	1 2 3 4
Respondent's Initials	Travel Raw Score

Maintaining and Changing Positions

1. Maintains adequate posture for at least 1/2 hour during classroom instruction.	1 2 3 4
2. Sits with stability on floor.	1 2 3 4
3. Moves on/off most or all chairs (or wheelchairs).	1 2 3 4
4. Moves from chair/wheelchair to floor.	1 2 3 4
5. Sits with stability on toilet.	1 2 3 4
6. Raises self from chair/wheelchair to standing position.	1 2 3 4
7. Maintains adequate posture to complete seat work and throughout all required classroom activities.	1 2 3 4
8. Moves from floor to chair or wheelchair.	1 2 3 4
9. Moves on and off toilet.	1 2 3 4
10. Raises self from floor to standing position.	1 2 3 4
11. Boards and disembarks from at least one type of vehicle.	1 2 3 4
12. Boards and disembarks from all types of vehicles (e.g., car, bus, van).	1 2 3 4
Respondent's Initials	Maintaining and Changing Positions Raw Score

Recreational Movement

1. Plays on at least one type of moveable play equipment (e.g., swing, seesaw).	1 2 3 4
2. Throws and catches a large (playground) ball.	1 2 3 4
3. Plays on low, stable play equipment (e.g., low climbing structure).	1 2 3 4
4. Catches a large, bouncing ball (playground ball).	1 2 3 4
5. Runs at least 20 feet in a straight line without falling.	1 2 3 4
6. Runs without falling, making changes in direction and speed.	1 2 3 4
7. Can do two or more of the following: running, hopping, skipping, or jumping.	1 2 3 4
8. Throws and catches a small ball (e.g., baseball).	1 2 3 4
9. Plays one or more games involving kicking (e.g., kickball).	1 2 3 4
10. Plays two or more games involving hitting a target (e.g., basketball, dodgeball, baseball).	1 2 3 4
11. Plays on high, stable play equipment (e.g., monkey bars, jungle gyms, high-climbing structure).	1 2 3 4
Respondent's Initials	Recreational Movement Raw Score

Reminder: Refer to the *Rating Scale Guide* for rating definitions and examples.

PART III Activity Performance
Physical Tasks (continued)

Manipulation With Movement

1. Carries objects small enough to be held in one hand.	1 2 3 4
2. Picks up materials from desk or table (e.g., food, art supplies).	1 2 3 4
3. Opens doors that have minimal or no resistance.	1 2 3 4
4. Places items in empty spot on crowded surface (e.g., tray, table).	1 2 3 4
5. Opens and closes doors that require only pushing.	1 2 3 4
6. Moves objects along the floor (e.g., pushes chair into place).	1 2 3 4
7. Opens and closes doors that require manipulation (e.g., doorknob, handle).	1 2 3 4
8. Places spillable/breakable substances on table without spillage (e.g., tray, glass of juice, fragile item).	1 2 3 4
9. Retrieves small items from floor (e.g., pencil, paper).	1 2 3 4
10. Carries objects large enough to require two hands.	1 2 3 4
11. Opens and closes all types of doors necessary for movement within and around school.	1 2 3 4
12. Moves through narrow spaces while carrying object (e.g., cafeteria line, between desks).	1 2 3 4
13. Carries tray (or other such item) containing more than one item on top without spilling or dropping (may use wheelchair lap tray).	1 2 3 4
14. Moves through line (e.g., serving line, distribution of materials) gathering needed items within an acceptable time frame.	1 2 3 4
15. Safely carries fragile objects or liquids in open containers.	1 2 3 4
16. Opens doors that have maximum resistance.	1 2 3 4

Respondent's Initials: _____ **Manipulation With Movement Raw Score** _____

Using Materials

1. Opens and closes book.	1 2 3 4
2. Manipulates toys of average size (e.g., trucks, dolls).	1 2 3 4
3. Turns pages in large book singly.	1 2 3 4
4. Paints with brush.	1 2 3 4
5. Uses writing utensils (e.g., pencils, pens, markers, crayons) to draw/write on paper.	1 2 3 4
6. Turns pages in small book singly.	1 2 3 4
7. Manipulates small game pieces or toys.	1 2 3 4
8. Takes off and replaces caps on pens and markers.	1 2 3 4
9. Spreads paste or glue on paper and places another paper on top to stick.	1 2 3 4
10. Separates a single sheet of paper for use.	1 2 3 4
11. Molds and shapes clay, etc.	1 2 3 4
12. Inserts paper into folder pocket.	1 2 3 4
13. Folds paper with a definite crease.	1 2 3 4
14. Cuts with scissors along a line.	1 2 3 4
15. Uses a stapler to fasten two or more sheets of paper.	1 2 3 4
16. Constructs using several media (e.g., paper, wood, fabric, leather, cord, yarn).	1 2 3 4
17. Cuts off and applies tape.	1 2 3 4
18. Performs card game tasks.	1 2 3 4
19. Erases pencil marks without tearing the paper.	1 2 3 4
20. Cuts out simple shapes.	1 2 3 4
21. Sharpens pencil with pencil sharpener.	1 2 3 4
22. Uses all art materials comparably to peers.	1 2 3 4
23. Assembles several sheets of paper together with edges lined up (e.g., to stack or collate).	1 2 3 4
24. Folds and constructs out of paper and cardboard.	1 2 3 4
25. Secures paper with paper clip.	1 2 3 4

Respondent's Initials: _____ **Using Materials Raw Score** _____

Ratings Key for Activity Performance

1: Does not perform **2:** Partial performance **3:** Inconsistent performance **4:** Consistent performance

PART III Activity Performance
Physical Tasks *(continued)*

Setup and Cleanup

1. Picks up and holds small objects with hand.	1 2 3 4
2. Puts objects/materials into large containers (e.g., desk, bookshelves, cubbies).	1 2 3 4
3. Disposes of trash in trash receptacle.	1 2 3 4
4. Opens bag without fastener (e.g., paper bag).	1 2 3 4
5. Removes materials/food from large containers (e.g., boxes, bookshelves, bins).	1 2 3 4
6. Puts objects/materials into small containers (e.g., jars).	1 2 3 4
7. Uses sponge or cloth to wipe dirt/spills from flat surfaces (e.g., desk/table).	1 2 3 4
8. Removes materials or food from small containers (e.g., jars, cartons).	1 2 3 4
9. Takes out and puts away book in desk.	1 2 3 4
10. Stacks materials (e.g., on desk or cafeteria tray).	1 2 3 4
11. Obtains personal items from own bag or pocket and gives to another (e.g., homework, money for lunch).	1 2 3 4
12. Collects objects/materials (e.g., from others to clean up).	1 2 3 4
13. Removes pull-off lids from containers.	1 2 3 4
14. Passes out objects or materials.	1 2 3 4
15. Opens cartons (e.g., milk carton).	1 2 3 4
16. Opens sealed bags (e.g., potato chips).	1 2 3 4
Respondent's Initials	Setup and Cleanup Raw Score

Eating and Drinking

If student is exclusively tube fed, score "1" on all items and proceed to next section.

1. Eats regular lunchtime/snacktime foods without choking.	1 2 3 4
2. Drinks from a cup or glass.	1 2 3 4
3. Picks up and puts down utensils.	1 2 3 4
4. Carries finger foods to mouth and bites off small pieces.	1 2 3 4
5. Brings food from plate/container to mouth using fork or spoon.	1 2 3 4
6. Drinks without spilling from at least one type of container (e.g., cup, glass, carton, etc.).	1 2 3 4
7. Scoops food or liquids with spoon.	1 2 3 4
8. Eats and drinks without dribbling or drooling.	1 2 3 4
9. Eats within allotted time.	1 2 3 4
10. Scoops food with fork.	1 2 3 4
11. Uses napkin to wipe face.	1 2 3 4
12. Spears food with fork.	1 2 3 4
13. Uses napkin to wipe hands.	1 2 3 4
14. Drinks from student-accessible water fountain.	1 2 3 4
Respondent's Initials	Eating and Drinking Raw Score

Hygiene

- **Rate actual physical performance; cognitive and behavioral issues are addressed elsewhere.**
- **Toileting items may refer to toilet, catheter, or diaper use.**

1. Dries hands (using any method).	1 2 3 4
2. Washes hands.	1 2 3 4
3. Turns water faucet on/off.	1 2 3 4
4. Obtains paper towel from dispenser or towel from rack.	1 2 3 4
5. Pushes handle to flush toilet.	1 2 3 4
6. Obtains soap from any type of dispenser, or holds and applies bar soap.	1 2 3 4
7. Wipes nose.	1 2 3 4
8. Cares for toileting needs in timely fashion to avoid wetting (e.g., goes to bathroom or changes diaper on time).	1 2 3 4
9. Cares for toileting needs in timely fashion to avoid soiling (e.g., goes to bathroom or changes diaper on time).	1 2 3 4
10. Obtains toilet paper from roll or dispenser.	1 2 3 4
11. Blows nose.	1 2 3 4
12. Raises or lowers toilet lid or seat if needed.	1 2 3 4
13. Closes and secures bathroom stall or door.	1 2 3 4
14. Wipes or cleans self after toileting (consider any cleaning except washing hands).	1 2 3 4
15. Covers mouth/nose with hand or tissue when coughing or sneezing.	1 2 3 4
Respondent's Initials	Hygiene Raw Score

Reminder: Refer to the *Rating Scale Guide* for rating definitions and examples.

PART III Activity Performance
Physical Tasks (continued)

Clothing Management

1. Removes hat.	1 2 3 4
2. Removes front-opening garment top (e.g., sweater, coat).	1 2 3 4
3. Puts on hat.	1 2 3 4
4. Puts on front-opening garment top (e.g., sweater, coat).	1 2 3 4
5. Lowers garment bottoms from waist to knees and pulls up from knees to waist (e.g., for toileting).	1 2 3 4
6. Zips and unzips, not including separating and hooking zipper.	1 2 3 4
7. Removes pullover garment top (e.g., sweatshirt, sweater).	1 2 3 4
8. Removes shoes/boots.	1 2 3 4
9. Hangs clothing on hook or hanger.	1 2 3 4
10. Puts on pullover garment top (e.g., sweater).	1 2 3 4
11. Puts on and removes socks.	1 2 3 4
12. Puts shoes/boots on (do not consider tying or closures).	1 2 3 4
13. Secures shoes by tying or using velcro.	1 2 3 4
14. Separates and hooks zippers.	1 2 3 4
15. Buttons a row of buttons with one-to-one correspondence.	1 2 3 4
16. Fastens a belt buckle.	1 2 3 4
17. Buttons small buttons (less than one inch).	1 2 3 4

Respondent's Initials _____ **Clothing Management Raw Score** _____

Written Work

Complete this scale only if the student regularly uses paper/pencil for classroom work.

1. Works from left to right.	1 2 3 4
2. Identifies appropriate starting and stopping point on paper or worksheet.	1 2 3 4
3. Writes on lines on paper or within designated space on worksheet.	1 2 3 4
4. Writes numbers and letters of appropriate size.	1 2 3 4
5. Produces words and numbers of acceptable quality.	1 2 3 4
6. Keeps place on worksheet with multiple items; does not omit items.	1 2 3 4
7. Copies material accurately/legibly from a nearby source (e.g., from textbook).	1 2 3 4
8. Leaves appropriate spaces between words.	1 2 3 4
9. Aligns numbers and words as required (e.g., number problems, lists).	1 2 3 4
10. Organizes written items on a page (e.g., spaces math problems on paper; moves to next line when appropriate).	1 2 3 4
11. Copies material accurately/legibly from a distance (e.g., from blackboard).	1 2 3 4
12. Produces written work at necessary speed to keep up with peers.	1 2 3 4

Respondent's Initials _____ **Written Work Raw Score** _____

Up/Down Stairs

Complete this scale only if the student must routinely use stairs in school.

1. Moves up and down single step (e.g., curb).	1 2 3 4
2. Walks/moves up/down a short flight of stairs (4–5 steps).	1 2 3 4
3. Walks/moves down a flight of stairs (at least 12 steps).	1 2 3 4
4. Walks/moves up a flight of stairs (at least 12 steps).	1 2 3 4
5. Walks/moves up and down a flight of stairs (at least 12 steps) with regular speed.	1 2 3 4
6. Walks/moves up and down stairs at regular speed when carrying an object.	1 2 3 4

Respondent's Initials _____ **Up/Down Stairs Raw Score** _____

Computer and Equipment Use

Complete this scale only if the student routinely uses a computer.

1. Operates equipment using a simple switch (e.g., computer/tape recorder).	1 2 3 4
2. Works for 1/2 hour at computer without fatigue.	1 2 3 4
3. Locates and hits one to two keys in sequence to carry out computer functions.	1 2 3 4
4. Locates and hits three or more keys in sequence to carry out computer functions.	1 2 3 4
5. Uses a mouse to carry out computer functions.	1 2 3 4
6. Inserts and removes diskettes from computer or tape from tape recorder.	1 2 3 4
7. Produces a complete sentence on computer in acceptable time.	1 2 3 4
8. Produces classroom work using computer at speed to keep pace with peers.	1 2 3 4

Respondent's Initials _____ **Computer and Equipment Use Raw Score** _____

Ratings Key for Activity Performance

1: Does not perform **2:** Partial performance **3:** Inconsistent performance **4:** Consistent performance

PART III Activity Performance
Cognitive/Behavioral Tasks

Functional Communication

Consider any established mode of communication (e.g., verbal, sign, computer, writing, communication board). Ratings should be based on interpretability by others who are knowledgeable of the mode used.

1. Communicates yes/no, acceptance/refusal, or choice between 2 or more items.	1 2 3 4
2. Communicates "hungry" or "thirsty."	1 2 3 4
3. Communicates "sick," "hurt," or "help."	1 2 3 4
4. Communicates need for help with a functional (nonacademic) task (e.g., toileting, opening a container).	1 2 3 4
5. Communicates first and last name.	1 2 3 4
6. Communicates where something is located in classroom or school.	1 2 3 4
7. Communicates short messages to another person.	1 2 3 4
8. Communicates inquiries/requests for information.	1 2 3 4
9. Communicates short messages from one person to another (e.g., teacher to principal).	1 2 3 4
10. Communicates basic safety information.	1 2 3 4
11. Describes an object well enough to enable correct identification.	1 2 3 4
12. Communicates where he/she would go or what he/she would do if lost (e.g., on school trips).	1 2 3 4
13. Communicates complex (3 step) directions to others.	1 2 3 4
Respondent's Initials — **Functional Communication Raw Score**	

Memory and Understanding

1. Demonstrates understanding of basic one-step directions or instructions (e.g., come here, stop, go ahead, get book).	1 2 3 4
2. Demonstrates memory for use of tools and materials as taught (e.g., classroom tools, adapted equipment, specialized items).	1 2 3 4
3. Demonstrates memory of routines/structures from day to day.	1 2 3 4
4. Demonstrates memory for where materials belong.	1 2 3 4
5. Demonstrates memory for directions to/from other areas in/around the school (e.g., does not get lost).	1 2 3 4
6. Demonstrates understanding of instructions/directions involving prepositions or spatial concepts (e.g., in the box, under the chair).	1 2 3 4
7. Demonstrates understanding of two-step directions or instructions.	1 2 3 4
8. Demonstrates memory of game/activity rules (e.g., board games).	1 2 3 4
9. Demonstrates understanding of (follows) directions/instructions involving conditional, temporal or sequential concepts (e.g., if/then, after, later, first/second).	1 2 3 4
10. Demonstrates ability to follow a series of three or more related instructions (e.g., put things away, get your coat, and line up).	1 2 3 4
Respondent's Initials — **Memory and Understanding Raw Score**	

Reminder: Refer to the *Rating Scale Guide* for rating definitions and examples.

PART III Activity Performance
Cognitive/Behavioral Tasks (continued)

Following Social Conventions

1. Eats only own food and drink unless has permission of others.	1 2 3 4
2. Displays appropriate behavior regarding issues of sexuality (e.g., refrains from explicit sexual talk/acts, private body parts display).	1 2 3 4
3. Smiles, nods or says "you're welcome" when told "thank you."	1 2 3 4
4. Maintains appropriate social/physical boundaries by keeping hands to self, sitting/standing at appropriate distance.	1 2 3 4
5. Uses good manners, including saying "please," "thank you," and "sorry" when appropriate.	1 2 3 4
6. Obtains items that are out of reach appropriately (e.g., asks/points rather than reaching over).	1 2 3 4
7. Observes social conventions regarding appropriate topics and language (e.g., unappetizing topics while eating; bathroom talk).	1 2 3 4
8. Asks permission in contexts where it is expected (e.g., leaving the room, using some one else's possessions).	1 2 3 4
9. Respects others' privacy.	1 2 3 4
10. Apologizes for unintentional mistakes (e.g., bumping into another person).	1 2 3 4
11. Demonstrates recognition of how and when to communicate about private matters (e.g., toileting accident).	1 2 3 4
12. Observes social conventions regarding asking questions or making statements that are embarrassing or hurtful of others.	1 2 3 4
Respondent's Initials: Following Social Conventions Raw Score	

Compliance With Adult Directives and School Rules

1. Proceeds as directed when told "yes" or "begin."	1 2 3 4
2. Cooperates with non-routine commands and directions given by teacher or other responsible adult.	1 2 3 4
3. Cooperates when asked to help with cleanup and other classroom chores.	1 2 3 4
4. Observes rules regarding allowed versus restricted objects in classroom.	1 2 3 4
5. Observes rules concerning allowed versus off-limits or restricted areas.	1 2 3 4
6. Stops activity immediately when told to do so.	1 2 3 4
7. Observes rules governing movement around the classroom (e.g., lining up, changing seat).	1 2 3 4
8. Shows care in use and handling of others' property.	1 2 3 4
9. Observes rules governing bathroom use (e.g., using appropriate amount of toilet paper, disposing of waste appropriately).	1 2 3 4
10. Observes rules governing movement around the school (e.g., running, walking in line).	1 2 3 4
11. Observes rules regarding talking.	1 2 3 4
12. Cleans assigned area and puts things away at appropriate time.	1 2 3 4
13. Follows time limits set by adult.	1 2 3 4
14. Raises hand (or makes some other gesture) before asking a question or answering.	1 2 3 4
15. Keeps belongings organized in assigned space.	1 2 3 4
Respondent's Initials: Compliance With Adult Directives and School Rules Raw Score	

Ratings Key for Activity Performance

1: Does not perform **2:** Partial performance **3:** Inconsistent performance **4:** Consistent performance

PART III Activity Performance
Cognitive/Behavioral Tasks (continued)

Task Behavior/Completion

1. Listens/attends for at least five minutes.	1 2 3 4
2. Remains in designated play or work area without supervision for a specified time.	1 2 3 4
3. Attends quietly to/stays focused on audio or visual presentation for at least 20 minutes.	1 2 3 4
4. Attends to directions/instructions given to a small group of students.	1 2 3 4
5. Attends to a story or teacher-directed lesson for more than 15 minutes.	1 2 3 4
6. Stays on task at own work or play for at least 15 minutes.	1 2 3 4
7. Listens/attends to an entire class activity, presentation, or lecture.	1 2 3 4
8. Maintains an acceptable level of performance while not working near others.	1 2 3 4
9. Makes some attempt to modify performance based on teacher's suggestions or constructive feedback.	1 2 3 4
10. Recovers after failure (i.e., does not give up or lose temper).	1 2 3 4
11. Initiates work promptly after receiving directions.	1 2 3 4
12. Identifies materials needed for a particular task.	1 2 3 4
13. Lets teacher know when task information or specific assistance is needed.	1 2 3 4
14. Finishes project that takes several days.	1 2 3 4
15. Asks for help when rules or directions are not clear.	1 2 3 4
16. Attempts to solve a problem on own before asking for help.	1 2 3 4
17. Works productively on own work, even while seated in close proximity to others (i.e., ignores distractions).	1 2 3 4
18. Makes appropriate modifications to task or materials to meet his/her needs (e.g., rearranges desktop to make more space; changes to more functional position; finds a different writing implement).	1 2 3 4
19. Has good independent work habits and makes efficient use of class time.	1 2 3 4
Respondent's Initials	Task Behavior/Completion Raw Score

Positive Interaction

1. Responds appropriately to social interaction by adult.	1 2 3 4
2. Responds appropriately to social interaction by peer.	1 2 3 4
3. Waits for turn in group activities.	1 2 3 4
4. Works/plays in a group without disrupting the play or work of others.	1 2 3 4
5. Demonstrates independence in social participation (i.e., does not cling to others).	1 2 3 4
6. Listens/pays attention while others in group are speaking.	1 2 3 4
7. Shares materials without being reminded.	1 2 3 4
8. Asks permission to use objects or materials being used by another.	1 2 3 4
9. Waits turn to speak.	1 2 3 4
10. Initiates conversations appropriately.	1 2 3 4
11. Sustains conversations through several exchanges.	1 2 3 4
12. Offers to help another person.	1 2 3 4
13. Modulates volume and tone of voice to suit context.	1 2 3 4
14. Makes positive comments to peers (e.g., on successful performance).	1 2 3 4
15. Ends conversations appropriately.	1 2 3 4
16. Negotiates joining an ongoing play or activity group.	1 2 3 4
17. Works cooperatively with other students on all aspects of a multiple step, goal-directed activity.	1 2 3 4
18. Initiates topics of interest to others.	1 2 3 4
19. Listens to others and contributes own views.	1 2 3 4
20. Negotiates simple plans/decisions and compromises with others.	1 2 3 4
Respondent's Initials	Postive Interaction Raw Score

Reminder: Refer to the *Rating Scale Guide* for rating definitions and examples.

PART III Activity Performance
Cognitive/Behavioral Tasks *(continued)*

Behavior Regulation

1. Displays appropriate restraint regarding self-stimulation (e.g., refrains from head banging, hand flapping).	1 2 3 4
2. Accepts unexpected changes in routine.	1 2 3 4
3. Refrains from provoking others.	1 2 3 4
4. Uses nonaggressive words and actions.	1 2 3 4
5. Maintains behavioral control in large groups of students (e.g., cafeteria, assemblies).	1 2 3 4
6. Hears constructive criticism without losing temper.	1 2 3 4
7. Uses words rather than physical actions to respond when provoked or angry at others.	1 2 3 4
8. Seeks adult assistance, if necessary, when experiencing peer conflict, especially conflicts involving violence.	1 2 3 4
9. Responds to/handles teasing in a constructive way.	1 2 3 4
10. Handles frustration when experiencing difficulties with school tasks/activities.	1 2 3 4
11. Shows common sense in words and actions around bullies, gangs, or strangers.	1 2 3 4
12. Resolves ordinary peer conflicts or problems adequately on his/her own without requesting teacher assistance.	1 2 3 4
Respondent's Initials	**Behavior Regulation Raw Score**

Safety

1. Keeps unsafe objects out of mouth.	1 2 3 4
2. Reports illness/injury to an adult.	1 2 3 4
3. Demonstrates caution around electrical outlets, light sockets, and equipment.	1 2 3 4
4. Demonstrates appropriate caution in situations where falling is possible (e.g., stairs, climbing on play equipment, tipping in chairs).	1 2 3 4
5. Demonstrates appropriate caution around hot things, including regulating water temperature.	1 2 3 4
6. Recognizes dangerous areas and situations and adjusts behavior accordingly (e.g., broken glass).	1 2 3 4
7. Responds to emergency signal by initiating established routine.	1 2 3 4
8. Identifies an accident or emergency situation and reports it to a teacher or adult.	1 2 3 4
9. Demonstrates some wariness around unknown individuals who have not been designated as "visitors" by a responsible adult (e.g., seems to understand potential harm).	1 2 3 4
10. Checks for safety before crossing a traffic area, even when accompanied by another person (e.g., looks/listens before moving into road).	1 2 3 4
Respondent's Initials	**Safety Raw Score**

Personal Care/Awareness

- **Rate items based on demonstrated awareness that action is needed.**
- **If student is physically unable to perform activity, rate "1," unless he/she initiates asking others to perform the needed action, in which case rate "2."**

1. Wipes face/chin when needed.	1 2 3 4
2. Washes and dries hands after toileting.	1 2 3 4
3. Re-dresses self before exiting bathroom or stall.	1 2 3 4
4. Selects appropriate sex bathroom; checks to see if bathroom/stall is occupied before entering.	1 2 3 4
5. Blows/wipes nose.	1 2 3 4
6. Closes the bathroom/stall door for privacy.	1 2 3 4
7. Wipes self after toileting.	1 2 3 4
8. Rearranges clothing as needed (e.g., insures that pants zipper is up, skirt is down).	1 2 3 4
9. Covers mouth and nose with hand or tissue when coughing or sneezing.	1 2 3 4
10. Brushes, combs, or rearranges hair as needed.	1 2 3 4
Respondent's Initials	**Personal Care Awareness Raw Score**

Ratings Key for Activity Performance

1: Does not perform **2:** Partial performance **3:** Inconsistent performance **4:** Consistent performance

Student Name: _____ Date: _____

Adaptations Checklist

Directions: Record the adaptations that the student routinely uses to perform functional activities during the school day. If the specific adaptations used by the student are not listed, or if you want to record additional details, use the lines provided under the appropriate section.

Activities of Daily Living

- ☐ bib
- ☐ custom dishes/utensils
- ☐ special cup
- ☐ straw
- ☐ modified/specialized foods
- ☐ tube feeding
- ☐ catheterization
- ☐ toileting schedule
- ☐ diaper
- ☐ modified clothing materials/styles
- ☐ dressing aids
- ☐ other (describe below)

Comments/Descriptions: _____

Architectural

- ☐ set-aside personal space
- ☐ modified classroom arrangement
- ☐ modified community areas
- ☐ hallway modifications
- ☐ signs or markers
- ☐ elevator
- ☐ stair climber
- ☐ ramps
- ☐ adapted bathroom facilities
- ☐ adapted playground equipment
- ☐ other (describe below)

Comments/Descriptions: _____

Behavioral

- ☐ formal behavior management program
- ☐ specialized routines/responsibilities
- ☐ different student grouping techniques
- ☐ rule modifications
- ☐ special placement in line
- ☐ increased feedback or monitoring
- ☐ extended time for activities
- ☐ use of reinforcers
- ☐ special seating placement
- ☐ transition modifications
- ☐ other (describe below)

Comments/Descriptions: _____

Classroom Work

- ☐ adapted writing tools
- ☐ magnifiers
- ☐ adapted work surfaces
- ☐ modified writing paper
- ☐ adapted scissors
- ☐ manipulative materials
- ☐ book/paper holder
- ☐ adapted toys
- ☐ other (describe below)

Comments/Descriptions: _____

Adaptations Checklist (continued)

Cognitive

- ☐ alternative curriculum
- ☐ alternative modified materials
- ☐ adjusted expectations/objectives
- ☐ additional repetition or practice
- ☐ alternative modified directions
- ☐ alternative/modified form of evaluation
- ☐ multisensory approach
- ☐ change in pace or sequence of activities
- ☐ extended time
- ☐ use of notebooks or lists
- ☐ peer involvement
- ☐ other (describe below)

Comments/Descriptions: _____

_____

Communication

- ☐ signal system
- ☐ communication board
- ☐ communication book
- ☐ speech output device
- ☐ mouthstick
- ☐ headwand
- ☐ choice program
- ☐ hearing aids
- ☐ microphone
- ☐ interpreter
- ☐ Braille
- ☐ other (describe below)

Comments/Descriptions: _____

_____

Computer

- ☐ specialized software
- ☐ control switches
- ☐ modified hardware/keyboard
- ☐ calculator
- ☐ environmental controls
- ☐ other (describe below)

Comments/Descriptions: _____

_____

Seating/Mobility/Transportation

- ☐ cane
- ☐ crutches
- ☐ walker
- ☐ manual wheelchair
- ☐ electric wheelchair
- ☐ stroller
- ☐ positioning chair/system
- ☐ seating supports
- ☐ cushion
- ☐ wheelchair accessories
- ☐ orthotics
- ☐ prosthetics
- ☐ specially equipped vehicle
- ☐ car seat
- ☐ adapted bus/van
- ☐ other (describe below)

Comments/Descriptions: _____

_____

Other Adaptations

- ☐ one-to-one aide
- ☐ peer assistance program

Comments/Descriptions: _____

_____

School Function Assessment Summary Score Form

Name: _____ Date: _____

		Total Raw Score	Criterion Score	Standard Error	Criterion Cut-off Score K–3	Criterion Cut-off Score 4–6
Part I Participation						
	Regular Classroom + 5 Settings				100	100
	Special Education Classroom + 5 Settings				100	100
Part II Task Supports						
	Physical Tasks—Assistance				100	100
	Physical Tasks—Adaptations				100	100
	Cognitive/Behavioral Tasks—Assistance				77	92
	Cognitive/Behavioral Tasks—Adaptations				91	100
Optional Tasks	Up/Down Stairs—Assistance					
	Up/Down Stairs—Adaptations					
	Written Work—Assistance					
	Written Work—Adaptations					
	Computer and Equipment Use—Assistance					
	Computer and Equipment Use—Adaptations					
Part III Activity Performance						
Physical Tasks	Travel				100	100
	Maintaining and Changing Positions				100	100
	Recreational Movement				83	100
	Manipulation With Movement				93	100
	Using Materials				83	100
	Setup and Cleanup				87	100
	Eating and Drinking				100	100
	Hygiene				92	100
	Clothing Management				93	100
	Up/Down Stairs				100	100
	Written Work				73	94
	Computer and Equipment Use				65	100
Cognitive/Behavioral Tasks	Functional Communication				91	100
	Memory and Understanding				79	100
	Following Social Conventions				73	92
	Compliance With Adult Directives and School Rules				76	82
	Task Behavior/Completion				72	81
	Positive Interaction				81	83
	Behavior Regulation				74	78
	Personal Care Awareness				92	100
	Safety				91	100

Functional Profile

Setting	Classroom Reg.	Classroom Spec.	Playground/ Recess	Transportation	Bathroom/ Toileting	Transitions	Mealtime/ Snack Time
Rating							

0 10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

APPENDIX IV: Example of Scoring Table Appendix B of the School Function Assessment

Part I Participation

REGULAR CLASS		
Raw Score	Criterion Score	Standard Error
6	0	14
7	8	10
8	17	8
9	22	7
10	27	6
11	31	6
12	34	5
13	37	5
14	40	5
15	43	5
16	45	5
17	47	4
18	49	4
19	51	4
20	53	4
21	54	4
22	56	4
23	58	4
24	59	4
25	61	4
26	62	4
27	64	4
28	65	4
29	67	4
30	70	4
31	72	5
32	75	5
33	79	6
34	84	8
35	93	10
36	100	13

Criterion Cut-off Score
K–3rd grade = 100
4th–6th grade = 100

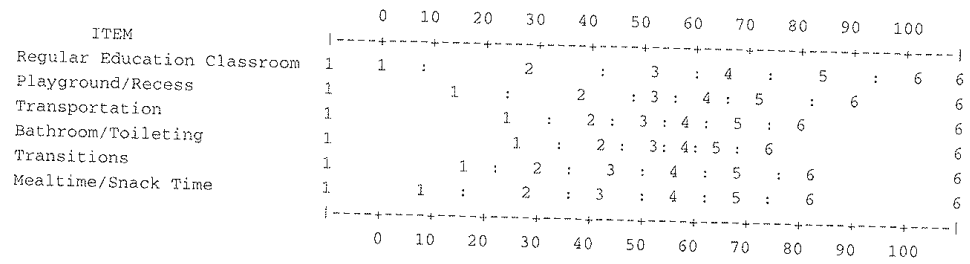
SPECIAL EDUCATION CLASS		
Raw Score	Criterion Score	Standard Error
6	0	14
7	8	11
8	17	8
9	23	7
10	27	6
11	31	6
12	34	5
13	37	5
14	40	5
15	43	5
16	45	5
17	48	5
18	50	4
19	52	4
20	54	4
21	55	4
22	57	4
23	59	4
24	60	4
25	62	4
26	64	4
27	65	4
28	67	4
29	69	4
30	71	5
31	74	5
32	77	5
33	80	6
34	85	7
35	93	10
36	100	14

Criterion Cut-off Score
K–3rd grade = 100
4th–6th grade = 100

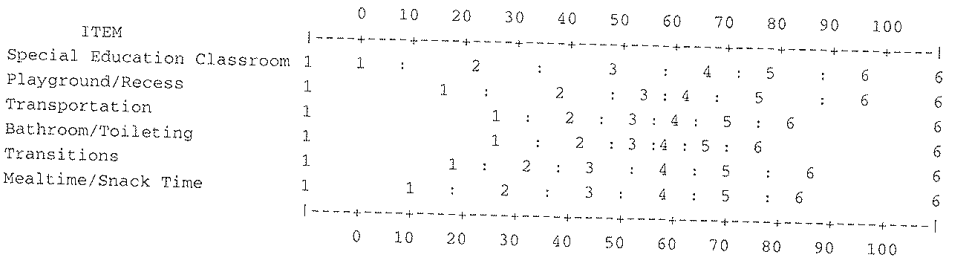
Appendix V: Example of Item Maps Appendix C of the School Function Assessment

Part I Participation

Participation – (6 settings, including Regular Classroom)



Participation – (6 settings, including Special Education Classroom)



Note: The manual states that SFA criterion scores have been placed on a scale that goes from 0 to 100. Actually, these scores are placed on a scale in which scores below 0 or above 100 are extremely rare, but still possible. This is reflected in some of the item maps where points are beyond 0 or 100. This should not significantly change the interpretation of the item maps as explained in the manual.

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Appendix VI: The Gross Motor Function Classification System

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GMFCS – E & R
Gross Motor Function Classification System
Expanded and Revised

GMFCS - E & R © Robert Palisano, Peter Rosenbaum, Doreen Bartlett, Michael Livingston, 2007
CanChild Centre for Childhood Disability Research, McMaster University

GMFCS © Robert Palisano, Peter Rosenbaum, Stephen Walter, Dianne Russell, Ellen Wood, Barbara Galuppi, 1997
CanChild Centre for Childhood Disability Research, McMaster University
(Reference: Dev Med Child Neurol 1997;39:214-223)

INTRODUCTION & USER INSTRUCTIONS

The Gross Motor Function Classification System (GMFCS) for cerebral palsy is based on self-initiated movement, with emphasis on sitting, transfers, and mobility. When defining a five-level classification system, our primary criterion has been that the distinctions between levels must be meaningful in daily life. Distinctions are based on functional limitations, the need for hand-held mobility devices (such as walkers, crutches, or canes) or wheeled mobility, and to a much lesser extent, quality of movement. The distinctions between Levels I and II are not as pronounced as the distinctions between the other levels, particularly for infants less than 2 years of age.

The expanded GMFCS (2007) includes an age band for youth 12 to 18 years of age and emphasizes the concepts inherent in the World Health Organization's International Classification of Functioning, Disability and Health (ICF). We encourage users to be aware of the impact that **environmental** and **personal** factors may have on what children and youth are observed or reported to do. The focus of the GMFCS is on determining which level best represents the **child's or youth's present abilities and limitations in gross motor function.** Emphasis is on usual **performance** in home, school, and community settings (i.e., what they do), rather than what they are known to be able to do at their best (capability). It is therefore important to classify current performance in gross motor function and not to include judgments about the quality of movement or prognosis for improvement.

The title for each level is the method of mobility that is most characteristic of performance after 6 years of age. The descriptions of functional abilities and limitations for each age band are broad and are not intended to describe all aspects of the function of individual children/youth. For example, an infant with hemiplegia who is unable to crawl on his or her hands and knees, but otherwise fits the description of Level I (i.e., can pull to stand and walk), would be classified in Level I. The scale is ordinal, with no intent that the distances between levels be considered equal or that children and youth with cerebral palsy are equally distributed across the five levels. A summary of the distinctions between each pair of levels is provided to assist in determining the level that most closely resembles a child's/youth's current gross motor function.

We recognize that the manifestations of gross motor function are dependent on age, especially during infancy and early childhood. For each level, separate descriptions are provided in several age bands. Children below age 2 should be considered at their corrected age if they were premature. The descriptions for the 6 to 12 year and 12 to18 year age bands reflect the potential impact of environment factors (e.g., distances in school and community) and personal factors (e.g., energy demands and social preferences) on methods of mobility.

An effort has been made to emphasize abilities rather than limitations. Thus, as a general principle, the gross motor function of children and youth who are able to perform the functions described in any particular level will probably be classified at or above that level of function; in contrast, the gross motor function of children and youth who cannot perform the functions of a particular level should be classified below that level of function.

OPERATIONAL DEFINITIONS

Body support walker – A mobility device that supports the pelvis and trunk. The child/youth is physically positioned in the walker by another person.

Hand-held mobility device – Canes, crutches, and anterior and posterior walkers that do not support the trunk during walking.

Physical assistance – Another person manually assists the child/youth to move.

Powered mobility – The child/youth actively controls the joystick or electrical switch that enables independent mobility. The mobility base may be a wheelchair, scooter or other type of powered mobility device.

Self-propels manual wheelchair – The child/youth actively uses arms and hands or feet to propel the wheels and move.

Transported – A person manually pushes a mobility device (e.g., wheelchair, stroller, or pram) to move the child/youth from one place to another.

Walks – Unless otherwise specified indicates no physical assistance from another person or any use of a hand-held mobility device. An orthosis (i.e., brace or splint) may be worn.

Wheeled mobility – Refers to any type of device with wheels that enables movement (e.g., stroller, manual wheelchair, or powered wheelchair).

GENERAL HEADINGS FOR EACH LEVEL

LEVEL I	-	Walks without Limitations
LEVEL II	-	Walks with Limitations
LEVEL III	-	Walks Using a Hand-Held Mobility Device
LEVEL IV	-	Self-Mobility with Limitations; May Use Powered Mobility
LEVEL V	-	Transported in a Manual Wheelchair

DISTINCTIONS BETWEEN LEVELS

Distinctions Between Levels I and II - Compared with children and youth in Level I, children and youth in Level II have limitations walking long distances and balancing; may need a hand-held mobility device when first learning to walk; may use wheeled mobility when traveling long distances outdoors and in the community; require the use of a railing to walk up and down stairs; and are not as capable of running and jumping.

Distinctions Between Levels II and III - Children and youth in Level II are capable of walking without a hand-held mobility device after age 4 (although they may choose to use one at times). Children and youth in Level III need a hand-held mobility device to walk indoors and use wheeled mobility outdoors and in the community.

Distinctions Between Levels III and IV - Children and youth in Level III sit on their own or require at most limited external support to sit, are more independent in standing transfers, and walk with a hand-held mobility device. Children and youth in Level IV function in sitting (usually supported) but self-mobility is limited. Children and youth in Level IV are more likely to be transported in a manual wheelchair or use powered mobility.

Distinctions Between Levels IV and V - Children and youth in Level V have severe limitations in head and trunk control and require extensive assisted technology and physical assistance. Self-mobility is achieved only if the child/youth can learn how to operate a powered wheelchair.

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Gross Motor Function Classification System – Expanded and Revised (GMFCS – E & R)

BEFORE 2ND BIRTHDAY

LEVEL I: Infants move in and out of sitting and floor sit with both hands free to manipulate objects. Infants crawl on hands and knees, pull to stand and take steps holding on to furniture. Infants walk between 18 months and 2 years of age without the need for any assistive mobility device.

LEVEL II: Infants maintain floor sitting but may need to use their hands for support to maintain balance. Infants creep on their stomach or crawl on hands and knees. Infants may pull to stand and take steps holding on to furniture.

LEVEL III: Infants maintain floor sitting when the low back is supported. Infants roll and creep forward on their stomachs.

LEVEL IV: Infants have head control but trunk support is required for floor sitting. Infants can roll to supine and may roll to prone.

LEVEL V: Physical impairments limit voluntary control of movement. Infants are unable to maintain antigravity head and trunk postures in prone and sitting. Infants require adult assistance to roll.

BETWEEN 2ND AND 4TH BIRTHDAY

LEVEL I: Children floor sit with both hands free to manipulate objects. Movements in and out of floor sitting and standing are performed without adult assistance. Children walk as the preferred method of mobility without the need for any assistive mobility device.

LEVEL II: Children floor sit but may have difficulty with balance when both hands are free to manipulate objects. Movements in and out of sitting are performed without adult assistance. Children pull to stand on a stable surface. Children crawl on hands and knees with a reciprocal pattern, cruise holding onto furniture and walk using an assistive mobility device as preferred methods of mobility.

LEVEL III: Children maintain floor sitting often by "W-sitting" (sitting between flexed and internally rotated hips and knees) and may require adult assistance to assume sitting. Children creep on their stomach or crawl on hands and knees (often without reciprocal leg movements) as their primary methods of self-mobility. Children may pull to stand on a stable surface and cruise short distances. Children may walk short distances indoors using a hand-held mobility device (walker) and adult assistance for steering and turning.

LEVEL IV: Children floor sit when placed, but are unable to maintain alignment and balance without use of their hands for support. Children frequently require adaptive equipment for sitting and standing. Self-mobility for short distances (within a room) is achieved through rolling, creeping on stomach, or crawling on hands and knees without reciprocal leg movement.

LEVEL V: Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At Level V, children have no means of independent movement and are transported. Some children achieve self-mobility using a powered wheelchair with extensive adaptations.

BETWEEN 4TH AND 6TH BIRTHDAY

LEVEL I: Children get into and out of, and sit in, a chair without the need for hand support. Children move from the floor and from chair sitting to standing without the need for objects for support. Children walk indoors and outdoors, and climb stairs. Emerging ability to run and jump.

LEVEL II: Children sit in a chair with both hands free to manipulate objects. Children move from the floor to standing and from chair sitting to standing but often require a stable surface to push or pull up on with their arms. Children walk without the need for a hand-held mobility device indoors and for short distances on level surfaces outdoors. Children climb stairs holding onto a railing but are unable to run or jump.

LEVEL III: Children sit on a regular chair but may require pelvic or trunk support to maximize hand function. Children move in and out of chair sitting using a stable surface to push on or pull up with their arms. Children walk with a hand-held mobility device on level surfaces and climb stairs with assistance from an adult. Children frequently are transported when traveling for long distances or outdoors on uneven terrain.

LEVEL IV: Children sit on a chair but need adaptive seating for trunk control and to maximize hand function. Children move in and out of chair sitting with assistance from an adult or a stable surface to push or pull up on with their arms. Children may at best walk short distances with a walker and adult supervision but have difficulty turning and maintaining balance on uneven surfaces. Children are transported in the community. Children may achieve self-mobility using a powered wheelchair.

LEVEL V: Physical impairments restrict voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Functional limitations in sitting and standing are not fully compensated for through the use of adaptive equipment and assistive technology. At Level V, children have no means of independent movement and are transported. Some children achieve self-mobility using a powered wheelchair with extensive adaptations.

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BETWEEN 6TH AND 12TH BIRTHDAY

Level I: Children walk at home, school, outdoors, and in the community. Children are able to walk up and down curbs without physical assistance and stairs without the use of a railing. Children perform gross motor skills such as running and jumping but speed, balance, and coordination are limited. Children may participate in physical activities and sports depending on personal choices and environmental factors.

Level II: Children walk in most settings. Children may experience difficulty walking long distances and balancing on uneven terrain, inclines, in crowded areas, confined spaces or when carrying objects. Children walk up and down stairs holding onto a railing or with physical assistance if there is no railing. Outdoors and in the community, children may walk with physical assistance, a hand-held mobility device, or use wheeled mobility when traveling long distances. Children have at best only minimal ability to perform gross motor skills such as running and jumping. Limitations in performance of gross motor skills may necessitate adaptations to enable participation in physical activities and sports.

Level III: Children walk using a hand-held mobility device in most indoor settings. When seated, children may require a seat belt for pelvic alignment and balance. Sit-to-stand and floor-to-stand transfers require physical assistance of a person or support surface. When traveling long distances, children use some form of wheeled mobility. Children may walk up and down stairs holding onto a railing with supervision or physical assistance. Limitations in walking may necessitate adaptations to enable participation in physical activities and sports including self-propelling a manual wheelchair or powered mobility.

Level IV: Children use methods of mobility that require physical assistance or powered mobility in most settings. Children require adaptive seating for trunk and pelvic control and physical assistance for most transfers. At home, children use floor mobility (roll, creep, or crawl), walk short distances with physical assistance, or use powered mobility. When positioned, children may use a body support walker at home or school. At school, outdoors, and in the community, children are transported in a manual wheelchair or use powered mobility. Limitations in mobility necessitate adaptations to enable participation in physical activities and sports, including physical assistance and/or powered mobility.

Level V: Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain antigravity head and trunk postures and control arm and leg movements. Assistive technology is used to improve head alignment, seating, standing, and and/or mobility but limitations are not fully compensated by equipment. Transfers require complete physical assistance of an adult. At home, children may move short distances on the floor or may be carried by an adult. Children may achieve self-mobility using powered mobility with extensive adaptations for seating and control access. Limitations in mobility necessitate adaptations to enable participation in physical activities and sports including physical assistance and using powered mobility.

BETWEEN 12TH AND 18TH BIRTHDAY

Level I: Youth walk at home, school, outdoors, and in the community. Youth are able to walk up and down curbs without physical assistance and stairs without the use of a railing. Youth perform gross motor skills such as running and jumping but speed, balance, and coordination are limited. Youth may participate in physical activities and sports depending on personal choices and environmental factors.

Level II: Youth walk in most settings. Environmental factors (such as uneven terrain, inclines, long distances, time demands, weather, and peer acceptability) and personal preference influence mobility choices. At school or work, youth may walk using a hand-held mobility device for safety. Outdoors and in the community, youth may use wheeled mobility when traveling long distances. Youth walk up and down stairs holding a railing or with physical assistance if there is no railing. Limitations in performance of gross motor skills may necessitate adaptations to enable participation in physical activities and sports.

Level III: Youth are capable of walking using a hand-held mobility device. Compared to individuals in other levels, youth in Level III demonstrate more variability in methods of mobility depending on physical ability and environmental and personal factors. When seated, youth may require a seat belt for pelvic alignment and balance. Sit-to-stand and floor-to-stand transfers require physical assistance from a person or support surface. At school, youth may self-propel a manual wheelchair or use powered mobility. Outdoors and in the community, youth are transported in a wheelchair or use powered mobility. Youth may walk up and down stairs holding onto a railing with supervision or physical assistance. Limitations in walking may necessitate adaptations to enable participation in physical activities and sports including self-propelling a manual wheelchair or powered mobility.

Level IV: Youth use wheeled mobility in most settings. Youth require adaptive seating for pelvic and trunk control. Physical assistance from 1 or 2 persons is required for transfers. Youth may support weight with their legs to assist with standing transfers. Indoors, youth may walk short distances with physical assistance, use wheeled mobility, or, when positioned, use a body support walker. Youth are physically capable of operating a powered wheelchair. When a powered wheelchair is not feasible or available, youth are transported in a manual wheelchair. Limitations in mobility necessitate adaptations to enable participation in physical activities and sports, including physical assistance and/or powered mobility.

Level V: Youth are transported in a manual wheelchair in all settings. Youth are limited in their ability to maintain antigravity head and trunk postures and control arm and leg movements. Assistive technology is used to improve head alignment, seating, standing, and mobility but limitations are not fully compensated by equipment. Physical assistance from 1 or 2 persons or a mechanical lift is required for transfers. Youth may achieve self-mobility using powered mobility with extensive adaptations for seating and control access. Limitations in mobility necessitate adaptations to enable participation in physical activities and sports including physical assistance and using powered mobility.

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