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# The evaluation of the Conductive Education program and the Cognitive Stimulation program in a home for children with developmental disabilities in a rural area of South Africa.

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**Abstract**

**Introduction:** This research evaluated the effectiveness of two developmental programs given in the Sizanani Children's Home for disabled children in Bronkhorstspruit, South Africa. The Conductive Education (CE) program focuses on motor functional skills to create more independency in daily life activities. This follow-up study measured the development of those skills in the children and young adults at Sizanani Children's Home in the period from April 2008 to November 2009. Next to this, it was measured whether this development is moderated by the level of gross motor functioning in April 2008. The Cognitive Stimulation (CS) program was an 8-week program focusing on stimulating the cognitive abilities. **Methods:** The CE program is evaluated in a longitudinal research (N = 39), in which the functional skills were assessed with the Functional Motor Assessment Scale (FMAS), the Level of intervention Observation Instrument (LOI) and the Pediatric Evaluation of Disability Inventory (PEDI). The CS program consists of an experimental group (N = 12), in which the participants received two times a week cognitive stimulation by play intervention in a social context, and a control group (N = 9), in which the participants received no play intervention. The possible cognitive effect of this program has been assessed with the Play Observation Scale (POS; Vos & Van Westrhenen, 2009) through the observation of play performance. This instrument is based upon Piaget's (1962) classification of successive stages of play and was, in the current study, adjusted to make it more sensitive. Furthermore, the CS program has been optimized to enlarge learning opportunities by introducing a guideline of encouragement in play. **Results:** A significant improvement was found between April 2008 and November 2009 in functional skills according to the FMAS and the dressing subscale of the LOI, but not according to the PEDI and the feeding subscale of the LOI. Also, no further improvement was shown from April to November 2009. In addition, the level of gross motor functioning in April 2008 was not a moderator for the effect of the CE program. The results after the 8-week CS program showed a significant improvement in the level of cognitive play performance, as well as a significant interaction effect between time and condition. **Conclusion:** The effect of the CE program on the development of the motor functional skills was only proved partly in the current study and the level of gross motor functioning of April 2008 was not a moderator for this effect. The CS program proved to be effective, with a significantly more improved cognitive play performance for the group that received play intervention than for the group that did not.

Keywords: Cerebral Palsy, Cognitive Stimulation, Conductive Education, Motor and cognitive disabilities, Physical and cognitive development, South Africa.

**Samenvatting**

**Introductie:** Dit onderzoek was gericht op de evaluatie van de effectiviteit van twee op ontwikkeling gerichte programma's in Sizanani Children's Home, een residentiële inrichting voor kinderen en jongvolwassenen in Bronkhorstspruit, Zuid-Afrika. Het CE programma is gericht functionele motorische vaardigheden om de zelfstandigheid in alledaagse activiteiten te bevorderen. Dit vervolgonderzoek meet de ontwikkeling van betreffende vaardigheden bij de kinderen en jongvolwassenen van Sizanani Children's Home in de periode van April 2008 tot November 2009. Daarnaast werd ook gemeten of deze ontwikkeling gemodereerd wordt door het niveau van grof motorisch functioneren in April 2008. Het CS programma was een acht weken durend programma gericht op het stimuleren van cognitieve vaardigheden. **Methoden:** Het CE programma wordt geëvalueerd in een longitudinaal onderzoek (N=39) waarin het motorisch functioneren wordt gemeten met de 'Functional Motor Assessment Scale' (FMAS), de 'Level of intervention Observation Instrument' (LOI) en de 'Pediatric Evaluation of Disability Inventory' (PEDI). Het CS programma bestaat uit een experimentele conditie (N=12), waarin deelnemers spelinterventie krijgen in een sociale context, en een controle conditie (N=9), waarin deelnemers geen spelinterventie krijgen. De mogelijke cognitieve vooruitgang door dit programma werd gemeten met de 'Play Observation Scale' (POS; Vos & Van Westrhenen, 2009) door het observeren van speelvaardigheden. Dit meetinstrument is gebaseerd op Piaget's (1962) ontwikkelingsstadia van spel en is in het huidige onderzoek aangepast om het sensitiever te maken. Tevens is het CS programma geoptimaliseerd om leermogelijkheden te vergroten door de introductie van een richtlijn voor spelaanmoediging. **Resultaten:** Er werd een significante verbetering gevonden in functionele motorische vaardigheden blijkens de FMAS en de LOI bij aankleden in de periode van April 2009 tot November 2009, maar niet blijkens de PEDI en de subschaal voeden op de LOI. Tevens werd geen verdere verbetering gevonden van April tot November 2009 en bleek het niveau van grof motorisch functioneren van April 2008 geen moderator voor het effect van het CE programma. De resultaten van het acht weken durende CS programma lieten een significante verbetering zien in het cognitieve spel vermogen, evenals een significant interactie-effect tussen tijd en conditie. **Conclusie:** Het effect van het CE programma op de ontwikkeling van motorische functionele vaardigheden was met het huidig onderzoek slechts

gedeeltelijk aangetoond en het niveau van grof motorisch functioneren van April 2008 bleek geen moderator voor dit effect. Het CS programma bleek effectief te zijn, met een significant sterker verbeterd cognitief spel vermogen voor de groep die de spelinterventie ontving dan voor de groep die deze niet ontving.

Sleutelwoorden: Cerebrale parese, Cognitieve Stimulatie, Conductive Education, Fysieke en cognitieve ontwikkeling, Motorische en cognitieve beperkingen, Zuid-Afrika.

## Introduction

Cerebral palsy (CP) is a disability that covers a number of neurological conditions resulting in abnormal development of movement and postural control (Ketelaar, Vermeer, 't Hart, Petegem-van Beek, & Helders, 2001). A frequently used definition of CP is: 'an umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of its development' (Mutch, Alberman, Hagberg, Kodama, & Velickovic, 1992, in Rosenbaum, 2005). People with CP are also considerably more likely to have functional difficulties related to their central nervous system, like sensory, epileptic, learning, behavioural and other developmental impairments (Kennes et al., 2002, in Rosenbaum, 2005).

Conductive Education (CE) is a method that has been developed to stimulate children and adults with motor disorders, resulting from CP and other brain disorders in their motor functioning, and to teach them motor skills that are necessary to become more independent in activities of daily life. The program was developed in the 1940's and 1950's by the Hungarian child neurologist and educationalist Dr. András Petö. His viewpoint was that motor disabilities like CP are learning disorders, and that children, given the correct teaching, could learn to overcome these at the highest level of the cortex. Therefore, one might say that the CE program is based on an educational rather than a medical intervention, and that it is developed to integrate both education and rehabilitation goals into one program (Coles & Zsargo, 1998; Van der Hoek, De Groot & Vermeer, 1992; Cottam & Sutton, 1986). The four main elements of CE are: (1) task-oriented learning within highly structured programs; (2) facilitating and commenting on motor actions by rhythmic intending, for example, rhythmic speaking or singing; (3) integration of manual abilities into the context of activities of daily life; and (4) child-oriented group settings to facilitate psychosocial learning to increase the level of participation (Blank, Von Kries, Hesse, & Von Voss, 2008; Reddihough, King, Coleman & Catanese, 1998).

Results from one evaluation study suggest that the amount of progress, made by individual children following CE, varied widely, with some children showing improvement, others showing almost no change and some showing a negative reaction to the program (Bochner, Center, Chapparo, & Donelly, 1999). However, Blank et al. showed in his study that CE improved the coordinative hand functions and activities of daily life in children with CP. This indicates an improved independence, which is the most important objective of CE.

The aim of the present study is to evaluate the effectiveness of the intervention program CE specifically for children and young adults with severe and profound neurological disorders in Sizanani Children's Home. The expectation is that children and young adults make significant improvement in becoming more independent in activities of daily life when receiving CE treatment.

Since variation has been found in the results of CE (Bochner et al., 1999), it is important to study the possible influence of a moderating external factor. Little is known about factors that could influence the effect of CE, except for gross motor functioning. Palisano et al. (2000) found that the classification of gross motor functioning at baseline in children with CP is predictive of functional skills and gross motor functioning at a later stage. Therefore, in addition to the general evaluation of the effectiveness of the CE program, the present study will also examine whether gross motor functioning moderates the effect of the CE program. Rosenbaum et al. (2002) pointed out that there is a tendency for children with lower motor development potential to reach their limit more quickly than children with higher potentials. This indicates that children and young adults with better gross motor functioning profit more from a developmental program using CE than children with a lower level of gross motor functioning.

Children with CP miss important experiences to learn about their environments and develop their cognitive abilities. Delayed or aberrant motor function, being characteristic for CP, also affects the development of a child's capacity to explore actively and to learn about space effort, independence, and the social consequences of moving, touching, and getting into mischief (Rosenbaum, 2005). Moreover, of severely disabled children with CP, almost 98% is also profoundly mentally disabled (Odding, Roebroeck, & Stam, 2006). The second aim of this study is to evaluate the effectiveness of a Cognitive Stimulation (CS) program as a new intervention program for children and young adults with severe and profound neurological disorders.

A CS program has been developed by Vos & Van Westrhenen, 2009 and adjusted in de current research to give children and young adults with CP a chance to explore the world around them by offering play situations. This is founded by literature showing that playing with toys offers children with developmental disabilities useful experiences and promotes the development of cognitive functions (Malone, 1999; Lewis, Boucher, Lupton & Watson, 2000). Furthermore, social interaction involving more capable peers and adults provides a context for a shared construction of knowledge and understanding, and is therefore an

important element in play that promotes cognitive development (Vygotski, 1987, in Fu & Stremmel, 1993; Pierce-Jordan & Lifter, 2005; Brodin, 1999).

Vygotsky (1987, in Fu & Stremmel, 1993) even theorized that every function of the child's development occurs first at the social level before the individual level. He developed the construct "zone of proximal development", which he referred to as the area in which a child's learning, with *sensitive assistance*, exceeds the reach of his or her current developmental level. *Sensitive assistance* is the level of teacher participation which depends on this level of ability of the child, as evidenced by the moment-to-moment signs of success and frustration experienced by the child, and the nature of the particular task (Rogoff, 1990; in Fu & Stremmel, 1993). By working within this zone, adults and more competent peers create opportunities for children to perform at levels they cannot achieve on their own. In order to accurately and successfully assist children, the teacher must first assess the child's initial understanding and intentions in attempting an activity. In the present study, CS will be given following a guideline based on Vygotsky's *zone of proximal development* and *sensitive assistance*, tailored to the needs of CP children and young adults (see Attachment 1).

A way to examine if CS affects the cognitive development of the children and young adults is to observe their level of play abilities. The level of play abilities is a reflection of the level of intellectual abilities, and observing play performance therefore provides insight into the development of these cognitive abilities (Gowen et al., 1989; Messier, Ferland & Majnemer, 2008; Piaget, 1962; Power & Radcliffe, 1989; Ungerer, Zelazo, Kearsly & O'Leary, 1981). Piaget (1962) made a classification model for the successive stages by which children master developmental and cognitive tasks. The stages are based on the degree to which play remains purely sensorimotor or if the playing has some bearing on thought itself. The variables, which the successive stages are based on, are 'Functional play', 'Constructive play' and 'Dramatic play'. 'Functional play' is an activity that is performed simply for the enjoyment of the physical sensation it creates. Generally speaking, the child engages in simple repetitive muscle movements with or without objects. The definition of 'Constructive play' is the manipulation of objects to construct or to create something, for example a puzzle or a house of blocks. Any element of pretend play is coded as 'Dramatic play'. The child may take on a role of someone else, or may be engaged in pretend activity, such as imitating the sound of a driving car while playing with a toy car.

These three developmental stages in play (Piaget, 1962) form the basis of the Play Observation Scale (POS), developed by Vos & Van Westrhenen in 2009 and adjusted in de current research, to measure the cognitive improvement as a result of the CS program through

the observation of cognitive play performance. In the POS, the three stages, Functional, Constructive and Dramatic play, are subdivided into smaller steps by which a child shows the level in which it masters these stages of development (see Attachment 2).

*Sizanani Children's Home*

This research takes place at the Sizanani Children's Home. Sizanani means 'help each other' and this motto is brought into practice in the Sizanani Children's Home, where children and young adults with severe and profound neurological disorders can find care and accommodation. This residential care facility has been opened in March 1993 and is situated in Sizanani Village in Bronkhorstspruit, South Africa. Childcare workers take care of the daily needs of the children and young adults, who live mainly in the townships closely located near Sizanani Village (Magyarszeky & Mbethe, 2006; Vermeer, Wijnroks & Magyarszeky, 2006). Currently the Home accommodates 64 children with ages ranging from 3 to 32 years. Most of them have cerebral palsy, which is also the most common developmental disability in the whole of rural South Africa (Kroon, Sinnaeve, Appels, Magyarszeky & Wijnroks, 2006; Christanson et al., 2002). The above introduced theory will now be specified for the situation of the Sizanani Children's Home.

Conductive Education in Sizanani Children's Home

Originally the main objective of the Sizanani Children's Home was providing nursing care for the children, but in 2003 this changed with the introduction of a CE program. This program was implemented at the Home to train the childcare workers in assisting the children to develop their functional and motor abilities to become more independent in their daily activities (Magyarszeky & Mbethe, 2006).

The CE program at the Sizanani Children's Home has been adapted with regard to the original program of Petö (Cottam & Sutton, 1986). First, it is adapted to the more severe impairments these children have than children that are usually admitted to a CE program. Contrary to the admittance criteria of the original CE program (Van der Hoek, De Groot & Vermeer; 1992), at the Sizanani Children's Home there are also children in the CE program who are profoundly disabled, have visual and auditory impairments, autism or problems in their communication. Second, the CE program at the Sizanani Children's Home focuses on the coaching of the child care workers in how they could best create learning situations for the children and stimulate them to reach their full potential in all areas of development: motor,

cognitive, social, communicative and emotional development (Magyarszeky & Mbethe, 2006). This is in contrast with the original program, in which the certified CE conductor focuses directly on the children themselves instead of indirectly through the coaching of the child care workers. In the latter the childcare workers have more responsibility in providing learning situations than they are educated for. In addition, possibly miscommunication emerges from the different languages both parties speak. Third, in concrete form, the CE program in the Sizanani Children's Home consist of a one and a half hour lasting program every working day at nine o'clock in the morning and the training of individual goals during the day. For the morning program, the children are divided into four different groups according to their level of functioning, with different goals per group and child. In these individual and group goals, the focus is in general on sensory motor development, basic motor skills, academic development, improving communication and independence and on social skills (Visser, 2010). However, except for the morning program, this task-oriented learning has not been practiced within a highly structured program, like prescribed by the first of the above mentioned four main elements of conductive education (Blank et al., 2008; Reddihough et al., 1998). In brief, the CE program at the Sizanani Children's Home is applied in a somewhat different form compared to the original CE program, developed by Petö. However, these adjustments had to be made because of the large number of profoundly disabled children in the Home and too few certified conductors.

The evaluation of this CE program is important to provide Sizanani Children's Home with knowledge on the effectiveness of the program for these children and young adults. Between February 2008 and May 2008 Lange and Post found no significant improvement in the functional motor abilities of the children and young adults. Between April 2008 and April 2009 Vos and Van Westrhenen found a significant improvement in their follow-up study on some but not all measures of the functional motor abilities. They reported a significant improvement in the independence of the children regarding to the childcare workers, concerning self care and detected a decrease in the amount of guidance the child needed during dressing. These changes were not significantly related to the level of gross motor functioning in April 2008.

The aim of the current research is to continue the longitudinal study of the previous researchers by examining the change in gross motor functioning and functional skills of the children and young adults of the CE research group during the CE program in the period of April 2008, April 2009 and November 2009. Furthermore to study whether this change is moderated by the level of gross motor functioning in April 2008, divided in two groups, low

versus high gross motor functioning. The expectation was that the gross motor functioning and the functional skills of the CE research group is improved over the period of April 2008, April 2009 and November 2009. Because of the possibility in the current research to study effects over a longer period of time, it is expected that there will be more improvement in gross motor functioning and functional skills than previously found. Furthermore, it was expected that the children and young adults with a higher baseline level of gross motor functioning will show more improvement in their functional skills and gross motor functioning than the children and young adults with a low baseline level of gross motor functioning.

Cognitive Stimulation in Sizanani Children's Home

Since the children and young adults of Sizanani Children's Home are not only severely physically disabled, but most often also mentally disabled, it was desirable to not only focus on stimulating the functional development, but also the mental development of the children and young adults. For this reason the CS program was developed and tested in the Sizanani Children's Home in 2009 by Vos and Van Westrhenen, and its objective was to stimulate the cognitive and social development of the participants through the provision of play intervention in a social context.

In the study of Vos and Van Westrhenen (2009) a positive trend was found of the play abilities on the POS following three months of the CS program, but this trend was not significant. The lack of a significant improvement might have been caused by the lack of a structured procedure for the play intervention, a measuring instrument that was not sensitive enough to detect these effects, as well as the small number of participants.

Therefore, in the present study, a number of adjustments were made. First, the CS program has been adjusted according to Vygotsky's concept of *sensitive assistance* (Rogoff, 1990; in Fu & Stremmel, 1993) in the Guideline Level of Encouragement for CS program (see Attachment 1). In short, this guideline contains six different levels of encouragement, of which a child will receive one, depending on the level of initiative and independence it shows in playing with the toy during a specific period of time. The more initiative and independence a child shows, the less encouragement the researcher will give. This scale of encouragement ranges from only verbal reinforcement as the first step in the guideline to physically joining in play at the other end of the continuum. The Guideline Level of Encouragement for CS is a program based on the *Zone of proximal development* which is tailored to the needs of

individual children and young adults with CP, making it possible to stimulate cognition depending on their of physical and cognitive functioning.

Adjustments have also been made to the POS, the instrument to measure cognitive play performance, which originally was developed by Vos and Van Westrehnen (2009). To improve the instrument in a way that it could detect smaller changes in the cognitive abilities, the original scales which measure the level in which a child masters Piaget's three stages of development in play (1962), 'Functional play', 'Constructive play' and 'Dramatic play',were enlarged in the present study by inserting extra steps (see Attachment 2).

The third adjustment that has been made is the enlargement of the power by increasing the number of participants in the experimental and control group. The original study of Vos and Van Westrehnen (2009) consisted of two experimental conditions, the 'cognitive stimulation only' condition, in which participants received play intervention without social interaction, and the 'cognitive stimulation and social interaction' condition, in which participants received play intervention in a social context. Since a number of studies have already shown the importance of social interaction in play (Vygotski, 1987, in Fu & Stremmel, 1993; Pierce-Jordan & Lifter, 2005; Brodin, 1999), it was decided in the current study to combine these two conditions and create one group of children and young adults receiving the play intervention in a social context (N = 12). Additionaly, also the control condition was enlarged with three extra participants (N = 9), who were selected by the professional opinion of the conductors, taking the level of gross motor functioning into account.

In addition to the continuation and evaluation of the CE program, the aim of the present study was to continue and evaluate the CS program during eight weeks. Although now by introducing a guideline for the level of encouragement given during the play sessions to structure teaching procedure, by studying the effects of the CS program more accurately by using the POS in a more refined way, and by increasing the number of participating children. It was expected that Piaget's level of cognitive play performance of the children and young adults who received the 8-week period CS program, is improved more compared to a matched control group who did not receive the play intervention.

## Methods

### Conductive Education program

#### *Design*

The current research concerning the CE program is part of a longitudinal research project and has a quasi-experimental baseline-intervention-follow-up design.

#### *Participants*

In April 2008 the research group consisted of 41 children and young adults who were considered suitable, by the professional opinion of the conductors, for the CE program. In April 2009 the research group included the same children, minus two who had passed away. In the current study the same 39 children and young adults were included in the CE research group, that is 61 % of all children and young adults in Sizanani Children's Home. The CE research group included 27 boys aged between 9 and 30 years ($M$ = 20.2, $SD$ = 5.3) and 12 girls aged between 10 and 32 years ($M$ = 19.6, $SD$ = 7.0). The diagnosis of the group was as follows: spastic quadriplegia $N$ = 21, spastic diplegia $N$ = 4, ataxia $N$ = 1, spastic hemiplegia $N$ = 1, spastic triplegia $N$ = 1, athetosis $N$ = 3, and other (i.e. developmental delay, brain injury, autism and hydrocephaly) $N$ = 8. In addition, many of the children and young adults suffer from epilepsy, visual and hearing impairments, microcephaly and hyperactivity. No exact numbers are known, because these diagnosis are not reliable. The level of gross motor functioning of the CE research group as assessed with the Gross Motor Functioning Classification System for cerebral palsy (GMFCS; Palisano et al, 1997) by Lange and Post in April 2008 is shown in Table 1. The GMFCS is a five-level classification system which measures the present abilities and limitations in gross motor function of children and young adults with cerebral palsy on the basis of their self-initiated movement with particular emphasis on sitting, walking and wheeled mobility. The first level represents good abilities in sitting and walking and the fifth level represents a low level of independence.

Table 1: *Level of gross motor functioning according to the GMFCS in the CE research group**

| Level | Description level | Number (%) |
|---|---|---|
| 1 | Walks without limitations | 1 (2.6%) |
| 2 | Walks with limitations | 3 (7.7%) |
| 3 | Walks using a hand-held mobility device | 2 (5.1%) |
| 4 | Self-mobility with limitations; may use powered mobility | 11 (28.2%) |
| 5 | Transported in a manual wheelchair | 22 (56.4%) |

*Note.* GMFCS = Gross Motor Functioning Classification System for cerebral palsy.

* Data obtained by Lange and Post (2008)

*Instruments*

Functional skills were assessed with the Functional Motor Assessment Scale (FMAS), Level of intervention Observation Instrument (LOI) and with the Pediatric Evaluation of Disability Inventory (PEDI). Each of these instruments will be described below.

Functional Motor Assessment Scale

The Functional Motor Assessment Scale (FMAS; Vermeer, 1989) is an observation method in wich children have to demonstrate several functional motor abilities. The FMAS consists of 14 different functional motor skills: head control, rolling over, lie to sit, crawling, sitting on a chair, sitting on the ground, standing, walking, riding in a wheelchair, walking special, jumping, biking, transfer, stair walking. The items could be answered on a 5-point Likert scale from 1 = 'non-independent execution of the skill' to 5 = 'independent execution of the skill'; a score of 0 is given if the child was not able to get into the starting position (Vermeer, Kruithof & Van Zoggel, 1995; see Attachment 3). All the items have their own situation and their own starting position. A scaled score is computed by adding all the item scores and dividing these by the total number of items. Research showed that the FMAS can be regarded as a reliable and valid instrument, but no exact results are given (Vermeer et al., 1995). The items 12 and 14 refering to stairs and bicycles were left out in the present study because they were not applicable for Sizanani Children's Home.

Levels of intervention Observation Instrument

The Levels of intervention Observation Instrument (LOI; Vermeer et al., 2006) is an observation method to categorize teaching strategies used by professionals to bring a child to an independent performance of a task. The categorization of the teaching strategies takes place on a 7-point scale measuring the level of guidance needed for the child during dressing and feeding. The score 1 equals the lowest independence, whereas the score 7 equals the highest independence (see Attachment 4). A sixty-second time interval was used to score the level of guidance until the task was finished. Every guidance level is a score point (level 1 is one point, level 2 two points etcetera). To calculate the scaled score, all sample points are added and divided by the number of samples, the sixty-second time intervals, and then by the number of possible answers (i.e. 7), which results in a scaled score ranging from 0 to 1. The reliability and validity of the instrument were proven in two studies, one study with persons with mental retardation (Vermeer, Westra, Benig, Beks, Diemel & Brink, 1990, in Vermeer et al., 2006) and one with children with cerebral palsy (Vermeer, Vos, Lindeman, Van Alphen & Snel, 1989). Intra- and inter-observer reliability (kappa > .80) and concurrent validity (rs > .74) proved to be good (Vermeer et al., 2006).

In this research, part two of the LOI, which measures the educational actions of the childcare workers was not used. It was not possible to interpret the verbal instructions, because the main language spoken in the Home between childcare workers and children is Zulu.

Pediatric Evaluation of Disability Inventory

The Pediatric Evaluation of Disability Inventory (PEDI; Haley, Coster, Ludlow, Haltiwanger & Andrellos, 1992) evaluates functional skills in children with cerebral palsy. The PEDI was only used for the 17 children and young adults scoring a level 1 to 4 on the GMFCS. The children and young adults scoring a level 5 on the GMFCS were not suitable for the PEDI in view of the few functional skills. The PEDI can be administered by parents or a caregiver who knows the child well for evaluation and discrimination of the level of functional abilities. The PEDI consists of three scales: the Functional Skills scale, the Caregiver Assistance scale and the Modification scale. Each of these scales is designed to capture a different aspect of the child's daily functioning in three domains: Self-care, Mobility and Social Function. The Self-care domain contains areas like eating and washing, the Mobility domain contains simple transfers and mobility in different environments; and the Social domain is concerned with living with others in one community and social functional skills (see Attachment 5). A

number of studies support the PEDI as a reliable and valid assessment instrument of functional performance for children with disabilities (Vermeer et al., 2006; Haley et al. 1992). In these studies no reliability findings are presented.

The Functional Skills scale includes 197 items distributed across 15 areas of Self-care, 13 areas of Mobility and 13 areas of Social function. Capability in those areas is measured by identification of functional skills for which the child has demonstrated mastery and competence. For each skill specific behavioural scoring criteria are provided. The items of the Functional Skills scale can be scored as either 0 = 'unable' or 1 = 'able' . Per domain the scores were added and these raw scores were transformed, in accordance to the manual, into scaled scores from 0 to 100, where a score of 100 equals the highest motor functioning. The items 8, 9, 20, 21, 22, 23 of the Self-care domain and the items 51, 53, 54, 56, 58 and 59 of the Mobility domain of the Functional Skills scale were deleted because they were not applicable for Sizanani Children's Home. These items concern activities that are not accomplished in the Home like cycling, climbing of stairs and brushing hair.

The Caregiver Assistance scale measures the extent of help needed in 20 typical daily situations, using a six-point scale ranging from 0 = 'total assistance' to 5 = 'independent'. The level of caregiver assistance provides a general assessment of independence and of the amount of help a child needs to complete a particular functional activity. Per domain the scores were added and these raw scores were transformed, in accordance to the manual, into scaled scores from 0 to 100, where a score of 100 equals the highest level of independence. The item G (i.e. 'walking on stairs') from the Mobility domain of the Caregiver Assistance Scale was deleted because it was not applicable for Sizanani Children's Home.

The Modification scale measures adaptations or use of objects, but was not used in this research because of a lack of sufficient specialized equipments, like bicycles, crutches and rollaters, in Sizanani Children's Home. The scale could be left out without affecting the other scales (Haley et al., 1992).

*Procedure*

The categorization of the gross motor functioning of the children and young adults (Lange & Post, 2008) was used in the current research. The PEDI was utilized by interviewing the childcare workers in a separate and quiet room and was conducted in English. The researcher observed the functional motor abilities of the children and young adults with the FMAS. During the observation the childcare worker gave the child (verbal/non-verbal) instructions on what to do according to the FMAS items. The observations for the LOI were conducted

during dressing, which started directly after the moment the child was dry after bathing, and during feeding. The feeding took place three times a day and the observation took place during one entire meal, from the first bite until the plate was empty.

*Statistical analyses*

All analyses were conducted using the Statistical Package for Social Sciences (SPSS, version 17.0, 2008). The effect of the CE program on the functional skills and functional motor abilities as measured with the FMAS, LOI and PEDI were analysed with an analysis of variance (ANOVA), with time of assessment (April 2008, April 2009 and November 2009) as a repeated measures factor. In case of a significant overall time effect (i.e. across all three assessments), the contrasts between specific times were analysed post hoc. In view of the results of the LOI and the PEDI wich were not normally distributed, nonparametrics tests were applied in case significant results were found with the ANOVA. Furthermore, the possible moderator effects of gross motor functioning in April 2008 as measured with the GMFCS on the change in functional motor abilities and functional skills as measured with the FMAS, LOI and PEDI were analyzed by including the GMFCS level in the repeated measures ANOVA. In view of the small sample size, the GMFCS level was recoded into two groups. For the FMAS and the LOI, the children and young adults scoring GMFCS levels 1 to 4 (N = 17)were taken together into one group and children and young adults scoring GMFCS level 5 (N = 22) were taken in the second group. For the PEDI, level 1 to 3 (N = 6) were taken together into one group and children and young adults scoring GMFCS level 4 (N = 11) in the other. For all analysis a $p < .05$ was considered significant.

Cognitive Stimulation Program

*Design*

In the Cognitive Stimulation (CS) study a non-randomised pretest-posttest matched control group design, with two conditions was used. In the experimental condition participants received a play intervention within a supporting social context and in the control condition participants received no play intervention.

*Participants*

Children and young adults who were physically able to play with toys were selected for the CS program. More specifically, these were the children and young adults scoring a level 1 to

4 on the GMFCS and one child scoring a level 5 on the GMFCS measured by Lange and Post in April 2008 (Table 1). In total 33% of all the children and young adults in Sizanani Children's Home were included in the current CS study.

In the previous study from April 2009 eighteen children were included in the CS program. These eighteen participants were divided into three equal groups across three conditions, matched as much as possible on their GMFCS level and on their play capacities as measured with the Play Observation Scale developed by Vos and Van Westrhenen (2009). The three conditions were two experimental conditions, one with only cognitive stimulation, one with cognitive stimulation in a social context, and one control condition in which the children and young adults did not receive any play intervention besides the normal CE program. In this study, both experimental conditions were not structured. In the current research two children from the eighteen participants in the previous study were found not suitable for participation in the CS program, because of blindness and a diagnoses of athetoid cerebral palsy, for which the functional motor abilities are not good enough to be able to play with the toys. With both of these impairments, the nature of the impairment is measured instead of their level of cognitive functioning. These two children were replaced by children who were more suitable for the CS program. In view of enlarging the power and the proven importance of the social context in play (Vygotsky, 1987, in Fu & Stremmel; Pierce-Jordan & Lifter, 2005), the twelve children and young adults in the two experimental conditions of the previous study were combined in the current study into one experimental group that received play intervention within a structured social context. Also, the control group was enlarged to nine children and young adults. The children and young adults were, taking the GMFCS levels into account, selected by the professional opinion of the conductors.

The CS research group in the current research included 14 males aged from 9 to 30 years (M = 21.1, SD = 6.7 ) and 7 females aged from 11 to 27 years (M = 18.3, SD = 4.8 ). The diagnosis of the children and young adults in this group was as follows: spastic quadriplegia N = 6, spastic diplegia N = 3, athetosis N = 1, spastic hemiplegia N = 1, spastic triplegia N = 1, ataxia N = 1, and other (i.e. developmental delay, autism and hydrocephaly) N = 8. Table 2 describes their characteristics, the level on the Play Observation Scale (POS) and the level of gross motor functioning as assessed with the GMFCS by Lange and Post in April 2008 of the children and young adults in the two conditions. The children and young adults were classified for the two POS levels by their play capacities as measured with the POS during the first measurement in the research project of April 2009 and during the first measurement in the current research. Level 2 was used for those participants who scored 6 or

7 on all the toys in level 1 of the POS. No significant differences in age between the experimental condition and the control condition ($F(1,19) = 0.26$, $p = 0,61$) were found.

Table 2: Participant characteristics, POS level and GMFCS classification in the CS research group per condition

| Condition | Gender | | Age | | POS level | | GMFCS classification* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Male* | *Female* | *M* | *SD* | *level 1* | *level 2* | *1* | *2* | *3* | *4* | *5* |
| Experimental | 9 | 3 | 20.8 | 6.1 | 10 | 2 | 1 | 2 | 1 | 7 | 1 |
| Control | 5 | 4 | 19.3 | 6.4 | 7 | 2 | 3 | 1 | 1 | 4 | 0 |

Note. M = Mean age in years, SD = Standard deviation, POS = Play Observation Scale, GMFCS = Gross Motor Functioning Classification System for cerebral palsy.

*Data obtained by Lange and Post (2008)

*Procedure*

The children and young adults in the experimental condition received two toys during a 10-minute play session twice a week for eight weeks including social interaction and stimulation. Each week these toys were replaced by two other toys, which were of an equal level of complexity. Verbal instructions, encouragement and physical assistance were given by the researchers following the Guideline Level of Encouragement for CS program (see Attachment 1). The guideline is in the current study developed based on Vygotksy's 'zone of proximal development' (1987, in Fu & Stremmel, 1993), which stated the level of encouragement a child should receive based on his or her level of play interaction with the toy (in Fu & Stremmel, 1993). The play intervention took place in a separate room in which the child was placed in a position most suitable with respect to their opportunity to play (in chair or wheelchair). Then the toy was placed on the table in front of the child so that the child was able to touch it with his/her hands. From this point encouragement according to the Guideline of Encouragement were given five minutes for each of both toys. If the toy was thrown away by the child, accidentally or on purpose, the researcher waited for about five seconds before placing the toy back to see the child's reaction to the absence of the toy. Once per week both researchers played individually with every individual child. In view of the continuation of the CS program in the future the researchers invited the childcare workers for the playsessions. Occasionally a childcare worker joined, after instructions from the researchers and with the knowledge of the Guideline of Encouragement, a play session. In practice this occurred once

or twice per child during the 8-week period. The children in the control condition did not receive any play intervention during the eight week period.

*Instruments*

As compared to earlier research (Vos & Van Westrhenen, 2009) the Play Obervation Scale (POS) in the current research was adjusted for the detection of smaller effects in play development (see Attachment 2 ).

Play Observation Scale

The purpose of the Play Observation Scale (POS) was to assess the level of children's and young adult's cognitive play abilities in an experimental play setting. The variables chosen were based upon Piaget's (1962) classification of successive stages of play: 'Functional play', 'Constructive play' and 'Dramatic play' (Vos & Westrhenen, 2009).

The POS consists of two levels, the participants with a low level as well as the participants with a higher level of cognitive functioning at the start of the CS program were able to improve their play abilities. Level 1 contained five different toys that were used during the observations. Level 2 contains the two most complex toys used in level 1 and four more complex toys. Level 2 was used for those participants who had a maximum score on the level 1 of the POS during the first measurement in the research project of April 2009 and during the first measurement in the current research. In view of the stages of Piaget level 2 was enlarged with an extra toy based on dramatic play. The toys used for the baseline and final assessment of POS were not the same toys used during the playsession, but the toys were similar in complexity (see Attachment 6).

In the current research the Play Observation Scale was adjusted to enable the detection of smaller effects in cognitive play development. The original 5-point scale for level 1 was enlarged to a 8-point scale (score 0-7) and the 5-point scale for level 2 was enlarged to a 7-point scale (score 0-6) based on the stages of Piaget. Only the toy in level 2 based on dramatic play was measured on a 6-point-scale. For example the 8-point scale for "the ball with sensory aspects" in level 1 is as follows: a score 0 is given if child shows no action towards the toy, score 1 is given if child looks at or reaches for the toy, score 2 is given if child touches and makes sounds with the ball, score 3 is given if child picks up the ball, score 4 is given if child rolls the ball, score 5 is given if child rolls the ball to the researcher, score 6 is given if child throws the ball and score 7 is given if child throws the ball and catches the ball.

Scores of the POS were obtained during a 15-minute or 18-minute play session for all toys, with three minutes of observation for each of the toy, except for toy 7 in level 2, the memory game. The scoring of the memory game took place after the child had ten turns, because it was more relevant how many pairs a child would find instead of the time needed for a pair to be found. For the observations of the play abilities for the toys 1 to 3 at level 1 (ball with sensory aspects, xylophone and car) the child was observed using 10-second intervals. After each 10-second interval a score from zero to seven was given based on the behaviour shown. For the observations of the play abilities for the toys 4 and 5 at level 1 (puzzle box and woodenblocks) and for all the toys at level 2 (puzzle box, woodenblocks, puzzle, memory, alphabet puzzle and elephant and cuddly lion) just one scoring point from zero to six was given after three minutes of observation, since the maximal score gave a better impression of the cognitive ability than the mean score computed after using a 10-second interval. Finally a total mean score of the play abilities of all the toys was computed per assessment (see Attachment 7 for the scoring sheets). A normal distrubution was found for the results of the POS. A Cronbach alpha of 0.81 was found for level 1 of the POS. Because of the small sample size no internal consistency for level 2 was measured.

The possible effects of the CS program was assessed with the POS twice during the 8-week period comparing a baseline- and a final assessment. During the assessment, the toy was, in consensus with the play intervention, placed in front of the child and when the toy was thrown away by the child accidentally or on purpose the researcher waited ten seconds before placing the toy back and a score 0 was scored for the particular interval. Encouragement, through words, nodding and pointing at the toy, was given directly from the beginning of the assessment in combination with positive reinforcement of every interaction with the toy. If the child showed interest in the toy by reaching for the toy, but was physically not able to pick it up, the toy was placed in the hands. No other encouragement or help was given, regardless of the behavior of the child.

In view of the precise scoring it was, other than in the study in April 2009, not possible for one researcher to play and score at the same time. During the assessments, the toy and the encouragement was offered by one researcher and the other researcher scored the play behaviour on the POS. During both assessments the same researcher had scored the POS.

*Data analysis*

The effect of the CS program on the level of play abilities was analysed with a 2 (condition experimental versus control) x 2 (time of assessment: baseline versus final measurement)

Analysisof Variance with time of assessment as a repeated measures factor. This analysis produces main effects for condition and time of assesssment, and an interaction effect for the interaction between these two variables. The interaction effect indicates whether one group changes more than the other across time. For all analyses a $p < .05$ was considered significant.

**Results**

Conductive Education program

The FMAS and LOI were completed for all 39 children and young adults of the CE research group. The PEDI was completed for 17 of the 39 children and young adults. *Table 3* displays the mean scores and standard deviations at the FMAS, LOI and PEDI of the CE research group at the assessments of April 2008, April 2009 and November 2009.

According to the FMAS a significant improvement in functional motor abilities was show in the period from April 2008 to November 2009 ($F$ (2,72) = 4.93; $p$ = 0.01). Post hoc tests showed a significant improvement between April 2008 and April 2009 (p = 0.008), but not between April 2008 and November 2009. A significant improvement was also shown in dressing as measured with the LOI (F (2,74) = 13.25; $p$ = 0.001). Again post hoc tests indicated significant improvement between April 2008 and April 2009 ($p$ = 0.001) aswell between April 2008 and November 2009 ($p$ = 0.001), but not between April 2009 and November 2009. These results were still found with the Wilcoxon nonparametric tests (Z = -3.53; $p$ = 0.001 and Z = -3.54; $p$ = 0.001). Neither for feeding as measured with the LOI nor for any of the domains of the PEDI significants changes were found between April 2008 and November 2009.

The level of gross motor functioning as measured with the GMFCS level in April 2008 appeared not to be a moderator of the effect of the CE program on the functional motor abilities and functional skills according to the PEDI, FMAS and LOI. This means that the effect of the CE program on the motor function abilities are the same for the severely disabled group and the less severely disabled group of children and young adults according to the GMFCS.

Table 3: *Comparison of scores at the PEDI, FMAS and LOI of April 2008, April 2009 and November 2009*

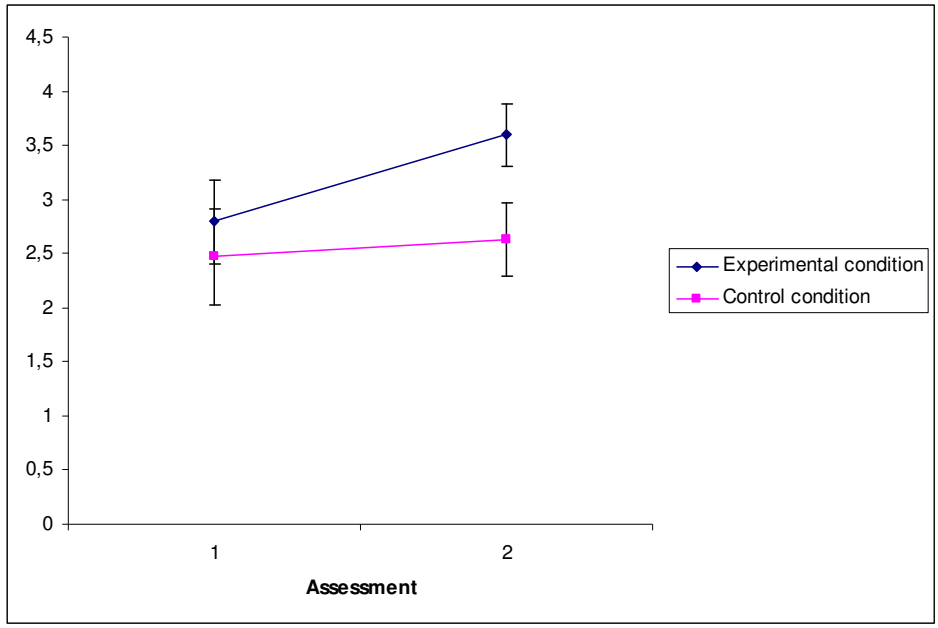
| | | | April 2008 | | April 2009 | | November 2009 | |
|---|---|---|---|---|---|---|---|---|
| | *N* | *Range* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| FMAS | 38 | 0-5 | 1.85 | 1.16 | 2.05 | 1.22 | 2.02 | 1.20 |
| LOI feeding | 39 | 0-1 | 0.37 | 0.38 | 0.41 | 0.38 | 0.39 | 0.39 |
| LOI dressing | 39 | 0-1 | 0.21 | 0.23 | 0.25 | 0.23 | 0.24 | 0.23 |
| PEDI FS SC | 17 | 1-100 | 39.47 | 16.39 | 39.85 | 19.41 | 40.84 | 14.53 |
| PEDI FS M | 17 | 1-100 | 44.93 | 17.09 | 44.15 | 16.46 | 42.60 | 14.32 |
| PEDI FS SF | 17 | 1-100 | 39.04 | 16.56 | 39.55 | 24.35 | 36.16 | 21.55 |
| PEDI CA SC | 17 | 1-100 | 36.56 | 29.49 | 41.52 | 33.54 | 39.59 | 22.76 |
| PEDI CA M | 17 | 1-100 | 44.97 | 20.04 | 42.76 | 27.45 | 44.92 | 26.26 |
| PEDI CA SF | 17 | 1-100 | 32.34 | 26.83 | 37.53 | 37.12 | 28.83 | 24.41 |

*Note.* FMAS = Functional Motor Assessment Scale, LOI = Levels of intervention Observation Instrument, PEDI = Pediatric Evaluation Disability Inventory, FS = Functional Skills scale, CA = Caregiver Assistance scale, SC = Self-Care domain, M = Mobility domain, SF = Social Functioning domain.

Cognitive Stimulation Program

Figure 1 shows the development in play abilities in the 8-week period for the two groups. A significant improvement in play abilities was found between the baseline and final assessment ($F(1,19) = 10.37$; $p = 0.005$) as well as a significant interaction effect between time and condition ($F(1,19) = 4.61$; $p = 0.045$). This means that the group of children and young adults who received the play intervention improved more in their play abilities than the group with no play intervention. No main groupeffect was found.

Figure 1: *Development at the POS at baseline and at the final assessment of the CS research group receiving and not receiving the play intervention*




## Discussion

This research has been performed to evaluate the effectiveness of two developmental programs given in the Sizanani Children's Home for disabled children in Bronkhorstspruit, South Africa. This concerns the Conductive Education (CE) program and the Cognitive Stimulation (CS) program.

*Conductive Education program*

The CE program focuses on motor functioning development to create more independency in daily life activities. This follow-up study measured the development of those skills in children and young adults at Sizanani Children's Home in the period from April 2008 to November 2009. It was expected that the functional motor abilities and the functional skills of the CE research group had been improved during the period from April 2008 to November 2009. The expectation was also that this improvement was related to the baseline level of gross motor function as measured in April 2008. In particular, the children and young adults with a higher baseline level of gross motor functioning were expected to show more improvement in their functional skill development then children and young adults with a lower baseline level of gross motor functioning (Rosenbaum et al., 2002).

Between April 2008 and April 2009 a significant improvement in functional skills according to the FMAS and the dressing subscale of the LOI was found by Vos and Van Westrhenen (2009). On those instruments a significant improvement was also found between April 2008 and November 2009. However, no further improvement was shown between April 2009 and November 2009 with the two instruments. Effects during the entire period were not shown for the feeding subscale of the LOI and the PEDI. In addition, the level of gross motor functioning as measured with the GMFCS was not a moderator for the effect of the CE program as measured by the FMAS, LOI and PEDI. This latter finding is in contrast with the results of Rosenbaum et al. (2002) who found that children with higher motor development potential are more likely to reach their limit of motor functioning at a later stage than children with a lower motor development potential. A possible explanation may be found in the relatively rough classification of the children and young adults children into two groups, which was necessary in the current study because of the small sample size. It is possible that the study of Rosenbaum et al. (2002) could detect smaller effects between each of the different GMFCS levels.

The results of the current research show no additional positive effects of the CE program on the development of the functional skills of the children and young adults in Sizanani Children's Home. This lack of further improvement and thus somewhat disappointing results in functional motor abilities and functional skills during the CE program can be explained by different aspects. First, the admittance criteria at the Sizanani Children's Home are broader than in the original CE program, since also children and young adults who are profoundly disabled, have visual and auditory impairments, autism or problems in their communication also are admitted. These children might be less suitable for the CE program and this might have a negative influence on the effectiveness of the program. A recommendation for future research is to analyse the possible moderator effects of these extra impairments. Second, the CE program at the Sizanani Children's Home is given by childcare workers who were trained by conductors. This may have resulted in less educated coaches for the children and young adults,which might negatively effect the aim of the CE program. Third, both the morning program and the afternoon program of the CE are not very structured, because of the lack of a structured manual. In practice this means that the childcare workers give their own interpretation to the program. Furthermore this means there is no intensive stimulation of the CE goals of the children and young adults during the *whole* day. The lower intensity of the program may negatively effect the development of the functional skills and gross motor functioning of the children and young adults. The adjusted manual for the CE program in Sizanani Children's Home, wich will be implemented in January 2010, will partly solve this issue.

A strength of this CE study is the use of reliable and valid instruments. The reliability and validity of the FMAS, the LOI and the PEDI were proven to be good for children and young adults

with disabling conditions or cerebral palsy (Haley et al. 1992, Vermeer et al., 1995; Vermeer et al., 2006). Another strength is that since the evaluation of the CE program, three different measurements in 2008 and 2009 were taken by different researchers. This way, the researchers were not prejudiced, which prevented observer bias. The PEDI is completed by the same childcare workers as in April 2008. This contributes to the reliability of this instrument, because these childcare workers knows the children and young adults very well.

This study has, however, also several methodological shortcomings. First, the sample size was relatively small. The program included 39 children and since not all the measurements of the CE program were performed for all the children of the research group, the sample size for the PEDI was even smaller (N=17). Small to moderate time effects or small to moderate group differences may not be found when sample sizes are this small. Second, this study included no control group. For future research it is recommended to include a control group in which children and young adults do not participate in the CE program. In the near future this may be accomplished by the out-reaching program of Sizanani Children's Home. Third, it is possible that the development of motor functioning of the children and young adults in Sizanani Children's is too small to detect. Palisano et al. (2000) found that children with CP older than seven years of age do not often make substantial changes in the gross motor abilities. Finally, instructions were given and interviews were taken in English, which might occasionally have led to miscommunication between the researchers and childcare workers, because the main language spoken by the childcare workers is Zulu. To avoid this miscommunication as much as possible, the researchers asked the questions in different forms.

In conclusion, the CE program at Sizanani Children's Home has shown some effects on functional motor abilities and functional skills between April 2008 and April 2009, but not between April 2009 and November 2009. For future research it is recommended that the CE program at Sizanani Children's Home is given in a more structured and intensive way. The adjusted manual of the CE program, which is implemented in January 2010, may take an important role in this. Futhermore, efforts should be taken to increase the number of participants in the CE program because otherwise the power will be to low to detect small to moderate effects of the program

*Cognitive Stimulation program*

Since most children with CP are also profoundly mentally disabled, another program was designed and tested in the Sizanani Children's Home which focused on stimulating the mental development of the children and young adults. This CS program was an 8-week program consisting of an experimental group, in which the participants received cognitive stimulation two times a week by play intervention in a supportive social context, and a control group, in which the participants

received no play intervention. The possible cognitive improvement during this program has been assessed with the adapted Play Observation Scale (POS; Vos & Van Westrhenen, 2009) through the observation of play performance. This instrument is based upon Piaget's (1962) classification of successive stages of play and was, in the current study, adjusted to make it more sensitive.

In the preceding study of Vos and Van Westrhenen (2009), a non-significant improvement in play abilities as measured with the POS was found following three months of the CS program. The lack of a significant improvement might have been caused by a couple of reasons. First, the lack of a couple structured manner of teaching to optimize learning opportunities. Second, the small number of participants. Third, the relatively small and therefore not easily detectable effects. Finally, a measuring instrument that might not have been sensitive enough to detect these effects. Therefore, in the current study, a number of adjustments have been made to optimize the program, the instrument and the methodology to enlarge the chance of finding positive effects.

First, the quality of the CS program itself was improved in the current study by the introduction of the Guideline Level of Encouragement for CS program, based on the "zone of proximal development" of Vygotski (1987; in Fu & Stremmel, 1993), which has been developed to provide concrete steps in interaction of the researcher with the child or young adult to increase their opportunity to learn from the program. Second, to detect smaller changes in the children's play abilities, the original POS had been adjusted in such a way that the instrument was more sensitive and more accurate. For this aim, additional steps have been inserted in the observation instrument. The 5-point scale in level 1 was in the current research enlarged to an 8-point scale and the 5-point scale in level 2 was enlarged to a 7-point scale. Third, both the experimental and the control group have been extended in their number of participants to enlarge the power and improve the likelihood of detecting relatively small effects of the CS program.

In concordance with the expectations, a significant improvement was shown in play abilities of the experimantal group during the 8-week period, whereas no significant improvement was found in the play abilities of the control group. Since previous studies supported the relation between play performance and cognitive development (Majnemer, Messier & Ferland, 2008; Hsieh-Chun, 2008), the initial conclusion can be drawn that improvement in play abilities affect the cognitive developmental level in a positive way.

However, there are still several methodological issues, as the fact that the POS was based on the theory of Piaget (1962), which originally focused on the development of children without disabilities. It was suggested in literature that the children without disabilities succeed through the successive stages of Piaget, whereas children with cognitive disabilities could have some limitations in their play behaviour (Pierce-Jordan & Lifter, 2005; Rutherford & Rogers, 2003). The Guideline Level of Encouragement for CS program was developed partly to physically assist the

children and young adults when necessary, but still physical limitations may have affected the development through the stages of Piaget. Third, in this research it was observed that the four children and young adults in level 2 were less motivated to show toy appropriate behaviour in the final stage of Piaget (1962), the stage of 'Dramatic play', whereas they seemed capable of doing so. It is possible that these children not yet mastered their dramatic play stage, but it might also be that these children were inhibited to show this behaviour because they reached their mental age of adolescence and felt ashamed of engaging in pretend play. In normal children this will not be a problem, because they will go through these stages of development by Piaget (1962) at a younger age. Further research on the mental age of the children and young adults in Sizanani Children's Home is therefore needed.

Other issues concern possible explanations of the improvement in play abilities other than a real growth in the cognitive abilities of the children and young adults. First, the improvement at the POS might be explained by the fact that the children and young adults were also trained in playing with these particular toys. To minimalize this issue, different toys were used during the play sessions and the assessments. To control for this external factor, a recommendation for future research is to add another method to measure the cognitive improvement, next to measuring only the play abilities. Second, attachment to the researchers can be an external factor that accounts for a portion of the variation in the play abilities. The children and young adults in the experimental group might have been more attached to the researchers after the eight week period of CS program, as a result of which they might have felt more secure during the final assessment and performed better compared to the baseline. Children are more likely to explore their world when they feel secure (Bowlby, 1982). A recommendation for future research is to include a second control condition in which the children and young adults do have social interaction two times a week, but do not receive the play intervention. In view of the continuation of the program it is also important in future research to test the inter-observer reliability of the POS. A recommendation for this is to record the children and young adults during the assessment of the POS.

Despite these shortcomings, the results of the present study showed that the adapted CS program is an effective way to stimulate the cognitive development of the children and young adults of the Sizanani Children's Home. Because of these positive results, it would be desirable to continue this program in future. To accomplish this, the childcare workers should be educated about the program, both individually and group wise. A manual has been constructed of the procedure and requisites for the play sessions, as well as of the use of the POS during the observations.

For further research on the effect of the implementation of the CS program, it is recommended to also study effects on the well being of the children and young adults (Livingston, Rosenbaum, Russel & Palisano, 2007), since this is possible the value of the play intervention.

“Play can promote the emergence of pleasure in action and the development of the capacity to act in children, leading them to autonomy and a feeling of well being” (Ferland 1997; in Messier et. al., 2007).

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**Attachment 1**

**Guideline Level of Encouragement for CS program**

This guideline is based on the "zone of proximal development" developed by Vygotsky (1987; in Fu & Stremmel, 1993) and prescribes the level of encouragement and support a child will receive from the researcher during the play intervention sessions in the Cognitive Stimulation program. This level will be dependent of the level of interaction the child shows with the toy during a specific period of time within this session. The guideline for encouragement is meant to adjust the play intervention to different levels of development of different children so each child could benefit from it. Where a child shows evidence of success, adult assistance should offer more scope for the child to assume greater independence; conversely, following on the child's frustration and error in accomplishing a task or achieving a desired goal, more assistance should be provided, and thus teacher responsibility should be increased (Wood, 1988; in Fu & Stremmel, 1993). The amount of time in seconds suggested in this guideline should be considered as an estimation of the time needed to give the child the opportunity to show initiative before interference of the teacher.

Levels of encouragement:

1. The toy is placed in front of the child and the child will receive positive reinforcement of every spontaneous interaction with the toy.
2. If the child shows no interaction with the toy, other than looking (like reaching for it or touching it), for more than 30 seconds, the child will be given encouragement through words, nodding or pointing at the toy and positive reinforcement of every interaction with the toy.
3. If the child shows looking at, reaching for or touching the toy but no grabbing the toy for at least 60 seconds, the researcher will physically assist the child to enable the playing, combined with positive reinforcement of every interaction with the toy.
4. If the child shows no interaction with the toy, other than looking, reaching for it or touching it, after at least 60 seconds of level 3 encouragement, the toy will be placed in the hands of the child, combined with positive reinforcement of every interaction with the toy.
5. If the child shows looking at, reaching for, touching and grabbing the toy but no toy specific functional action with the toy for at least 60 seconds, the researcher will model the appropriate toy specific behavior after which the toy again will be placed in the hands of the child, combined with positive reinforcement of every interaction with the toy.

6. If the child shows no toy specific functional action with the toy after at least 60 seconds of level 5 encouragement, the researcher will physically join the child in playing with the toy, combined with positive reinforcement of every interaction with the toy.

**Guideline level of encouragement: Schematic reproduction**

• Starting position: toy placed in front of child

→ 1. No encouragement

If child shows:

• *Looking* at the toy AND THEN
No touching or reaching toy for 30 seconds
→ 2. Encouragement through words, nodding or pointing

• Looking at, *touching* and *reaching* for the toy AND THEN
No grabbing toy for 60 seconds
→ 3. Physically assist the child (and encouragement through words, nodding or pointing)

• Looking at, *touching* and *reaching* for the toy AND THEN
No grabbing toy after 60 seconds of level 3 encouragement
→ 4. Place toy in hands of child (and encouragement through words, nodding or pointing)

• Looking at, touching, reaching and *grabbing* the toy AND THEN
No functional action with toy for 60 seconds
→ 5. Model appropriate toy specific behavior (and encouragement through words, nodding or pointing)

• Looking at, touching, reaching and *grabbing* the toy AND THEN
No functional action with toy after 60 seconds of level 5 encouragement
→ 6. Physically join in play (and encouragement through words, nodding or pointing)

**Attachment 2**

**Play Observation Scale Scoring Table Level 1**

| Toy | Description | Piaget's Variable | Scoring Point | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Ball with sensory aspects | Functional Play | No action | Looking/ Reaching | Touching and making sound | Picking up | Rolling | Rolling over | Throwing the ball | Throwing/rolling the ball and catching |
| 2 | Instrument Xylophone | Functional & Constructive Play (≥ scoring point 4) | No action | Looking/ Reaching | Touching | Picking up | Making sound without stick | Making sound with the stick | Making music | Making music across from left to right (vice versa) |
| 3 | Car | Functional & Dramatic Play (≥scoring point 5) | No action | Looking/ Reaching | Touching | Picking up | Rolling | Play driving | Play driving and making sound | Play driving, making sounds, and digging |
| 4 | Puzzle box | Functional & Constructive Play (≥ scoring point 4) | No action | Looking/ Reaching | Touching, feeling wholes | Picking up | Building with blocks/ move lid aside and put blocks in box | Try to put blocks in holes | Put 1 to 3 blocks in correct holes | Put 4 or more blocks in correct holes |
| 5 | Duplo/ wooden blocks | Functional & Constructive Play (≥scoring point 4) | No action | Looking/ Reaching | Touching | Picking up | Put two blocks together | Put more than two blocks together | Making object with blocks on ground floor | Building an object with the blocks higher than ground floor |

**Play Observation Scale Scoring Table Level 2**

| Toy | ToyDescription | Piaget's Variables | Scoring Point | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 4 | Puzzle box | Functional & Constructive Play (≥ scoring point 2) | No action/ looking/ reaching | Touching/ picking up | Try to put blocks in holes | Put 1 to 3 blocks in correct holes | Put 4 to 6 blocks in correct holes | Put 7 to 9 blocks in correct holes | Put 10 or more blocks in correct holes |
| 5 | Wooden blocks | Functional & Constructive Play (≥ scoring point 2) | No action/ looking/ reaching | Touching/ picking up | Put two blocks together | Put more than two blocks together | Making object with blocks on ground level | Building an object with the blocks higher than ground level | Building more than one object with blocks (one higher than ground level) |
| 6 | Puzzle | Functional & Constructive Play (≥scoring point 2) | No action/ looking/ reaching | Touching/ picking up | Try to do puzzle/ put wrong pieces together | Put 2 to 4 pieces together | Put 5 to 8 pieces together | Put 9 to 12 pieces together | Put 13 or more pieces together |
| 7 | Memory | Functional & Constructive Play (≥ scoring point 2) | No action/ looking/ reaching | Touching/ picking up | Turn and compare cards/ finds wrong pairs | Find 1 to 3 pairs | Find 4 to 6 pairs | Find 7 or 8 pairs | Find 9 or more pairs |
| 8 | Alphabet puzzle | Functional & Constructive Play (≥ scoring point 2) | No action/ looking/ reaching | Touching/ picking up | Search for pairs/ find wrong pairs | Find 1 to 5 pairs | Find 6 to 10 pairs | Find 11 to 15 pairs | Find 16 to 20 pairs |
| 9 | Elephant & cuddly lion | Functional Play & Dramatic Play (≥ scoring point 2) | No action/ looking/ reaching | Touching/ picking up | Play walking animal/ making sounds | Play walking animal and making sounds | Play walking animals together and making sounds | Play animals together (e.g. eating, hugging or fighting) | |

**Attachment 3**

**Play Observation Scale Coding Sheet Level 1**

Name of Child:_____ Unit ___ Free Play Session _____

| **1** | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 |
|---|---|---|---|---|---|---|---|---|---|---|
| Scoring Point | | | | | | | | | | |
| | 1.50 | 2.00 | 2.10 | 2.20 | 2.30 | 2.40 | 2.50 | 3.00 | Total | Mean |
| Scoring Point | | | | | | | | | | |

| **2** | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 |
|---|---|---|---|---|---|---|---|---|---|---|
| Scoring Point | | | | | | | | | | |
| | 1.50 | 2.00 | 2.10 | 2.20 | 2.30 | 2.40 | 2.50 | 3.00 | Total | Mean |
| Scoring Point | | | | | | | | | | |

| **3** | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 |
|---|---|---|---|---|---|---|---|---|---|---|
| Scoring Point | | | | | | | | | | |
| | 1.50 | 2.00 | 2.10 | 2.20 | 2.30 | 2.40 | 2.50 | 3.00 | Total | Mean |
| Scoring Point | | | | | | | | | | |

| **4** | Total |
|---|---|
| Scoring Point | |

| **5** | Total |
|---|---|
| Scoring Point | |

| **Total** | |
|---|---|
| **Mean** | |

**Play Observation Scale Coding Sheet Level 2**

Name of Child:_____ Unit ___ Free Play Session _____

| **4** | Total |
|---|---|
| Scoring Point | |

| **5** | Total |
|---|---|
| Scoring Point | |

| **6** | Total |
|---|---|
| Scoring Point | |

| **7** | Total |
|---|---|
| Scoring Point | |

| **8** | Total |
|---|---|
| Scoring Point | |

| **9** | Total |
|---|---|
| Scoring Point | |

| **Total** | |
|---|---|
| **Mean** | |