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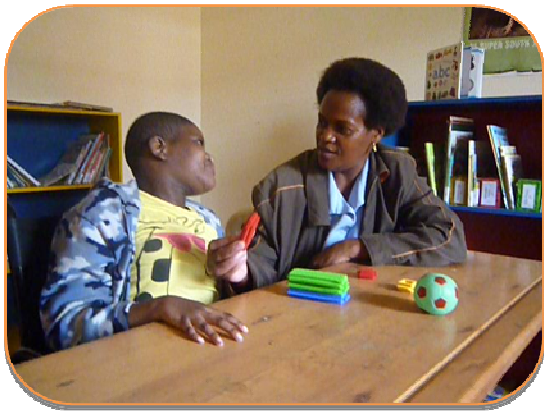
Evaluation of a cognitive play intervention in children with profound multiple disabilities at a children's home in South Africa.



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Abstract

Purpose: This research was designed to evaluate the effectiveness of a cognitive play intervention (CPI) on improving cognitive play performances of children with moderate to severe disabilities in Sizanani Children's Home in South Africa. Additionally, it has been investigated if children with varying functional abilities (social, cognitive and physical) profit differently of the intervention and if the effect of CPI is moderated by the effect of one of the parallel programs, Conductive Education (CE) or Multi-Sensory-Storytelling (MSST). **Method:** The research has been conducted in a single-case-experimental design with multiple interventions. Thirty children participated in CPI. In a 6-week period, the children received two play sessions per week from the childcare workers. The level of cognitive play performance has been assessed by means of the 'Play Observation Scale' (POS). Part of the research group also took part in either one or both of the parallel programs (CE and MSST). The effectiveness of the Conductive Education (CE) has been determined by means of the 'Goal Attainment Scale' (GAS), the level of gross and fine motor skills with the 'Fine and Gross Motor Scale' (FGMS). The level of social responsiveness before and after the MSST program has been measured with the 'Social Responsiveness Scale' (SRS). **Results:** The cognitive play intervention shows a significant effect on cognitive play performance. The cognitive play abilities of the residents in Sizanani Children's Home improved more during CPI than during the MSST-intervention or the baseline period. It has been established that children starting the intervention with a lower level of cognitive play progress to a greater extent than those already starting on a higher level. The level of motor functioning or social responsiveness does not moderate the effectiveness of CPI on cognitive play performances. Neither is the effectiveness of CPI moderated by the effect of one of the parallel programs (CE and MSST). **Conclusion:** The cognitive play intervention, as implemented in Sizanani Children's Home and conducted by the childcare workers, contributes to the cognitive development of the children and young adults. Participating in the CPI has a positive effect on the cognitive play performance, especially for those whose play abilities are not much developed yet. It can be concluded that the intervention is suitable for all children regardless of their motor or social functioning and gives the residents an opportunity to profit from the valuable effects that play has on the cognitive development.

Introduction

In childhood, play seems to occur naturally at every moment of the day and everything getting into a child's hands will be turned into a toy. Play does not only serve as an entertaining activity for children, but play with toys helps acquiring new skills and constructing knowledge of objects in general. Consequently, play offers a child useful learning experiences contributing to the cognitive development (Bruner, 1976). Play in children with disabilities tends to occur less natural and often as in children without disabilities (Malone, 1999). As a consequence, those children miss out on important learning experiences (Rosenbaum, 2005). However, research has proven that children with disabilities can show more play behavior in a stimulating environment (Brodin, 1999). Thus, structured play therapy can help to overcome the lack of motivation to play and teach children with handicaps the required skills to play (Frey & Kaiser, 2010). Hence, the children engage in more play activities, enabling them to take part in important learning experience, contributing to the child's development (Murphy, Callias & Carr, 1985).

Based on those findings, the effectiveness of an implemented play intervention in a Children's Home in South Africa will be examined. The cognitive play intervention (CPI) has been introduced in Sizanani Children's Home in Bronkhorstspruit South Africa, a residential facility, accommodating children with severe intellectual and physical disabilities, whereof most are diagnosed with cerebral palsy. In previous years master students introduced and carried out a play intervention themselves, finding a significant improvement in cognitive play performance (Vos & Westrhenen,van, 2009; Velzen,van & Mathot, 2010). Given the significant progress, an extended version of last years CPI has been implemented in the Home, so that the play therapy can be conducted by the childcare workers themselves. Accordingly, the present study will focus on the implementation of an improved and extended version of the CPI given by the childcare workers and on the evaluation of its effectiveness in stimulating cognitive functioning through play. The intervention has been implemented in addition to two programs already established in the Home's daily routine. Both programs, Conductive Education (CE) and Multi-Sensory-Storytelling (MSST) are integrated approaches addressing all aspects of development, including motor, social and cognitive components. Conductive Education (CE) is a holistic approach for people with physical disabilities. CE is carried out in daily group sessions concentrating on improving general abilities to become more independent in daily activities by promoting and training motor functioning. Each participant works on an individual goals focusing on motor, social and/or

cognitive development (Coles & Zsargo, 1998). Individual goals vary for instance from learning to brush teeth, sitting without support to lifting up the head. The effectiveness of the program will be investigated in a parallel research (for more information see Twilhaar, 2011). The second program, Multi-Sensory Storytelling (MSST) consists of personal stories derived from the children's daily life's (Nispel & Vermeer, 2010). The stories offer sensory stimulation in the form of smelling objects, touching various things and feeling different materials. Hereby different aspects of the development are trained, such as cognitive, motor and social functioning. Especially the aspect of social responsiveness will be examined in a parallel research conducted in the same research period (for more information see Halfens, 2011).

The cognitive play intervention (CPI), implemented in Sizanani Children's Home, is a structured play therapy intending to improve cognitive functioning through play. More specifically, it seeks to enhance cognitive play performance by elaborating play skills with toys. Cognitive play performance refers to play abilities reflecting the level of cognitive development. According to Smilansky, play behavior can be classified into three successive stages representing cognitive development: functional play, constructive play and dramatic play (Smilansky, 1968). The first and simplest stage is 'functional play', which is characterized as a stage with simple repetitive physical behaviors without a specific purpose but sensory stimulation. The second stage 'constructive play' is defined as manipulating objects and creating things with the toys offered, for example building a tower with the blocks. The last stage 'dramatic play' is described as pretend play, requiring a higher level of cognitive functioning like building a house out of blocks and pretending to live there (McCabe, Jenkins, Mills, Dale & Cole, 1999).

Play behavior not only reflects the level of cognitive development, it also contributes to its development. Learning to play with toys increases the ability to manipulate objects, enabling the children to explore the unique physical properties of objects, as well as their spatial, causal and functional relations (Fenson, Kagan, Kearsley & Zelazo, 1976). Thereby children gain a better understanding of their surrounding and get a chance to develop cognitions. According to Piaget, children create schemes of the physical and spatial relations of objects in their environment through explorative behavior. Those schemes form the basis for further cognitive development. Children compare new experiences with their schemes, transform and reorganize them accordingly and finally, in a later cognitive stage, create mental representations that cannot be directly inferred from the environment anymore

(Goshwami, 2008). Gibson on the other hand strongly opposes the idea of mental representations and emphasizes the direct perception of affordances offered from the environment. According to Gibson, getting to know affordances of the environment thus accounts for the basis and growth of cognitive knowledge. Affordances are defined as properties of the environment or objects, enabling different actions (Chemero, 2003). Discovering new affordances enables children to gain a better insight of how the world around them functions (Thelen, 2000). Despite distinct notions regarding the development of higher cognitions, Piaget and Gibson agree that exploration of the environment plays a fundamental role in the early cognitive development and forms the basis for further development (Ruben, Maioni & Homung, 1978). The exploration of the environment can be stimulated by elaborating play skills, which enables the discovery of different properties in the environment (Munier, Meyers & Pierce, 2007).

As mentioned earlier, the natural play instinct in children with disabilities seems to be less developed. They need more motivation and support to engage in play activities and to improve their play skills (Murphy, Callias & Carr, 1985). Vygotsky's sociocultural learning method, emphasizing the importance of social interaction in constructing knowledge and acquiring new abilities (Oakley, 2004), can help children with disabilities to play and elaborate cognitive play skills with the essential extra support and motivation. The CPI's procedure in particular is based on Vygotsky's ideas of sensitive teaching: giving sensitive assistance within the 'Zone of Proximal Development'. The Zone of Proximal Development is defined as the distance between the actual developmental level, the processes that are already developed and the potential level of the child, which refers to the processes that are not fully matured yet. 'Sensitive assistance' indicates that an experienced other, the sensitive teacher, creates opportunities for the children to perform at levels they could not achieve on their own (Oakley, 2004). The teacher is seen as a co-participant in the child's construction of knowledge, assisting the child in learning how to solve problems and complete tasks (Fu & Stremmel, 1993). By giving the children enough support to reach a specific goal and by challenging them to go one step further, development is stimulated. In the end the children should be able to perform the task by themselves (Levykh, 2008). Sensitive assistance in the CPI is translated into three steps to tailor the help given to the specific needs of the children and promoting independence in play. The first step of support consists of hand-over-hand physical help by the teacher. In the second step the child should get a demonstration of an appropriate play behavior (modeling). In the third step the child will just need verbal

encouragement and nodding to be able to perform the task. The more independence and initiative a child demonstrates the less assistance will be given. In order to improve play abilities and consequently also cognitive abilities it is desirable to decrease the level of assistance needed for a certain activity during the course of the intervention

A possible progress in cognitive play performance is difficult to assess with standardized tests in children with disabilities (Mayes, 1999). Standardized tests mostly rely on motor functioning and verbal abilities. Instead, play with objects is regarded to be a useful alternative to assess cognitive abilities (Power & Radcliffe, 1989). Research has shown a strong correlation between the developmental age and play level, attributing an essential value to play assessment as an alternative method of assessing cognitive abilities during the sensorimotor stage (Gowen, Goldman, Johnson-Martin & Hussey, 1989). Thus, play can also be seen as a reflection of early cognitive development (Goodley & Runswick-Cole, 2010). For example the early levels of sensorimotor-exploratory play is reflective of the early stages of sensorimotor development, whereas later forms of play, e.g. symbolic play, is indicative of later stages of sensorimotor development, an early aspects of preoperational development (Casby, 2003).

In order to assess the progress of cognitive abilities in this year's research the Play Observation Scale developed by previous master students (POS, Vos & Westrehnen, 2009), modified from Rubins (1984) version of the POS and based on Smilansky's (1968) sequence of play, is used to measure the level of cognitive functioning at the beginning and end of the intervention. The POS is based on play behaviors typical for the sensorimotor stage of cognitive development. Earlier observations of the play behavior of the residents in Sizanani Children's Home have indicated that their current play performances correspond to the play performances expected on a sensorimotor level of development. Therefore the POS proofs to be a suitable test for residents of Sizanani Children's Home. During the cognitive assessment by means of the POS, children have been offered various toys in a free play session and their play performance without any assistance has been observed before the therapy starts.

Additionally, during the intervention sessions itself, it has been assessed if an improvement in play abilities was accompanied by a decrease in the assistance given for each specific activity, in order to measure if there is an increase in independence of play abilities. Therefore, the level of assistance needed during the sessions has been assessed during the course of the intervention by means of the LIP-scale (Level of independent play-scale).

With regard to the actual implementation of the play intervention in Sizanani

Children's Home, changes from last years intervention and scoring instruments needed to be made and practical preparations needed to be done (detailed description in the method section). In addition to the implementation of the therapy, the research concentrates on the evaluation of the intervention, addressing the following research questions: To what extent does the cognitive play intervention have an influence on the cognitive play performance of the residents of Sizanani Children's Home?

The primary research question focuses on the evaluation of the effectiveness of CPI in enhancing cognitive functioning through play. Additionally, it has been examined if the chosen approach based on Vygotsky's sensitive teaching proofs to be effective by showing an increase in independent play over the course of the intervention. The research has been conducted as a single-case experimental design with multiple interventions: the first two weeks were a baseline period without intervention, followed by a 6 weeks period of MSST and 6 weeks of CPI. To assess the effectiveness of CPI, the growth of cognitive play performance during the play intervention has been compared to the growth of cognitive play performance during the MSST or baseline period. It has been hypothesized that the children improve their level of cognitive play performance to a larger extend during CPI than during the baseline period or MSST period. It has also been expected that the support needed to carry out a specific activity will gradually decrease during the course of the intervention.

Improving cognitive play performances asks more off a child than an increase in pure cognitive knowledge, such as having a more knowledge of spatial, functional and causal relations of objects and more problem-solving skills (Smith & Sheya, 2010). In order to master more sophisticated play performances, a child for example also needs to have the appropriate eye-hand coordination, the physical strength to lift the object and the essential concentration and motivation to focus on the task (Rodger, Ziviani, 1999; Smith & Sheya, 2010). The idea of various factors that need to interact and develop before a child is capable of mastering more sophisticated play behaviors, is an idea strongly supported by dynamic-system theorists (Thelen, 2000). Development according to Dynamic-System-Theory is described as self-organizing. New pattern of behavior emerges from interaction of various components without specific instructions from within the child or from the environment. Behavior is dynamic and different systems influence each other to evoke new behavior patterns (Smith & Thelen, 1997). The notion of interconnectedness can also be linked to Gibson's theory of cognitive development: for example improving motor functioning enables the children to explore their environment and to get to know more affordances, providing

more and different experiences to learn from. Abilities like reaching and grasping change affordances of things and places and provide new opportunities for acquiring knowledge and therefore contribute to the cognitive development (Gibson, 1988). Children with different levels of abilities have had different experiences and show different capabilities, which might let them profit differently from the play intervention. That is an important aspect to keep in mind, considering the great diversity of disabilities and capabilities of the residents of Sizanani Children's Home.

Thus, as a secondary research question it has been investigated if the initial level of children's functional abilities moderates the effect of CPI on improving cognitive play performances. More precisely, it it has been examined if there is a relation between the initial level of cognitive play performance, motor function and social responsiveness and the progress in cognitive performance. It was expected that children with a higher level of motor and/or cognitive functioning, also show higher levels of play performances. A higher initial level of cognitive abilities indicates an already existing repertoire of cognitive abilities enabling the child to solve tasks more easily and elaborate their existing knowledge and play behaviors to a greater extent. Similarly, a higher initial level of motor functioning implies a greater knowledge of affordances as the children had more chances to explore the world around them and consequently already acquainted more knowledge about the world (Gibson, 1988). Likewise, it has been hypothesized that children showing a higher level of social responsiveness at the beginning of the intervention might profit more off the assistance and stimulation given during the play sessions and as such may improve their cognitive play abilities more than children with a lower level of social responsiveness.

As mentioned earlier, Sizanani Children's Home offers two other interventions that some of the participants take part in as well, either before CPI or at the same time. The two programs could also influence the efficacy of the play therapy. That's why the third part of the research concentrates on examining a possible relation of an effect of the other two programs on the effectiveness of the play therapy on improving cognitive play. More precisely, this research has examined the relation between the improvement in motor functions as measured by reaching individual goals during the CE program after 2 months and the improvement in cognitive play performance measured after CPI. It has been expected that children achieving their individual goals show more progress in cognitive play abilities.

As a last question, the current research has attempted to identify a relation between a progress in social responsiveness at the end of MSST and the progress of cognitive play performance

after participating in CPI. It has been hypothesized that children showing progress in social responsiveness might profit more off the sensitive assistance and stimulation given during the play sessions and might as a result show more improvement in the cognitive play performance.

Method

Participants

Thirty children of Sizanani Children's Home were selected to participate in CPI. The selection of the participants has been based on the professional opinion of the manager of the Home, taking their general physical and mental development into consideration. Most importantly, a basic awareness of and reaction to the environment and the ability to move at least one arm and hand were requirements for participation. The participants age ranges from 10 to 31 years (M = 21.8, SD = 5.35). The majority of the participants are diagnosed with cerebral palsy (66%), whereas the rest of the group (34%) has different impairments such as brain injury, developmental delay, autism and spina bifida. Not every participant has a proper diagnosis; the descriptions above are indications of the disabilities. Moreover, the children's and young adults disabilities are often accompanied by epilepsy, visual and hearing impairment and hyperactivity.

The thirty children participating in CPI also took part in one or both of the parallel programs (CE & MSST) offered in the Home. Figure1 summarizes the exact distribution of the children participating in CPI and their participation in the parallel programs.

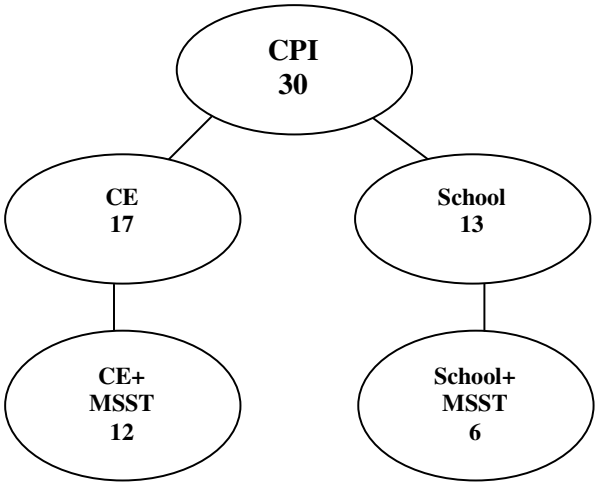

Figure 1. Overview of number of participants in the different programs.

The three programs were spread over the research period and provided at different moments during the day. CE was conducted in the mornings throughout the whole period, whereas MSST was given during the first 6 weeks in the afternoons, followed by 6 weeks period of CPI given in the afternoons, as shown in figure 2. T1 to T4 represent the assessments of cognitive play performance by means of the POS.

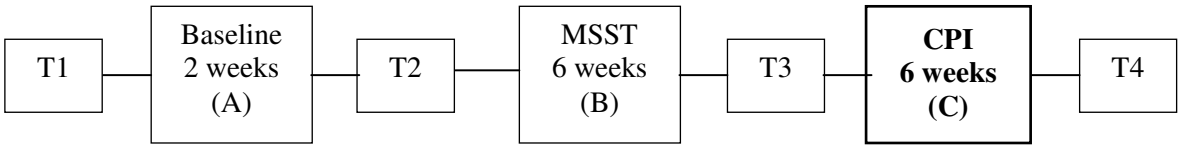

Figure 2. Schemata of the ABC single-case experimental design.

The current study used a single-case-experimental design instead of the non-randomized-pretest-posttest-matched-control group design that has been used in last year's research. This bears two major advantages: In the single-case experimental design each child functions as his/her own control group, meaning that data from the participant's baseline will be compared to data measured after the intervention phase. That substitutes for a difficult matching procedure for those very unique children and also enlarges the power, as all the participants can be placed in the experimental group.

Procedure

Cognitive Play Intervention sessions. In order to prepare the childcare workers to carry out the intervention themselves, a protocol has been written and a workshop has been organized to familiarize them with the procedure of the intervention. The written protocol illustrates the most commonly expected actions a child would perform within the sensorimotor stage with the toys used during the therapy (see appendix 1).

During the cognitive play intervention period the children attended two sessions per week given by different childcare workers every time. In a 10-minute session the children played with two different toys. Every session, the children played with two different toys, so that at the end of the intervention period they had played with every toy at least twice.

The exact procedure of the therapy will be illustrated by means of an example of a play session with the toy 'ball': The childcare worker offers the ball to the child and observes what the child is doing spontaneously with it. Subsequently, the childcare worker follows the instructions in the protocol to provide the child with as much support as needed to elicit a

higher level of cognitive play performance. First, the childcare worker encourages the child through words, nodding or pointing to evoke a functional action with the ball. In case the child is not engaging in a functional action yet, the childcare worker can model an appropriate action, e.g. rolling or throwing the ball. If the child does not react to the demonstration either, the childcare worker can physically help the child to perform the action by putting the hand on top of the child's hand and roll the ball together. Ideally, the child will need gradually less support and in the end will be able to perform a functional action by himself/herself.

After approximately 5 minutes of play time with the one toy, the childcare worker can introduce the second toy and follow the same procedure.

Instruments

Play Observation Scale (POS). The POS measures the level of cognitive play abilities indicating the level of cognitive development within Piaget's sensorimotor stage (see appendix 2). The scale consists of 9 different toys, eliciting different levels of cognitive play, as shown in table 1.

Table 1.

Overview of toys.

	Toy	Level of cognitive play
1	ball	functional play
2	xylophon	functional & constructive play
3	car	functional & constructional play & drama play
4	wooden blocks	functional & constructional play & drama play
5	puzzle	functional & constructional play
6	puzzle box	functional & constructional play
7	number puzzle	functional & constructional play
8	memory	functional & constructional play
9	camel & lion	functional & drama play

During the assessment by means of the POS, which has been conducted by one of the master students, one child at a time was placed in a quiet room in a comfortable position at the table. The student offered the first toy (ball) to the child, observed his/her play behavior for three minutes and gave positive reinforcement when appropriate. When initiated by the child, the student would join in the game by for example tossing the ball back to the child. After three

minutes the next toy was offered and the child's play behavior could be observed. Again, no explanation was offered, so that the child's self-initiated actions could be recorded. Interaction was only allowed when obviously initiated by the child. Every three minutes the child got a new toy (for more information about scoring see manual for POS, appendix 2.2).

The possible actions for each toy, that can be observed and scored, are divided into seven steps; these seven steps are indicative for the three different stages of cognitive play. This can be illustrated by an example for possible actions with the xylophone: score 0= 'no action', score 1 = looking, score 2 = ‘touching’ and score 3 = ‘picking up’. Score 2 and 3 are characteristic for functional play. Score 4= ‘making sound without the stick’ and score 5= ‘making sound using the stick’ represent two actions of constructional play. The last steps 6= ‘producing a music tone’ and 7= ‘playing music from right to left and/or vice versa’ show characteristics of dramatic play (see table 2).

Table 2.

Example of scoring system for one toy.

Description	Stages of Play	0	1	2	3	4	5	6	7
2. Xylophon	Functional & Constr. Play	No action	Touching	Looking/ Reaching	Picking up/ squeezing	Rolling	Rolling over	Throwing the ball	Throw & catch the ball

For toys that can elicit different levels of cognitive play (ball, xylophone, car and stuffed animals), the children will receive a score in the range of 1 to 7 during three minutes, scored in 10 second intervals based on their shown play behavior. For toys where the final result is decisive (blocks, puzzle, puzzle box, memory and number puzzle), children will get one score after the three minutes observation period, representing their maximal score over the period. The maximum score is more representative for those toys than an average score over the whole period would be. After the child has played with the first 5 toys (ball, xylophon, car, blocks, puzzle), it has to be assessed if he/ she attained a score higher than three on at least three different toys, indicating that at least a basic level of functional play has been performed. If the child attained at least a mean score of 4 on 3 different toys of the POS, he/she will be offered toys 6-9 (puzzle-box, memory, number-puzzle, stuffed animals). Otherwise the test will stop. The mean score of every toy has been computed for every toy that has been offered to the child. At the end, the mean score over all those mean scores will be computed and comprises the score for cognitive play performance.

The POS is also used to assign the children to specific play-material levels that are used during therapy (see table 3).

Table 3.

Classification system to assign children to play-material level.

	Scores	**Indicated cognitive level of play**
Play-Material Level 1	< 4 on ≥ 3 toys	functional play
Play-Material Level 2	> 4 on ≥ 5 toys	constructional play, some drama play
Play-Material Level 3	> 6 on ≥ 6 toys	constructional play & drama play

Choosing toys that are appropriate to the children's current abilities ensures an optimal starting point to challenge the children and elaborate their play skills. Additionally, to further control for the physical limitations of the participants, most of the play-material has been refined. For instance the original puzzle box has been replaced by one with bigger wholes and bigger objects that are easier to grab (detailed overview of all changes in appendix 3). Once the child masters to play independently with the toys from the assigned play-material level, he/she can move on to a higher play-material level.

The internal consistency of the POS has been established and was found to be highly reliable (9 items (Cronbach's α=.824) or 5 items (Cronbach's α=.924)). In order to determine the inter-observer reliability for the POS, the first 10 tests were scored from videos by two students and their agreement has been established (Cohen's κ=.90).

Level of Independent Play-Scale (LIP). The level of Independent Play-scale measures the level of help and support a child receives during a play session in order to carry out the possible actions (as described in the CPI manual and table 4).

Table 4.

Example of possible actions (ball).

Action 1	Look at the ball.
Action 2	Reach for the ball.
Action 3	Touch the ball.
Action 4	Roll the ball.
Action 5	Roll the ball to another person.
Action 6	Throw the ball to another person.

For every action performed during the session of the assessment, the child receives a scoring point according to the level of help he/she needed to carry out the particular action. The level of independent play has been assessed during the first, fourth and eighth CPI-session. Children were offered the same toys in all three sessions when the Level of Independent play has been assessed. Those two toys were chosen randomly out of the possible 5 toys of each play-material-level (see manual LIP appendix 4).

At the end a final mean score will be computed as a score for independent play (see table 5). The final mean score has been corrected for the level of difficulty of the performed action (see attachment 4 for a detailed description of calculating the mean score).

Table 5.

Scoring table LIP-scale.

		Action 1	Action 2	Action 3	Action 4	Action 5	Action 6	Total Points
	Points	**1**	**2**	**3**	**4**	**5**	**6**	
Independent	**4**							
Verbal Cues	**3**							
Demonstration	**2**							
Physical Help	**1**							

The internal consistency of the LIP-scale has been established and was found to be high (3 items, Cronbach's α= .924). In order to determine the inter-observer reliability for the LIP, the first 10 tests were scored from the videos by two students and their agreement has been computed (Cohen's κ=.84).

Fine and gross motor scale for children with severe multiple disabilities (FGMS).

The FGMS measures the fine and gross motor skills of children with severe multiple disabilities. The gross motor subscale represents 13 gross motor milestones, such as sitting up with support, crawling and walking (see table 6 and appendix 5).

Table 6.

Overview of milestones.

1. Fetal position
2. Lifting head up in prone position
3. Sit up with support
4. Sit with support; head study
5. Roll over from prone to supine position
6. Roll over from supine to prone position
7. (Sit without support; body is not upright)
8. Sit with support; body is upright
9. Creep
10. Crawl
11. Standing with support
12. Walking with support
13. Walking without support

Through observation of motor activities, it has been established how many milestones the children have mastered. Adding up all mastered milestones comprises the gross motor score. The fine motor subscale consists of seven sequential ways of reaching and grasping (see table 7).

Table7.

Ways of reaching and grasping.

1. No reaching
2. Reaching, but no contact
3. Contact only (no grasping)
4. Primitive squeeze: palm and fingers enclose the object
5. Hand grasp: claw-like move from above, with fingers and thumb and several fingers
6. Superior pincer grasp: grasping with a bended thumb and forefinger

The children will be offered 1 to 3 different objects of different sizes and shapes. Consequently, their way of reaching or grasping for it will be assessed (for detailed procedure see appendix 5). On account of those observations the children will receive a score corresponding to their highest performed level of fine motor skills. The scale is based on varies studies of motor development (Allen & Alexander, 1990, 1997; Frankenburg & Dodds, 1967; Husaini et al., n.d.; Shirly, in Netelenbos 1998; Netelenbos, 1998; Ornitz, Guthrie &

Farley, 1977). The inter-observer-reliability of the FGMS has been computed appears to be good for both the fine motor scale (Cohen's κ = .81) as well as the gross motor scale (ICC[1] = .99).

Goal Attainment Scale (GAS). The progress in the CE program has been established by means of the goal attainment scale (GAS). The GAS assesses the individual achievement of personal goals during the CE therapy. The scores are ascribed according to a 5-point scale assessing if the participants have achieved their goals entirely or partly. 0 indicates the expected achievement, +1 is given for achieving more than the expected and +2 for achievements far beyond expectations. The same applies to the other direction: -1 is given when the goal has not been completely achieved yet and -2 if the goal has not been achieved at all (Kirusek & Sherman, 1960).

Social Responsiveness Scale (SRS). Social functioning and the progress in MSST will be assessed by means of the Social Responsiveness Scale (SRS). The SRS assesses the social responsiveness children show in response to the stimuli offered during Multi-Sensory-Storytelling (see appendix 6). Social responsiveness consists of different dimensions: facial expression, vocalization, attention (looking at object/page/storyteller), pointing, waving, confirming, nodding and manipulation. The scale comprises two subscales: attention and manipulation. Attention measures the attention to the story and storyteller, the reaction to a stimulus (see table 8). Manipulation establishes the active manipulation of the stimulus that has been offered.

Table 8.

Example of scoring sheetSRS – subscale attention.

Behavior	**greeting**	**red box**	**pg1**	**pg2**	**pg3**	**pg4**	**pg5**	**pg6**	**pg7**	**goodbye**
Looks at object										
Looks at page										
Looks at storyteller										

The score of social responsiveness is a mean score over the frequency behaviors mentioned above that have been observed during MSST. Progress in MSST is defined as an increase of shown social responsive behavior during the MSST sessions. The scale is based on previous

[1] Intraclass correlation coefficient

studies (Multiplus,2008; Jonckheere, 2008; PAMIS, 2002; Young, Lambe, Fenwick and Hogg. 2010) and literature on development in children with profound disabilities or early development (Siegel-Causey & Bashinski, 1997; Petry & Maes, 2006; Verpoorten, 1983 in: Jonckheere, 2007).

The internal consistency of the SRS-scale has been established and is found to be reliable (13 items, Cronbach's $\alpha = .80$). The inter-observer-reliability has been found to be reliable (Cohen's $\kappa > .78$) as well.

Preliminary Statistical Analyses

Prior to testing the hypothesis, assumptions concerning normal distribution and sphericity have been tested over all variables used in the analyses. The data for the cognitive play performances showed a normal distribution and did not violate the assumption of sphericity (χ^2 (5) = 4.76, p = .445). The data of independent play also shows a normal distribution, but Maulchy's test indicated that the assumption of sphericity has been violated (χ^2 (2) = 17.64, p = .000), meaning that the differences of variance between the assessments of independent play are not equal, which should be taken into consideration when interpreting the results. For all analyses $p < .05$ was considered significant.

All analyses will be conducted with repeated-measure ANOVA's and repeated-measure ANCOVA's. Thomas et al. (2009) stated that the addition of a covariate tends to change the main effect of the repeated-measure ANOVA, although conceptually it should not be the case. The covariate can interact with the repeated measure factor, but should not completely alter the main effect. Delaney & Maxwell (1981) discuss the possibility to mean center the covariate before adding it to the ANOVA analyses. Mean centering the covariate prevents the change in main effect, but further does not influence possible interaction effects or the main effect of the covariate itself. Therefore all the three covariates have been rescaled before added to the analyses. Since the initial level of social and motor functioning has not been assessed by all the participants, but only by those participating in MSST or CE respectively, separate analyses have been conducted per sample.

Results

Effectiveness of the Cognitive Play Intervention

A one-way repeated-measures ANOVA was conducted to compare the means of cognitive play performances over the course of the research period after having participated in different interventions.

The analyses determined that the means of the cognitive play performances measured over the time of the research period differ statistically significant from each other (F (1,29) = 12.569, p = .001, η^2 partial = .302), as demonstrated in figure 3.

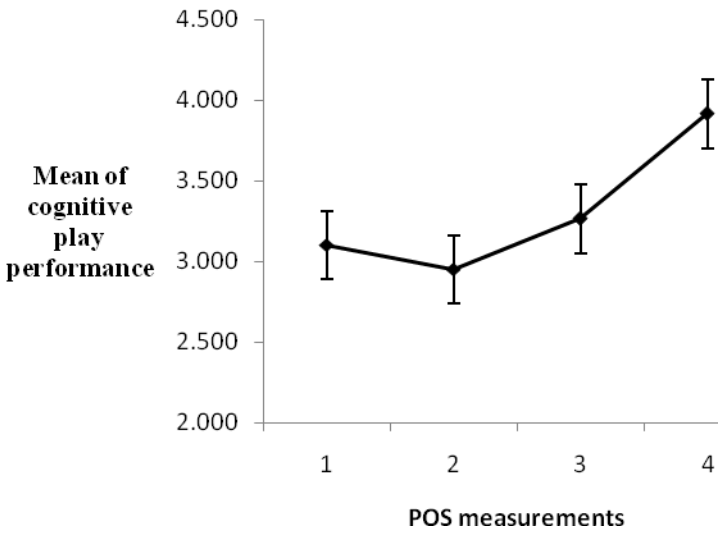

Figure 3. Graph of the estimated marginal means of cognitive play abilities over the research period.

Post-hoc comparisons (Bonferroni) revealed that the mean of cognitive play performances (M = 3.52, SD = .209) achieved after the play intervention is significantly higher than the mean of performed cognitive play abilities after the baseline period (M = 2.51, SD = .218). The mean of cognitive play performances (M = 3.52, SD = .209) after the CPI is also significantly higher than the mean after the first intervention MSST (M = 2.82, SD = .218), whereas the means of cognitive play performances achieved after MSST (M = 2.82, SD = .218) period and the baseline period (M = 2.51, SD = .218) are not significantly different from each other.

Effect of initial level of cognitive, social and motor functioning on CPI

In order to examine if the effect of CPI depends on children's social, motor and/or cognitive level of development, all three variables have been added one after another as covariates to the repeated-measures analyses.

Effect of initial level of cognitive play performance. When adding the mean centered variable of the initial level of cognitive play performance (POS1) to the repeated-measure ANOVA, the main effect increased (F (1, 28) = 16.812, p = .001, η^2 partial = .375), implying that more variance has been explained by adding the initial level of cognitive play performance as a covariate to the analyses. The covariate also shows a significant interaction with the repeated-measure factor (F (1, 28) = 10.732, p = .003, η^2 partial = .277), meaning that children with a lower score of cognitive play performance, show more progress during the CPI than those already starting on a higher level. Additionally, it can be stated that the covariate itself has a significant main effect (F (1, 28) = 104.035, p = .000, η^2 partial = .788), showing that children with a higher initial level of cognitive play performance also score higher on the POS scores after the intervention.

Predicting the progress of cognitive play performance. The repeated-measures ANOVA indicated that part of the variation of the within-subject differences of cognitive play performances over the course of the research period can be accounted for by the covariate initial level of cognitive play performance. In order to determine if the variable predicts the progress in cognitive play performance during CPI, a regression analyses has been conducted. The regression analyses indicates that the begin level of cognitive play performance predicts the progress in cognitive play abilities (R^2 = .277, F (1, 28) = 10.73, p = .003) with the level of cognitive play performance being a significant predictor (β=*–.294, t=-3.276, p=.003*). As shown in figure 4 shows the predictor 'initial level of cognitive play performance' a negative relation with the progress in cognitive play performance, implying that children with a higher initial level of cognitive play behavior improve less during the intervention than children who are starting on a lower level of cognitive play.

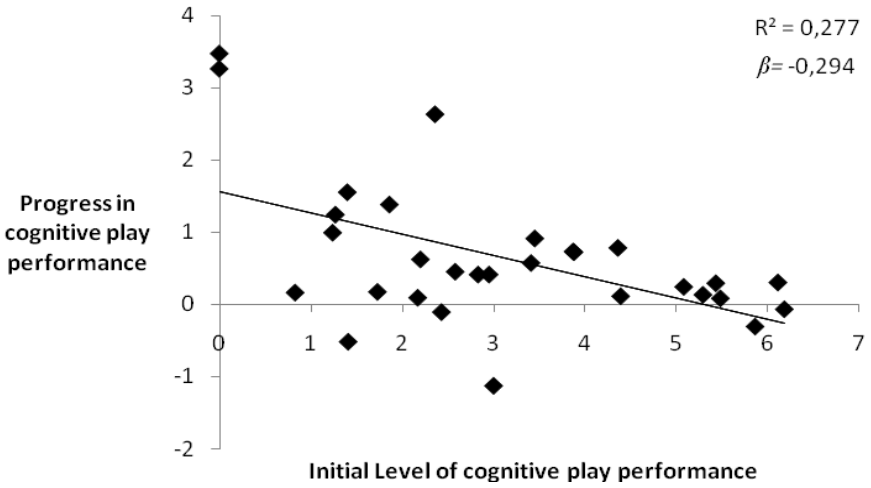

Figure 4. Regression line: initial level of cognitive play performance predicting progress in cognitive play.

Effect of social responsiveness. Although the sample size decreases (N = 17) when adding the covariate of social functioning (totSRS2), which has been assessed before the CPI started, the main effect of the repeated measure shows a significant effect (F (1, 14) = 3.777, p = .072, η^2 partial = .212). The covariate 'social functioning' has not shown a significant interaction with the repeated-measure factor (F (1, 14) = .102, n.s.). But the main effect of the covariate itself demonstrated a significant effect (F (1,14) = 4.795, p = .046, η^2 partial = .285), signifying that children with higher social functioning also perform cognitive play behavior on a higher level. When further examining the subscales, especially the subscale attention shows a trend to be correlated to the level of performed play behavior (r = 419, p = .094).

Effect of motor functioning. When adding the variables of fine and gross motor functioning as covariates to the repeated-measures ANOVA, the sample size decreases as well (N=16). The repeated-measure main effect stayed significant (F (1, 13) = 7.964, p = .014, η^2 partial = .380). Furthermore, no significant interaction effect has been detected and also the main effect of the covariate itself could not be found.

Effect of progress in parallel program on CPI

To evaluate if the progress in one of the parallel programs moderates the effect of CPI, the mean centered variables of the progress of CE (CEprog) and of the progress in MSST (MSSTprog) have been added to the repeated-measures ANOVA. As not all children have

participated in both MSST and CE, different analyses will be conducted respectively.

The addition of both variables as a covariate did not result in any further significant effects. Neither did the progress in CE or the progress in MSST interact with the repeated-measure factor (F (1,14) = .310, n.s.; F (1, 15) = .774, n.s.) , nor could a significant main effect of the covariates be detected (F (1,14) = .699, n.s.; F (1, 15) = .031, n.s).

Independent Play

In order to establish the differences in independent play/support given during the period of the intervention, another repeated-measure ANOVA with 'independent play' as a factor has been conducted.

As mentioned in the method section, the assumption of sphericity has been violated for the data of independent play, implying that the variance of differences between the measurement moments are not equal. Therefore Greenhouse-Geisser correction has been used to determine the significance of the results. The analyses with a Greenhouse-Geisser correction determined that the mean of level of independent play differs statistically significant from each other over the course of the intervention (F (1.36, 58) = 26.96, p=.000, η^2 partial = .482), as illustrated in table 2.

Post-hoc comparison revealed that the mean of LIP1 (M = 15.50, SD = 6.16) and LIP2 (M = 17.50, SD = 6.46) are significant different from each other, as well as the mean of LIP 1 (M = 15.50, SD = 6.16) and LIP3 (M = 19.06, SD = 6.53) and LIP2 and LIP3.

Table 2.

Mean of Level of Independent Play over Course of Intervention.

	Mean	SD	Min	Max	N
Level of Independent Play 1	15.50	6.16	7.83	28.00	30
Level of Independent Play 2	17.50	6.46	8.00	28.00	30
Level of Independent Play 3	19.56	6.53	8.00	28.00	30

Additionally, it has been tested if the initial levels of cognitive play behavior, social responsiveness and motor functioning have an effect on the level of independent play. Therefore the mean centered variables of the initial level of cognitive play behavior, social responsiveness and motor functioning have been added as covariates to the repeated-measures in three different analyses. In all three analyses no significant interaction analyses

could be stated.

But besides the significant main effect of independent play, also the variables of initial level of cognitive play intervention (F (1, 28) = 82.84, p = .000, η^2 partial = .747) and social functioning (F (1, 15) = 4.40, p = .053, η^2 partial = .227) show a significant main effect, implying that those showing higher levels of cognitive play performance and/or social functioning, score higher on independent play. When further examining the subscales, also here especially the subscale attention shows a trend to be correlated to independent play (r = 425, p = .089).

Discussion

The purpose of current research was to determine the effectiveness of CPI on the improvement of cognitive play behavior when carried out by the childcare workers. Additionally, it has been investigated if the chosen approach, based on Vygotsky's sensitive teaching, follows the expected line and as such has a positive influence on the progress of cognitive play performances. Furthermore, attention has been paid to possible factors that might influence the effectiveness of CPI. It has been examined if the initial level of cognitive, motor and social functioning moderates the progress of cognitive play performance. It has also been investigated if the effect of one of the parallel programs (CE and MSST) moderates the effectiveness of CPI.

Effectiveness of the Cognitive Play Intervention (CPI):

The study found a significant effect of CPI on the cognitive play performance of the residents of Sizanani Children's Home. As expected, analyses revealed that cognitive play performances improved significantly more during the play intervention than during the MSST-intervention or the baseline period without any intervention. The findings confirm that the intervention contributes to an improvement in cognitive play performances, also when carried out by the childcare workers. Thus, it can be seen as a valuable program contributing to the resident's cognitive development. Analyses also revealed that independent play increases over the course of the intervention. As expected, children and young residents needed significantly less support to carry out a play activity with a toy at the end of the intervention as compared to the beginning. Those findings corroborate the theoretical expectations about the chosen approach for the therapy: the structured socio-cultural

approach of Vygotsky's 'sensitive teaching' turns out to be an effective way to provide children with support specifically tailored to their individual needs and stimulating them to perform beyond their current functioning. Similar results have been found in related studies (Malone & Langone, 1999; Lifter, Ellis, Cannon, & Anderson, 2005), suggesting that structured approaches, with the teacher being sensitive and responsive to the abilities and interests of the individual child, are an effective method to teach skills to children with disabilities (Malone & Langone, 1999). However, it should be kept in mind that the effectiveness of the chosen approach has not been compared to a control group receiving the play intervention with a different approach or with no structured approach at all. Comparing the effect with a control group, would support the effectiveness of the chosen approach more strongly.

Effect of initial level of cognitive, motor and social functioning on CPI

Effect of initial level of cognitive play performance. Beforehand it has been hypothesized that children with a higher initial level of cognitive abilities already have a greater repertoire of cognitions, enabling them to solve tasks more easily and elaborate their existing knowledge and play behaviors to a greater extent. Contrary to expectations, analyses have shown that children with a lower initial level of play performance progress more during CPI than children with a higher initial level of cognitive play performances. A possible explanation could be that both the intervention and the assessment instrument, the POS, are based on the sensorimotor stage of cognitive development. Children starting already with a higher initial level might have fewer opportunities to improve their play performance within the sensorimotor stage or their real progress could simply not be measured by means of the POS. In future research it should be investigated if they already reached their potential or if the progress could not be detected due to limitations of the assessment instrument.

Effect of social responsiveness. Social responsiveness showed a significant between-subject effect. Children being more social responsive, also showed play behavior on a higher cognitive level. Especially the subscale attention showed a trend towards correlation with cognitive play performance. A finding that has been highlighted in various studies: 'focused attention' is a prerequisite to play (Vig, 2007) and is related to more complex play activities (Ruf & Lawson, 1990). Thus, it is not surprising that the children being socially more functional, especially those with higher scores in the subscale attention, show play behavior

on a higher level. Although moderation with the effect of CPI has been hypothesized beforehand, being more socially responsive does not moderate the effect. Children being socially more functional did not progress more during the play intervention, than children scoring lower on social responsiveness. That could be explained by the small sample size. Therefore, the moderation of the effect of CPI by social functioning should be subject for re-examination in future research with a bigger sample size.

Effects of motor functioning. Also contrary to expectations, no significant relation between motor abilities and the effect of CPI on cognitive play performance could be established. It has been hypothesized that children with a higher level of motor functioning already had more opportunities to explore their surrounding and discover affordances provided by the environment. Thus, as Gibson argued (1988), they were expected to already have a greater knowledge about spatial, causal and functional relations of objects and were expected to perform on a higher cognitive level of play and improve to a greater extent. Those expectations could not be found in the results. Children with more physical abilities did not show a higher initial level of cognitive play performance, nor did they improve their cognitive play abilities more during the intervention than those showing less physical abilities. As a possible explanation it should be stressed that the assessment scale of cognitive functioning (POS) has been adjusted in order to reduce the motor component, so that the children's cognitive abilities can be assessed regardless of their motor functioning. The POS has shown to be a suitable instrument to measure cognitive functioning, regardless of physical handicaps. Through adjustment of the toys and the general set-up of the POS, children could show their cognitive knowledge through play, despite of lacking mobility.

Effect of progress in parallel program on CPI

Originally it has been hypothesized that the effect of the parallel programs could have a moderating effect on the effectiveness of CPI. However, analyses did not reveal a significant moderation effect from either CE or MSST on the effectiveness of CPI.

It has been expected that children showing progress in CE improve either a fine motor or gross motor skill, enabling them to perform actions they have not been able to perform before. But it should be kept in mind that achieving this new skill is just one out of an array of different abilities required to actually perform on a higher level of cognitive play. As mentioned earlier, the dynamic-system approach emphasizes that new behavior only emerges

when all components needed to perform the action are developed beyond a critical level (Newman & Newman, 2007). Improving on one of the programs fostering the development of new skills might not be sufficient at the time of assessment to reach the critical level and to unfold play behavior on a higher cognitive level. Only when all essential components are developed, new play behavior can emerge. Attending all three programs might have a moderating effect on CPI in a long-term, but the effect could not be found in a short-term study. Moreover, the research has been conducted with a small number of participants (N = 17). In future research it should be examined if the moderating effect can be detected with a bigger research group and after a longer period of intervention.

Independent Play

Furthermore, relations between the variables for the initial level of cognitive play behavior, social responsiveness, motor functioning and independent play behavior have been examined. It was mainly expected that children with a higher initial level of social responsiveness profit more of the socio-cultural approach that children are provided with during the intervention and consequently show more progress in cognitive play performance**.**

Analyses, however, showed no significant interaction effects with either the variable for social responsiveness, motor functioning or the initial level of cognitive functioning, implying that functioning on a higher level in social, cognitive or motor development does not influence the progress in independent play. However main effects for the covariates of the initial level of cognitive play behavior and social responsiveness have been detected. It can be stated that although the initial level of cognitive play behavior or social responsiveness does not moderate the progress in playing independently, generally children with a higher level of cognitive play performance and/or social functioning show more independent play. Rodger and Ziviani (1999) state that cognitive knowledge, more precisely executive functioning, being able to plan an action and having knowledge of possible activities with the object, and attention are required to play independently (Rodger & Ziviani, 1999). Although the initial level of cognitive play performance does not predict the progress of independent play, it is logical that there is a relation between the initial level of cognitive play performance and the initial level of independent play.

Recommendations for further work:

Sizanani Children's Home is striving to ensure optimal development and to improve the

quality of life of their residents. By implementing three programs, stimulating motor, social and cognitive development, an important step has been made to fully exploit the children's and young residents' potentials. Higher-order goals of the programs are the improvement of quality of life, self-care abilities and independency. During CPI independent play is highly stressed. Being able to play independently enables children to explore even outside of the sessions and generalize their newly learned skills to everyday situations. If CPI could enable that step of generalization, the children and young adults would be given an important tool for further development. Most importantly, they would be given a tool to increase their self-care and independence and as such also contributes to the quality of life. For future research it would be of great interest to examine if the three programs contribute to an improvement of the quality of life. Considering the effect that CPI had on the development of cognitive play behavior after only 6 weeks, it would be of great interest to investigate the effect of CPI on the independence, self-care and quality of life. It should be examined if play behavior predicts everyday functioning in terms of independence and self-care abilities. Moreover, it should be investigated if children continuously show progress when given the intervention over a longer period of time or if an individual limit would be reached after a while. Another interesting point for future research would be the maintenance of learned skills. Is the progress in cognitive play performance still detectable after a few weeks/ months after the intervention stopped?

Conclusion

This study was set out to determine the effectiveness of the cognitive play intervention on the improvement of cognitive play performances of the residents of Sizanani Children's Home, as well as to identify factors that might moderate the effectiveness. The research provided evidence for the effectiveness of the cognitive play intervention in being more than a pleasurable recreational activity. The results support the use of the cognitive play intervention in enhancing cognitions. Future research is still recommended in order to examine long-term effects and also to identify a possible moderation effect of the three parallel programs offered at the Home.

In conclusion, play is seen as a primary occupation for children, which not only facilitates the development of cognition, but also contributes to sensory, motor and social development (Parham & Primeau, 1997). Play is an activity everyone can learn. For some play occurs more naturally, others need more help and support to achieve the ability to play. After all,

regardless of how much help was needed, in the end everyone should be able to profit from play. Thus, the play intervention can be seen as an effective approach to exploit the potentials in the diverse population of children and young adults of Sizanani Children's Home.

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APPENDIX 1:: **Protocol Cognitive Play Intervention**

Protocol Cognitive Play Intervention

- only in printed version -

APPENDIX 2: **Play Observation Scale (POS)**

1.1 Theoretical Background:

The Play Observation Scale measures the level of cognitive play abilities indicating the level of cognitive development within Piaget's sensorimotor stage. The POS is based on Smilansky's stages of play behavior representing different stages of cognitive development within Piaget's sensorimotor stage. Piaget (1962) differentiated three successive stages of play requiring different cognitive tasks that should be mastered by the child and give an indication of the children's cognitive level. The first stage 'functional play' is characterized as a stage with simple repetitive physical behaviors without a specific purpose, for example hammering with the blocks on the table. The second stage 'constructive play' is defined as manipulating objects and creating things with the toys offered, for example building a tower with the blocks. The last stage 'dramatic play' is described as pretend play, requiring a higher level of cognitive functioning like building a house with the blocks and pretending to live there.

1.2 Procedure:

a) Scoring to assess level of cognitive play performance:

Children are offered various toys in a free play session and their play performance without any assistance will be observed. Toys used in the free play sessions resemble the toys used during therapy, but are slightly different in order to prevent habituation.

The possible actions for each toy are divided into seven steps; these seven steps are indicative for the three different stages of cognitive play. This can be illustrated by an example for possible actions with the xylophone: score 1 = 'no action', score 2 = 'touching' and score 3 = 'picking up', where 2 and 3 characterize two steps in functional play, score 4= 'making sound without the stick' and score 5= 'making sound using the stick' represent two steps in constructional play, and the last steps 6= 'producing a music tone' and 7= 'playing music from right to left and/or vice versa' show characteristics of dramatic play

More precisely, the children will be offered the first five toys one after another each for a period of 3 minutes and their toy play behavior without adult interference will be observed.

For toys that can elicit different levels of cognitive play the children will receive a score in the range of 1 to 7 during three minutes in a 10 second interval based on their shown play

behavior. For toys where the final result is decisive, children will get one score after the three minute observation period, representing their maximal score over the period. In detail: for toy 1-3 (ball, xylophone and car) children will receive scores in the range of 1 to 7 during three minutes in 10 second intervals based on their shown play behavior in those intervals. For their play performance with toys 4 to 8 (block, puzzle, puzzle-box, number-puzzle and memory) the children will receive one score between1-7 after a three minutes observation period, representing their maximal score over the period. A maximum score is more representative for those toys than an average score over the whole period would be. For toy 9 (stuffed animals (lion and camel)) the child receives again scores in the range of 1 to 7 during three minutes in a 10 second interval based on the play behavior performed in those intervals.
After the child has played with 5 toys, it has to be assessed if he/ she attained a score higher than three on at least three different toys, indicating that at least a basic level of functional play has been performed. If the child attained at least a mean score of 4 on 3 different toys of the POS, he/she will be offered toys 6-9. Otherwise the test will stop.
At the end, compute the mean score for every toy offered, add them up and calculate a total mean score from all the toys that the child played with.

b) Scoring to assign children to play material 1, 2 or 3:

The POS is also used to assign the children to specific play-material levels that are used during therapy (table 1). Choosing toys appropriate to the children's current abilities ensures an optimal starting point to challenge the children and elaborate their play skills. Once the child masters to play independently with the toys from the assigned play-material level, he/she can move on to a higher play-material level.

Table 1.

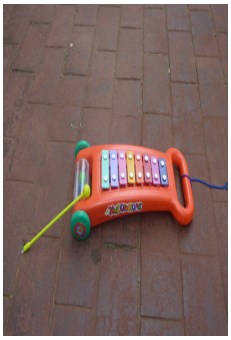
Classification system to assign children to play-material level.

	Scores	Indicated cognitive level of play
Play-Material Level 1	< 4 on ≥ 3 toys	functional play
Play-Material Level 2	> 4 on ≥ 5 toys	constructional play, some drama play
Play-Material Level 3	> 6 on ≥ 6 toys	constructional play & drama play

The internal consistency of the POS has been established and was found to be highly reliable (9 items (Cohen's α=.824) or 5 items (Cohen's α=.924)).

1.3 Toys:

1. Ball: The ball is placed in front of the child. Observe what the child is doing with the ball. If the child initiates an interaction with you (throwing the ball to you, rolling the ball to you), participate in the game. Otherwise observe the child's actions for 3 minutes.



2. Xylophon: Place the xylophone in front of the child and observe what the child is doing with the xylophone during a period of 3 minutes.

3. Car: Put the car in front of the child and observe what action the child initiates. If the child pushes the car over to you and wants you to push it back, participate in the game. Otherwise just observe the child for 3 minutes.

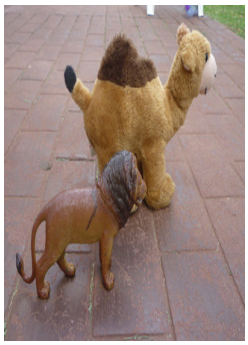
4. Wooden Blocks: Put the blocks in a row in front of the child and observe if the child is just moving the blocks, hammers with it, throws them or actually builds something.

5. Puzzle: Put the puzzle and the pieces in front of the child. Observe the child for 3 minutes and score how many pieces the child puts in the correct holes or what other action he/she initiates with the puzzle.

6. Puzzle Box: Put the puzzle box and the pieces in front of the child and score if and how many pieces the child puts in by himself.

7. Number Puzzle: Offer the child 5 pair and ask him/her to find the pairs that go together. If the child finds the 5 pair before the 3 minutes are over, offer the rest of the cards.

8. **Memory:** Present the child the 5 pair that you are going to play with. Tell the child that the game will last for 3 minutes. You can show the child once how the game works: Show him/her that he/she is supposed to turn around two cards and compare them. If they match he/she can keep them, if they don't match he/ she is supposed to put them back on the same spot and that it will be your turn. Observe the child what action the child is initiating.



9. Animals: Place the two animals next to each other in front of the child, so that both animals are facing the child. Observe what the child is doing with the toys for 3 minutes.

Children that are limited in their play because of obvious physical handicaps can receive help from the instructor. If it is for example difficult to turn around the memory cards or putting puzzle pieces together, the child can point to the memory card he wants to be turned around or point at the two puzzle pieces he would want to put together and the instructor can carry it out for the child. But only exactly those cards or pieces the child is pointing at.

Play Observation Scoring

Description	Piaget's stages	0	1	2	3	4	5	6	7
1. Ball	*Functional Play*	No action	Looking/ Reaching	Touching	Picking up/ Squeezing	Rolling	Rolling over	Throwing the ball	Throwing the ball & catching
2. Xylophone	*Functional & Constructive Play*	No action	Looking/ Reaching	Touching	Picking up stick or xylophon /rolling xylophon	Making sound without the stick	Making sound with the stick	Making music (tone)	Making music across from left to right (viceversa)
3. Car	*Functional & Dramatic Play*	No action	Looking/ Reaching	Touching	Picking up/ Moving a bit	Rolling	Rolling back & forth between two people	Play driving	Play driving and making sound
4. Wooden Blocks	*Functional & Constructive Play*	No action	Looking/ Reaching	Touching	Picking up blocks holds it or hammers it on table	Put two blocks next to each other/or on top of each other	Put more than two blocks together	Making objects with blocks on the ground floor (next to each other)	Making objects with blocks higher than ground floor (on top of each other)
5. Puzzle	*Functional & Constructive Play*	No action	Looking/ Reaching	Touching	Picking up a piece	Try to do puzzle	Put 1-3 pieces in the right spot	Put 4-6 pieces in the right spot	Put 7-8 pieces in the right spot

If they attain a score higher than three on at least three different toys, proceed with the rest or otherwise stop the play here.

6. Puzzle Box	*Functional& Constructive Play*	No action	Looking/ Reaching	Touching / feeling the wholes	Picking up pieces moving blocks on top of box	Try to put blocks in hole	Puts 1-2 bloccks in correct holes	Put 3-4 blocks in correct holes	Put 5-6 blocks in the correct holes
7. Number Puzzle	*Functional & Constructive Play*	No action	Looking/ Reaching	Touching	Picking up	Search for pairs/ find wrong pairs	Find 1-3 pairs	Find 4-7 pairs	Find 8-10 pairs
8. Memory	*Functional & Constructive Play*	No action	Looking/ Reaching	Touching	Picking up	Turn and compare cards/find wrong pairs	Find 1-3 pairs	Find 4-7 pairs	Find 8-10 pairs
9. Camel & Lion	*Functional Play & Dramatic*	No action	Touching / Picking	Picking up	Moving animal from one spot to	Play walking with 1 animal or	Play walking with animals	Play walking with animals	Play animals together (e.g.

	Play		up		another without purpose (e.g. walking)	any other purposeful action with 1 animal	or any other purposeful action with 2 animals but seperatly from each other (no interaction)	or any other purposeful action with 2 animals but seperatly from each other (no interaction) with sound	eating, hugging or fighting)

Play Observation Scale Coding Sheet

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
Score										
	1.50	2.00	2.10	2.20	2.30	2.40	2.50	3.00	Total	Mean
Score										

2	0.10	0.20	0.30	0.40	0.50	1.00	1.10	1.20	1.30	1.40
Scorie										
	1.50	2.00	2.10	2.20	2.30	2.40	2.50	3.00	Total	Mean
Score										

3	0.10	0.20	0.30	0.40	0.50	1.00	1.10	1.20	1.30	1.40
Score										
	1.50	2.00	2.10	2.20	2.30	2.40	2.50	3.00	Total	Mean
Score										

4	Total
Score	

5	Total
Score	

6	Total
Score	

7	Total
Score	

8	Total
Score	

9	0.10	0.20	0.30	0.40	0.50	1.00	1.10	1.20	1.30	1.40
Score										
	1.50	2.00	2.10	2.20	2.30	2.40	2.50	3.00	Total	Mean
Score										

Total: Mean:

APPENDIX 3: **Adjustments in toys**

APPENDIX 4: **Level of Independent Play-Scale (LIP)**

Theoretical Background

Vykotsky's concept of 'sensitive teaching' is comprised of 'sensitive assistance within the Zone of Proximal Development'. ' Sensitive assistancec' points out that children should be given just enough support to reach a specific goal and are challenged to go one step further. As such, development is stimulated and in the end the children should be able to perform the task by themselves (Levykh, 2008). Sensitive assistance in the CPI is translated into three steps to tailor the help given to the specific needs of the children. The first step of support consists of hand-over-hand physical help by the teacher. In the second step the child should get a demonstration of an appropriate play behavior (modeling). In the third step the child will just need verbal encouragement and nodding to be able to perform the task. The more independence and initiative a child demonstrates the less assistance will be given. In order to improve play abilities and consequently also cognitive abilities, it is desirable to decrease the level of assistance needed for a certain activity during the course of the intervention.

Scoring:

For every action performed during the session of assessment, the child receives a scoring point according to the level of help he/she needed to carry out the particular action. Possible actions for playing with blocks are for example: Child looks at the house (Action 1), Child touches the blocks (Action 2), Child picks up a block (Action 3), Child puts two blocks together (Action 4), Child builds a tower with the blocks (Action 5), Child builds a house (or another construction, Action 6).

Depending on the level of support the child needs to carry out the specific actions he/she receives a socre accordingly: 1 scoring point for physical-hand-over-hand support, 2 scoring points for modelling an action, 3 scoring point for verbal encouragement and 4 scoring points for independent play. Those scoring points are multiplied with the action and as such taking the difficulty of the action into account. At the end a final mean score will be computed as a score for independent play).

Level of Independent Play- Scoring Sheet

Name:

Toy: Measurement:

		Action 1	Action2	Action 3	Action 4	Action 5	Action 6	Total Points
	Points	*1*	*2*	*3*	*4*	*5*	*6*	
Independent	*4*							
Verbal cues	*3*							
Demonstration	*2*							
Physical Help	*1*							

Comments:

APPENDIX 5: **FGMS; Fine and Gross Motor Scale for children with severe, multiple disabilities**

Theoretical background

The Fine and Gross Motor Scale for children with severe, multiple disabilities is particularly developed for the research population in the Sizanani Children's Home in South Africa. Other, frequently used motor scales have various disadvantages when applied on this population. For instance, the steps from mastering one skill to another appear to be too big and unrealistic for shorter research periods (e.g. 4 months). Another disadvantage is that these scales cover the entire motor development. The children in the CE program in Sizanani have severe disabilities and are often deformed, with the consequence that they are mostly far behind in their motor development and simply not able to highly develop their motor skills. As a consequence, the majority of the children will be at the bottom of the scale, and therefore a normal distribution is lacking. The FGMS enlarges the early motor developmental stages, and by doing so allows for the mapping of smaller progressions in areas that would remain insufficiently specified when using general instruments.

The scale exist out of two subscales: a gross and a fine motor subscale. The gross motor scale is based on various studies on motor development (Allen & Alexander, 1990, 1997; Frankenburg & Dodds, 1967; Husaini et al., n.d.; Shirly, in Netelenbos 1998; Netelenbos, 1998; Ornitz, Guthrie & Farley, 1977). The fine motor subscale is based on grasping patterns as described by Halverson (1931, in Netelenbos, 1998) and Touwen (1977, in Netelenbos, 1998).

Although it is widely accepted that children in general develop their motor skills in a particular sequence (Netelenbos, 1998), it is doubtful whether the motor development of children in this research population follows this pattern. They may also show adjusted forms of locomotion, which emerges as a result of their disabilities (Netelenbos, 1998). Furthermore, the children in this population are often deformed by such an extent that they simply cannot reach some early milestones, while they may be able to master more complex ones. Therefore, the score on this scale is formed by the total of mastered milestones, instead of following the sequence and scoring the most complex milestone that is mastered.

Procedure

Fine motor subscale

If possible, the child should sit upright at a table or in a wheelchair with a table. If not, the objects can be offered from a flat surface, for example a plate or tray. The smallest of the four objects (the pin, see picture 1) is offered to the children and their way of grasping is observed. When the child scored below 6, and thus used an unsuitable way of grasping with respect to the size of the object, a bigger object (the crayon, see picture 2) is offered to establish the preferred way of grasping. When the child is not able to grasp this object, again a bigger object is offered (the block, see picture 3). The most successful way of grasping with the smallest object is scored. This means that when a child is able to grasp the small pin, this way of grasping is scored and it is not necessary to offer the other, bigger objects. When a child, for example, only touches the chalk, but is not able to grasp it, you can offer the block. If the child is able to grasp the block, the way of grasping that is used with respect to the block forms the score on the fine motor subscale. For children with visual impairments, you can tap with the object on the surface in order for the child to localize the object.

The used objects

Picture 1. Pin; smallest object

Picture 2. Crayon; middle-sized object

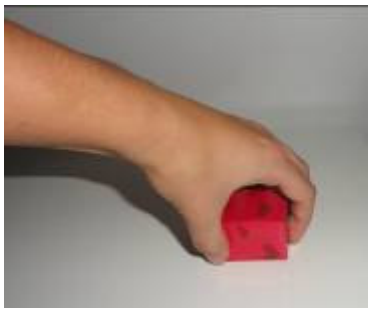
Picture 3. Block; biggest object

7 milestones in reaching and grasping behavior

Reaching, but no contact (1)

Contact only, no grasping (2)

Primitive squeeze (3)



Hand grasp (4)

Inferior pincer grasp (5)

Superior pincer grasp (6)

Gross motor subscale

The scoring of the mastered gross motor milestones mainly depends on observations in the daily living situation. If, however, the milestone is not seen during observations, you can try to make the child performing the motor action. For this purpose, a child is taken out of his/her wheelchair on the floor and is placed in the right starting position with regard to the particular action. Thereafter, the child is motivated by the environment to execute the motor behavior. For example, if you want to know whether a child is able to lift his head up in prone position, you can turn the child on his stomach and rattle with an object or make noises above him. It is important that the child is motivated to execute the specific motor behavior. If the environment does not provide a reason to, for example, crawl, why would the child crawl then? In this case, asking to execute the action is not seen as a motivational factor for the child. The number of mastered gross motor milestones forms the score for this subscale.

Scoring form FGMS

Name child: ……

Mark the gross motor milestones with either a ✓ or ✗, when the milestone is respectively mastered or not and add up the number of mastered milestones.

Gross motor milestones	**Mastered?**
1. Fetal position	
2. Lifting head up in prone position	
3. Sit with support	
4. Sit with support; head steady	
5. Roll over from prone to supine position	
6. Roll over from supine to prone position	
7. (Sit without support; body is not upright)	
8. Sit without support; body is upright	
9. Creep	
10. Crawl	
11. Standing with support	
12. Walking with support	
13. Walking without support	
Total of mastered milestones	

Mark the fine motor milestones that is shown after presenting the object with a ✓. The *italic* number in brackets forms the score for the fine motor subscale.

Fine motor milestones	**Showed way of reaching/grasping**
No reaching ***(0)***	
Reaching, but no contact ***(1)***	
Contact only (no grasping) ***(2)***	
Primitive squeeze: palm and fingers enclose the object ***(3)***	
Hand grasp: claw-like move from above, with fingers and thumb in a parallel position ***(4)***	
Inferior pincer grasp: grasping with a stretched thumb and several fingers ***(5)***	
Superior pincer grasp: grasping with a bended thumb and forefinger ***(6)***	

Appendix 5 Observation Scheme Multisensory Storytelling

Observation scheme Multi-Sensory Storytelling

Unit:
Name:
Story:
Group:
Measurement:

Emotional responses (facial and vocalisations)

Behavior	**greeting**	**red box**	**Page 1**	**Page 2**	**Page 3**	**Page 4**	**Page 5**	**Page 6**	**Page 7**	**goodbye**
Positive facial expression										
Happy vocalisations										

Attention

Behavior	**greeting**	**red box**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**goodbye**
Looks at object										
Looks at page										
Looks at storyteller										

Motor responses (Motor arousal, head movements and gestures)

Behavior	**greeting**	**red box**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**goodbye**
Wave										
Positive nod/shake no										
Clap hands										
Pointing										

Manipulations of objects and Page

Behavior	**greeting**	**red box**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**goodbye**
Reaching for the object/page										
Short										

touching										
manipulation										
Functional manipulation										