CHAPTER 5

RESULTS AND DISCUSSION

5.1 INTRODUCTION

This study aimed at validating a play package on the performance of children with intellectual impairments. Performance in this study was assessed on four developmental domains, namely sensorimotor, cognitive, communication and social-emotional, using four assessment tools.

A daily multiple measurement instrument (DMMI) was used and the TPBA, SPS, and VMI were used as countermeasures to indicate the level of performance, as well as to establish convergent validity. The treatment section of the play package was developed (Uys, 1997) and refined, based on the theory put forward that learning of communication- related behaviours is an adaptation process.

The areas of performance acquisition that were probed by this study were determined by the aims and sub-aims of the experimental phase as set out in Chapter 4. As the validation of the play package includes much more than the results of the experimental phase alone, the logical structuring of this chapter makes it necessary for the results to be presented according to the validation process, rather than according to the sub-aims of the experiment. Figure 5.1 illustrates the structure of the chapter as well as the sections where the specific sub-aims would be addressed.

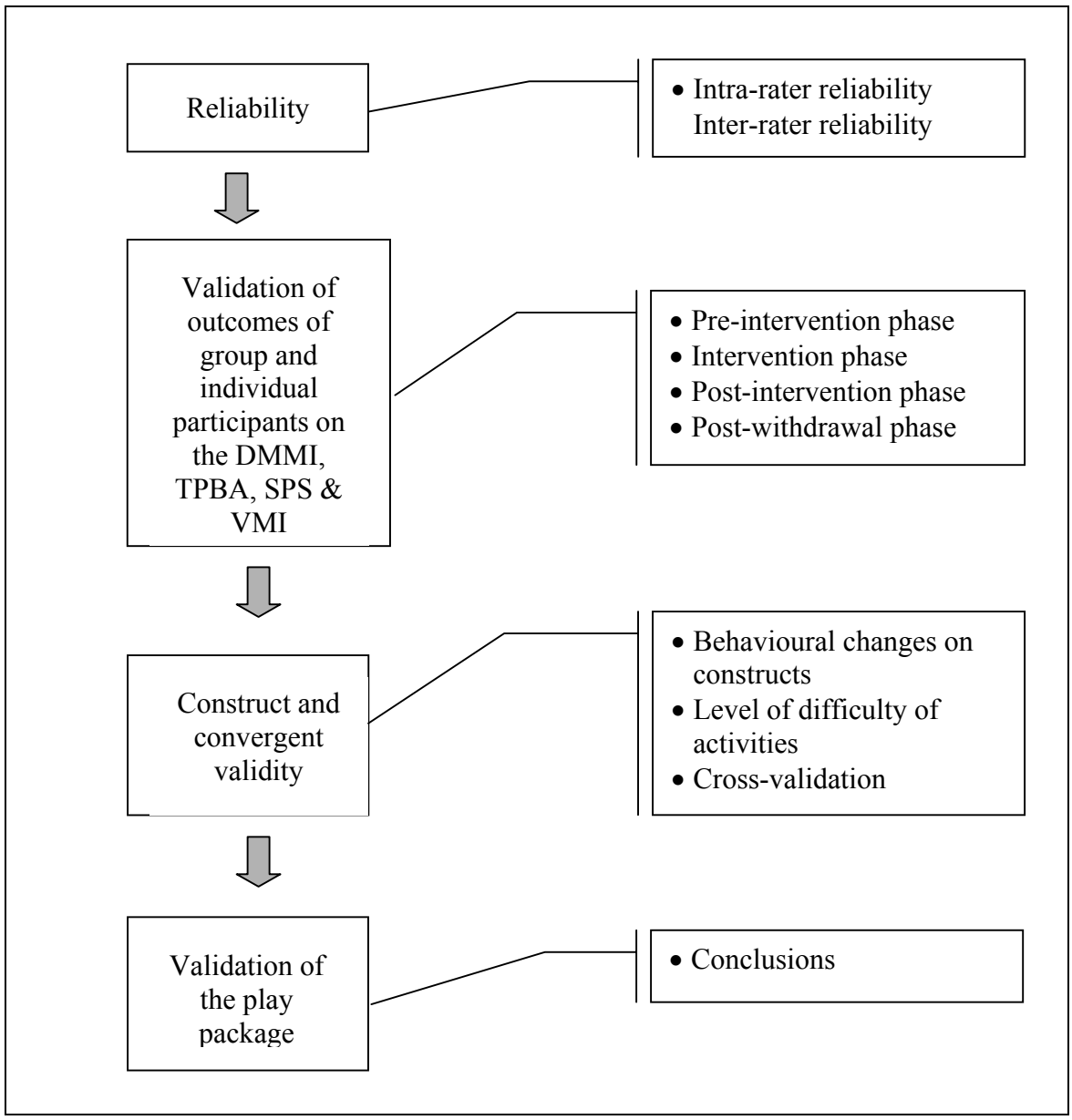


Figure 5.1 Schematic presentation of results of this study

5.2 RELIABILITY

Before addressing the issue of validity it was necessary to establish that the measurements were carried out reliably. Both intra-rater reliability and inter-rater reliability will be discussed with reference to the measurement phases of the study.

5.2.1 Intra-rater reliability

Intra-rater reliability was addressed during the experimental phase of the study. Video-recordings of all the intervention sessions were made. The researcher watched 20% of all the video-recordings made during the intervention phase. This was done 2 weeks after the initial scoring. The "complexity-score" of the DMMI were used for statistical analysis (See Appendix E).

The hypothesis was put forward, namely that

H_0 : there would be a difference in the scoring of the DMMI by the researcher.

H_1 : There would be no difference in the scoring of the DMMI by the researcher.

The "complexity-score" of the DMMI were used for statistical analysis (See Appendix E) and the following frequencies and percentages were calculated.

Table 5.1 Two-way frequency table to compare intra-rater reliability on the DMMI

		Score 1	Score 2	Score 3	Score 4
First scoring	Frequency	19	28	69	109
	Percentages	8.44	12.44	30.67	48.44
Second scoring	Frequency	20	28	68	110
	Percentages	8.85	12.39	30.09	48.67

The data of the 2 separate scorings compares favourably. The chi-square test was used to establish whether there was a difference between the researcher's scores or not. No significant difference between the first and the second scoring done by the researcher (p-value = 0.9983) was determined. The H_0 is rejected as stability in the researcher's scoring was established.

5.2.2 Inter-rater reliability

The external raters used the same assessment tools as the researcher to assess inter-rater reliability. Two external raters independently observed the same 20% of all the video-

recordings made during the intervention phase as well as 20% of the pre-intervention, post-intervention and post-withdrawal recordings. This exceeds Hensilwood and Ogilvy's (1999) view that only 15% of all observations are necessary to establish inter-rater reliability.

The hypothesis was put forward that

H_0 : there would be a difference in the scoring of the pre-intervention, intervention, post-intervention and post-withdrawal phases between the researcher and the external raters.

H_1 : there would be no difference in the scoring of the pre-intervention, intervention, post-intervention and post-withdrawal phases between the researcher and the external raters.

The scores of the two external raters were compared with those of the researcher. The "complexity-score" of the DMMI were used for statistical analysis (See Appendix E).

Table 5.2 Two-way frequency table to compare inter-rater reliability on the DMMI

		Score 1	Score 2	Score 3	Score 4
Researcher	Frequency	21	48	119	121
	Percentages	6.8	15.53	38.51	39.16
External rater 1	Frequency	16	50	110	133
	Percentages	5.18	16.18	35.60	43.04
External rater 2	Frequency	30	53	101	125
	Percentages	9.71	17.15	32.69	40.45

The chi-square test was used with the data from this table and it was established that there was a difference between the data of the researcher and the two external raters. There was no significant difference between raters' and the researcher's observations (p-value = 0.3375) therefore it could be stated that inter-rater reliability was established. The H_0 was therefore rejected.

A quantitative description was used to establish whether there was a reliable correlation between the presentation method used by the researcher and what the external raters found. The external raters watched the same video-recordings as mentioned above. There was a 95% correlation between the presentation methods used by the researcher and what the external raters observed (See Appendix A).

5.3 VALIDATION OF OUTCOMES

The sequence as presented in Figure 5.1 will be followed. Firstly, the outcomes as measured by the DMMI for the group and individual participants will be delineated. Secondly, the outcomes of the other measurement tools will be presented before the validation of the play package is addressed. Each section will start with a description of the results, followed by a detailed discussion.

Outcome validation refers to the assessment of perceived changes as a result of intervention (Wolf, 1978). The outcomes of the group will be presented across the whole research period i.e. the pre-intervention–, intervention–, post-intervention–, and post-withdrawal phase. A summary of the different assessment tools used during the different phases of the study for data collection is presented in Table 5.3.

Table 5.3 Assessment tools used during the different research phases

Pre-intervention phase Week 1	Intervention phase Week 2, 3, 4	Post-intervention phase Week 5	Post-withdrawal phase Week 8
DMMI TPBA SPS VMI	DMMI	DMMI TPBA SPS VMI	DMMI TPBA SPS

The DMMI was the constant measuring instrument used during all the phases. The TPBA, SPS and VMI were used to investigate construct and convergent validity. The VMI could not

be used during the post-withdrawal phase as this test should not be administered over short intervals (Beery, 1989).

In Chapter 4 the sub-aims were formulated with a view to establishing the behaviour of the participants during the pre-intervention and post-intervention phases, as well as to cross-validate measurements and establish convergent and construct validity. Although it seems as if primary attention is paid to the assessment of behaviours, the play package as a whole can only be validated through this assessment of changes in behaviour. Answers to the sub-aims will thus become evident by presenting the results in terms of outcomes. In this section sub-aims 4.3.2.2, 4.3.2.3, and 4.3.2.3.1 will be addressed.

5.3.1 Outcomes according to the DMMI

The outcomes of the group as a whole will be presented, as well as those of the individual participants. While the group's results will be based on quantitative analysis of the data, the analysis of the individual participant's results will be done quantitatively as well as qualitatively to augment the interpretation.

Figure 5.2 shows the performance of the group on the DMMI over the eight-week research period.

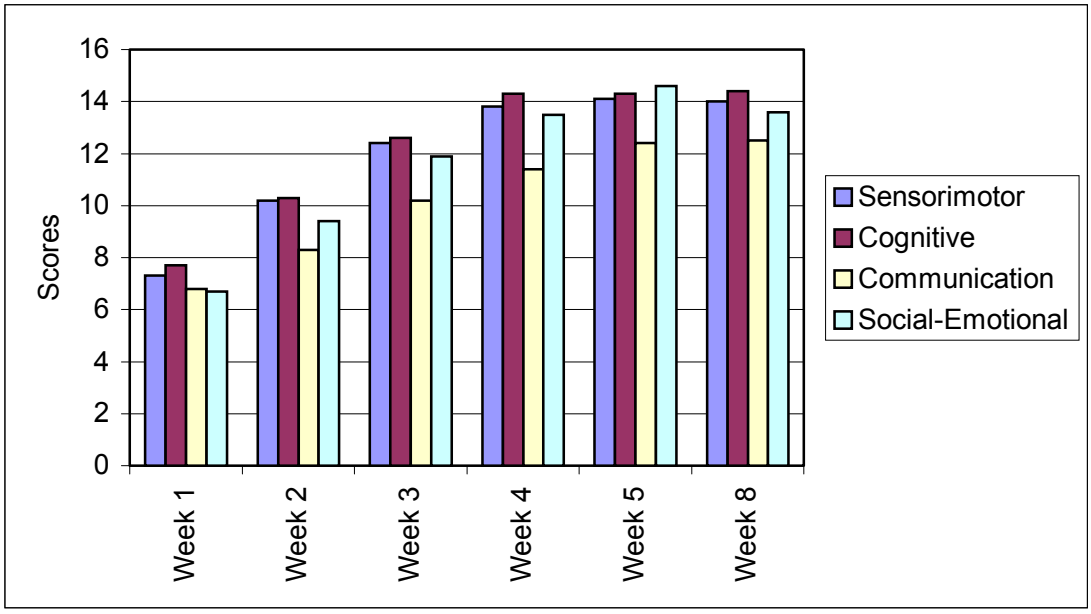


Figure 5.2 Mean performance of the group on the DMMI

In this figure the group's performance on the DMMI is presented on a weekly basis and it clearly shows the increase in performance on the four different developmental domains (constructs). Distinctive patterns occurred, such as that communication trails all other constructs, that there was little or no difference between the other 3 constructs across the 8 weeks, and that a definite pattern of gradual acquisition of behaviours occurred from week 1 to week 4. A plateau was reached from week 4 to week 8. The statistical analysis is described below.

Table 5.4 presents the mean, median and standard deviation scores as obtained from the Friedman two-way analysis of variance test for nonparametric statistics (Steyn, Smit & Du Toit, 1987). This test is designed for comparing three or more related (dependent) samples on an ordinal variable. It converts the raw scores to ranks.

Table 5.4 Friedman test of scores obtained with the DMMI across the whole research period

		Pre-inter-vention	Intervention phase			Post-intervention phase	
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 8
Sensorimotor	mean	7.2857	10.2	12.3543	13.7886	14.0857	14.0000
	median	6.5714	9.8571	12.1429	13.8571	14.1429	13.8571
	sd	1.5253	2.0291	1.5585	0.9158	1.0527	0.6624
Cognitive	mean	7.7333	10.327	12.597	14.2800	14.3333	14.4000
	median	7.6667	10.667	12.5000	14.667	14.6667	14.6667
	sd	1.5882	2.1475	1.6363	1.0846	1.4530	0.3651
Communication	mean	6.7750	8.2850	10.1700	11.4350	12.4250	12.5000
	median	6.2500	9.0000	10.6250	11.6250	12.7500	13.0000
	sd	2.4002	2.1144	2.5698	2.2836	2.8140	2.3335
Social-Emotional	mean	6.7000	9.4000	11.9200	13.5000	14.6000	13.6000
	median	6.5000	9.5000	12.5000	14.5000	16.0000	15.0000
	sd	1.0368	2.2867	2.3527	2.0916	2.8592	2.7704

The hypothesis was put forward that

H_0 : there would be no positive change in behaviours after the intervention phase (week 2 – week 4).

H_1 : there would be a positive change in behaviours after the intervention phase (week 2 – week 4).

The H_0 is rejected as a statistical difference (positive change) was found on the behaviours representing all the constructs between week 2 and 3, week 2 and 4, and week 3 and 4 (the intervention phase) at the 5% level ($p<0.0001$), indicative of development. The median scores were used to calculate the statistical difference on the Friedman test. This indicated that on the sensorimotor construct there was a difference between weeks 2 and 3 (9.8571 and 12. 1429), weeks 2 and 4 (9.8571 and 13.8571), and weeks 3 and 4 (12.1429 and 13.8571); on the cognitive construct there was a difference between weeks 2 and 3 (10.667 and 12.5000), weeks 2 and 4 (10.667 and 14.667) and weeks 3 and 4 (12.5000 and 14.667); on the communication construct there was a difference between weeks 2 and 3 (9.0000 and 10.6250), weeks 2 and 4 (9.0000 and 11.6250), and weeks 3 and 4 (10.6250 and 11.6250); on the social-emotional construct there was a difference between weeks 2 and 3 (9.5000 and 12.5000), weeks 2 and 4 (9.5000 and 14.5000), and weeks 3 and 4 (12.5000 and 14.5000).

An extract was taken from Table 5.4 to indicate the comparison between the pre-intervention, post-intervention and post-withdrawal phases. This seems to answer the hypothesis, namely that

H_0 : there would be no positive change in behaviours between the pre-intervention-, post-intervention- and post-withdrawal phases.

H_1 : there would be a positive change in behaviours between the pre-intervention-, post-intervention- and post-withdrawal phases.

Table 5.5 Comparison between averages of group's performance across weeks 1, 5, and 8

Construct	Week	Average performance	Level of significance	P-value
Sensorimotor	Week 1	6.5714	** *	p-value = 0.0224
	Week 5	14.1429		
	Week 8	13.8571		
Cognitive	Week 1	7.6667	** **	p-value = 0.0235
	Week 5	14.6667		
	Week 8	14.6667		
Communication	Week 1	6.2500	* **	p-value = 0.0224
	Week 5	12.7500		
	Week 8	13.0000		
Social-Emotional	Week 1	6.5000	**	p-value = 0.015
	Week 5	16.0000		
	Week 8	15.0000		

*Significant at the 10% level
**Significant at the 5% level

Table 5.5 compares weeks 1, 5, and 8 – the pre-intervention and post-intervention phases. The H_0 was thus rejected, as there was significant change (positive change) in the behaviours of the participants between the pre-intervention phase and the post-intervention phases, indicative of development. The median scores were used to calculate the statistical difference on the Friedman test. On the sensorimotor, cognitive and social-emotion constructs there was significant change at the 5% level between weeks 1 and 5. On the cognitive and communication construct there was significant change at the 5% level between weeks 1 and 8.

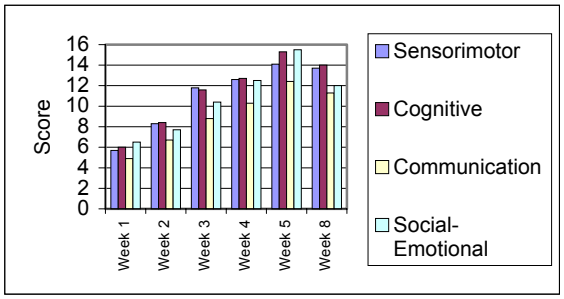
During the intervention phase, a significant difference indicative of development (adaptation) occurred in the behaviours representing all the constructs. It is generally accepted that the use of play as a therapeutic medium contributes to the development of children (Case-Smith, 1993; Johnson *et al.*, 1999). In the model presented by Cooper *et al.* (1978), the integration

of the developmental domains is highlighted, which supports the fact that each domain has an influence on all the other developmental domains. Certain domains are seen as more basic to others. Dunn (1992) stated that sensorimotor experiences provide the underlying information which facilitates the development of cognitive and language relationships. It was thus expected to note that communication trails the other developmental domains. Piaget (1978), Vygotsky (1962) Bricker & Carlson (1981) stated that communication is a higher cognitive function and that sensorimotor development can be seen as an underpinning for their development. In previous research (Uys, 1997) the same pattern was observed in children with severe disabilities.

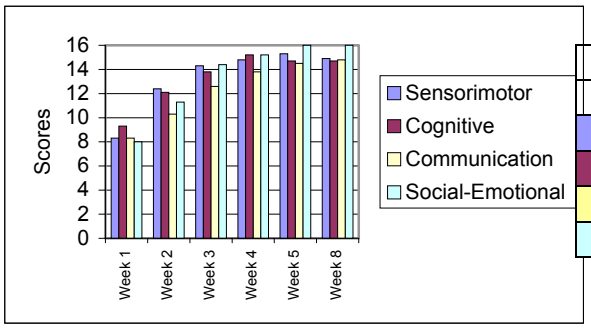
Another finding was that there is no significant difference between the behaviours as measured during the post-intervention and post-withdrawal phases (weeks 5 and 8), indicative of a plateau in behaviour acquisition. As there was no decrease in the level of performance in this study as well as in the previous study (Uys, 1997), it can be concluded that play as an intervention medium facilitates adaptive responses that are maintained over time. Kielhofner (1992) stated that when newly acquired behaviours become habitual in the performance of tasks, they are stable adaptive responses. Figure 2.1 proposes that for adaptation to occur the child should experience internal adaptation of all the developmental domains and that the therapist should select and present activities in such a fashion as to also facilitate external adaptation. This external, as well as internal adaptation leads to the adaptive response that leads to the habitual behaviour of components representing the developmental domains. Adaptation can only occur when a person is exposed to the "just right challenge" on activities that relate to their occupation (Kielhofner, 1992; Nelson, 1996; Schade & Schultz, 1992).

Another interesting finding was that the same relationship between these developmental domains was maintained in the final intervention week through the post-intervention phase to the post-withdrawal phase. This phenomenon became clear from the above results, indicating that there is interrelatedness between all the developmental domains (Bricker & Carlson, 1981; Mosey, 1974). Based on various theories (Cooper *et al.*, 1978; Linder, 1993) a model indicating this relationship was developed and is presented in Figure 2.4. The finding that this relationship was maintained seems to indicate that the intervention facilitated the development of the different domains.

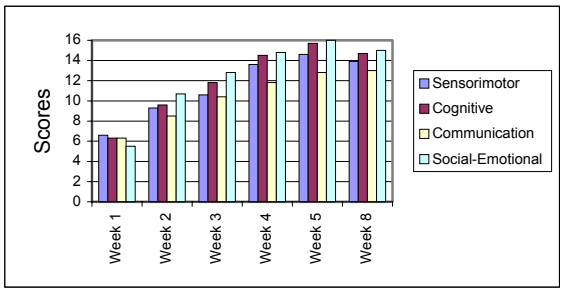
The outcomes of the individual participants will now be described. These data will be presented quantitatively and qualitative information on each participant will augment the interpretation. Figure 5.3 shows the average performance of each participant on the DMMI over the whole research period.



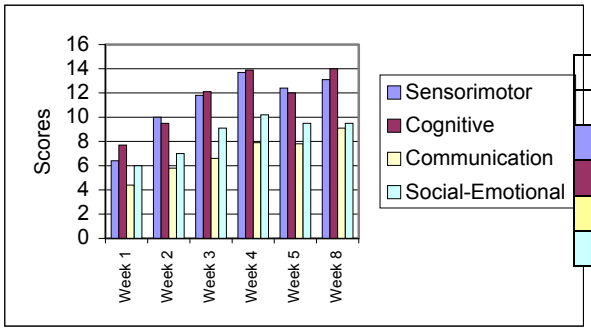
Participant 1						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 8
	5.7	8.3	11.8	12.6	14.1	13.7
	6.0	8.4	11.6	12.7	15.3	14
	4.9	6.7	8.8	10.3	12.4	11.3
	6.5	7.7	10.4	12.5	15.5	12



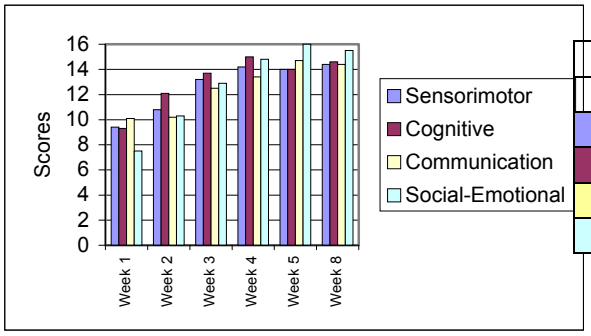
Participant 2						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 8
	8.3	12.4	14.3	14.8	15.3	14.9
	9.3	12.1	13.8	15.2	14.7	14.7
	8.3	10.3	12.6	13.8	14.5	14.8
	8.0	11.3	14.4	15.2	16.0	16.0



Participant 3						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 8
	6.6	9.3	10.6	13.6	14.6	13.9
	6.3	9.6	11.8	14.5	15.7	14.7
	6.3	8.5	10.4	11.8	12.8	13
	5.5	10.7	12.8	14.8	16.0	15.0



Participant 4						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 8
	6.4	10	11.8	13.7	12.4	13.1
	7.7	9.5	12.1	13.9	12	14
	4.4	5.8	6.6	7.9	7.8	9.1
	6.0	7.0	9.1	10.2	9.5	9.5



Participant 5						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 8
	9.4	10.8	13.2	14.2	14.0	14.4
	9.3	12.1	13.7	15.0	14.0	14.6
	10.1	10.2	12.5	13.4	14.7	14.4
	7.5	10.3	12.9	14.8	16.0	15.5

Figure 5.3 Average of performance of each participant on the DMMI

Statistical significance was not calculated for each individual due to the limited data. However, it is clear that all participants showed a gradual increase in performance across all constructs independent of their pre-intervention performance level.

Participant 1 had a steady increase in performance from week 1 to week 5 across all the constructs and the social-emotional performance improved the most. An interesting phenomenon was the slight decrease in performance after the withdrawal period, as this differed from the other participants' behaviour. The biggest decrease was observed in the score of the social-emotional construct during the post-withdrawal measurement. This does not follow the same pattern as the group, indicating that the newly acquired behaviours were not yet maintained and habitual. This finding could possibly be attributed to the fact that her pre-test score was one of the lowest. Conversely, participant 2 showed a gradual increase in performance across all the constructs and a plateau of behaviour from week 4 to week 8. Communication trails all other constructs, while the social-emotional construct showed the greatest increase in the scores and there was little difference in the performance of the sensorimotor and cognitive construct. Her performance corresponds with the pattern presented by the group.

When comparing the individual participants' performance with that of the group it was noted that participant 3 showed the greatest increase in performance across weeks 1 to 5. The pattern of improvement of each construct stayed the same over weeks 2 to 5 and even if this participant did not reach a plateau, the decrease of performance after the withdrawal period followed the same pattern relative to each construct.

Atypical results were found in the performance of participant 4 who showed autistic tendencies. He was the only one who presented with no functional speech throughout the research period. He was also the only participant who showed very poor performance on the social-emotional construct. An interesting observation is his performance on the post-intervention measures, where he scored much lower than in weeks 4 and 8 (the post-withdrawal measurement). This could be explained by the fact that he had influenza and a general feeling of malaise. It is an atypical phenomenon as his performance scores increased again in the post-withdrawal measurements when his physical condition improved. His performance was the only one that differed from the performance of the group as a whole.

This participant's score on the social-emotional construct had a definite influence on the mean performance of the group.

Participant 5 showed a very gradual increase of performance on all the constructs with a plateau on weeks 4, 5 and 8. The socio-emotional construct also showed the greatest increase in the scores. Her performance on the communication construct was on a par with the sensorimotor, and cognitive constructs. This was different from the group where communication trailed behind all the other constructs.

Although no statistical significance of these data was established, according to the descriptive analysis the following becomes evident. The participants were all diagnosed with moderate to severe intellectual impairments and although care was taken in the selection of these participants to ensure as much homogeneity as possible, visual inspection on comparing the data showed that some participants are relatively similar in developmental trends. The performance of participant 4 was, however, different from the other participants. Homogeneity is clearly improbable among the disabled population. This supports the description of the intellectually impaired population (See Table 2.7).

Another finding is that participants 1 and 3 with the lowest scores during the pre-intervention measurement showed the greatest improvement during the intervention phase. This finding can be interpreted in terms of the interactive theory (McLean & Snyder-McLean, 1978; Vygotsky, 1962), which holds that development of potential is dependent upon interaction. From observation and discussions with teachers and parents, it became evident that the home and school environment could possibly have influenced the development of these two children. It is also generally accepted that children who live in poverty are also at greater risk for developmental, behavioural and educational delay (Lequerica, 1997; Shonkhoff & Meisels, 2000). Extreme need and even destitution in conditions of poverty have a negative influence on the social interaction in families and communities (Wilson & Ramphele, 1989). The initial low scores of these two participants could possibly be attributed to such conditions. In the warm, accepting therapeutic relationship (Hupp *et al.*, 1992; Howe & Schwartzberg, 1995; Skinner, 1957; Sameroff, 1975) between the researcher and the participant during the research process, these participants actualised their potential (King, 1978). The gradual increase in performance correlates with the group tendency.

Another finding only became evident in the qualitative analysis of the individual participants, namely the influence of health on the performance of a child. Participant 4 showed a marked decrease in performance during week 5, when he was ill. A phenomenon such as this can only be identified when repeated and continuous measurements are carried out such as with the DMMI.

5.3.2 Outcomes according to the TPBA

The performance of the group as a whole will now be discussed on the basis of the outcomes obtained from the TPBA. This assessment tool was used during the pre-intervention and post-intervention phases of the research. The use of this tool was to establish convergent validity between the DMMI and the TPBA, as well as to assess whether there was a positive change in the participants' behaviour across the four developmental domains (constructs). Figure 5.4 shows the mean performances of the group during weeks 1, 5, and 8 of the research period.

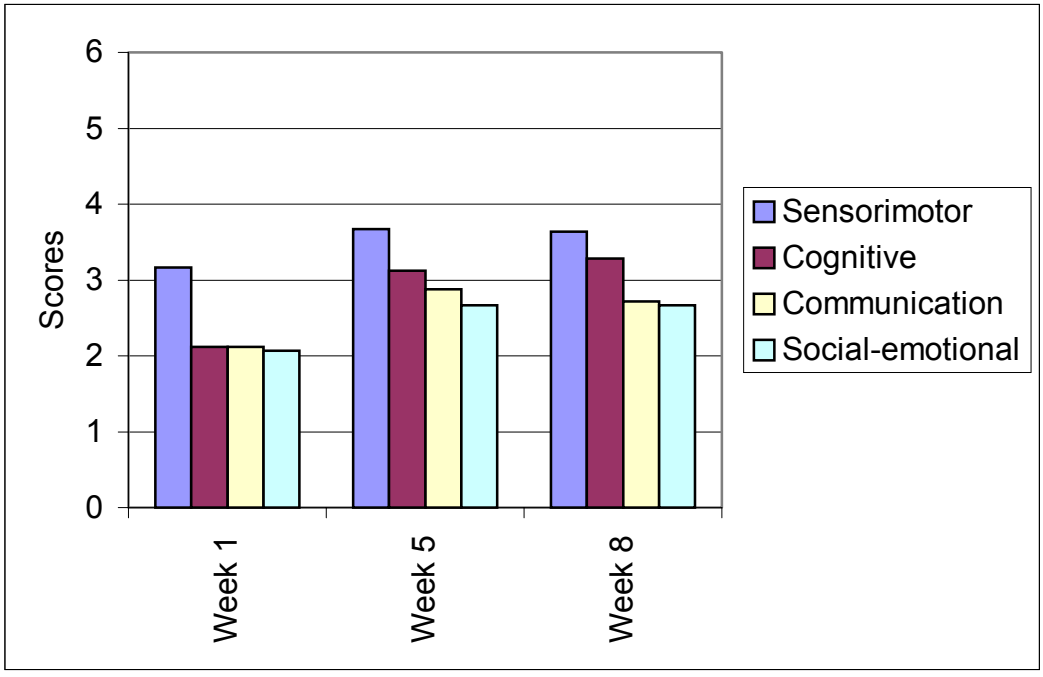


Figure 5.4 Mean performance of the group on the TPBA

From Figure 5.4 it is evident that there was a positive improvement on all the constructs from weeks 1 to 5 and little or no change in behaviours between weeks 5 and 8. All constructs trail the sensorimotor construct. Although the sensorimotor scored the highest for the group,

cognitive behaviour showed the greatest gain in performance. There was little or no difference between the communication and social-emotional constructs. Table 5.4 shows the mean, median and standard deviation scores as obtained from Friedman two-way analysis of variance test for non-parametric statistics.

Table 5.6 Friedman test of scores obtained with the TPBA

		Week 1	Week 5	Week 8
Sensorimotor	Mean	3.1667	3.667	3.6333
	Median	2.6667	3.1667	3.5
	Sd	0.986	1.0206	1.0165
Cognitive	Mean	2.12	3.12	3.28
	Median	2.1	3.1	3.7
	Sd	0.8044	0.6181	0.7629
Communication	Mean	2.12	2.88	2.72
	Median	1.8	2.4	2.4
	Sd	0.9654	1.2617	1.1541
Social-Emotional	Mean	2.0667	2.6667	2.6667
	Median	2	2.6667	2.6667
	Sd	1.0382	0.8165	1.1304

An extract was taken from Table 5.6 to indicate the comparison between the pre-intervention (week 1), post-intervention (week 5), and post-withdrawal (week 8) phases. This seems to answer the hypothesis namely that

H_0 : there would be no positive change in behaviours across all the constructs between the pre-intervention, post-intervention, and post-withdrawal phases on the TPBA.

H_1 : there would be a positive change in behaviours across all the constructs between the pre-intervention, post-intervention, and post-withdrawal phases on the TPBA.

Table 5.7 Comparison between medians of the group's performance across weeks 1, 5, 8

Construct	Week	Median	Level of significance	P-value
Sensorimotor	Week 1	2.6667		0.1165
	Week 5	3.1667		
	Week 8	3.5000		
Cognitive	Week 1	2.1000	**	0.0195
	Week 5	3.1000		
	Week 8	3.7000		
Communication	Week 1	1.8000	**	0.0224
	Week 5	2.4000		
	Week 8	2.4000		
Social-Emotional	Week 1	2.000	** *	0.0224
	Week 5	2.6667		
	Week 8	2.6667		

* Significant at the 10% level
** Significant at the 5% level

Table 5.7 shows the statistical analysis for the comparison between weeks 1, 5, and 8 – the pre-intervention and post-intervention phases. H_0 was rejected, as there was significant change (positive change) in behaviours of the participants between the pre-intervention and post-intervention phases, indicative of development.

The H_0 was rejected as significant change in behaviours occurred on all the constructs except for the sensorimotor construct. There was no significant change on the sensorimotor construct at the 5% level between weeks 1, 5, and 8. On the cognitive and social-emotional constructs there was significant change at the 5% level between weeks 1 and 8. On the communication construct there was significant change at the 5% level between weeks 1 and 5.

From the findings of the TPBA measurements there was a positive development in all the domains when the performance of the group on the pre-intervention and post-intervention phases are compared. Taking into account the ranking orders used in the Friedman analysis it is evident that there was a significant difference in the cognitive, communication and social-

emotional domains between the pre-intervention and post-withdrawal measurements. While a slight positive change was observed, no significant difference was found in the sensorimotor domain, probably because the initial level of performance was much higher than the other domains.

Even after refining the TPBA (See 4.5.4.2) the norm-based increments of this test do not seem to be sensitive enough to small changes in behaviour in the area of sensorimotor development. Specific and severe sensorimotor impairments were, however, not expected (See Table 2.7) in this group, although they performed much lower than their chronological age levels. The finding that sensorimotor performance leads the performance in the other domains was once again expected. From Figure 5.4 and Table 5.6 it is clear that similar patterns of performance exist in all measurements, especially the post-intervention phases (weeks 5 & 8).

All these findings support the theory and findings of Uys (1997) and Weeks and Ewer-Jones (1983) who stated that sensorimotor functioning is an important underpinning for the development of communication. Once again these findings support the interrelatedness between the different developmental domains (Dunn, 1991; Dunn, 1992; Linder, 1993; McLean & Snyder-McLean, 1978), as well as the model on interrelatedness of developmental domains as presented in Figure 2.4. The views of Case-Smith (1993), Wehman (1979) and Musslewhite (1986) that goal-directed intervention will bring about a positive change in behaviour in the intellectually impaired population are reflected in the findings.

Finally, the similarity in performance as measured during the post-intervention and post-withdrawal phases is indicative of the maintenance of behaviours developed during the intervention phase. In terms of the theory on the development of an adaptive response, maintenance of behaviour occurs once the response has become habitual. This finding thus seems to support the model for the development of adaptive communication behaviour (See Figure 2.1).

There seems to be similarities between the findings of the DMMI and the TPBA. These similarities could be attributed to the orientation and theoretical underpinnings of both measurement instruments as both cover the areas of the four developmental domains. It is interesting to note that similar significant outcomes were measured by the DMMI and TPBA.

While the greatest difference between the two tests is that the criteria for testing in the DMMI are set according to the measurement of performance components, previously called adaptive response, the criteria set in the TPBA aims at the measurement of performance skills, previously called adaptive skills (Kleinman & Bulkley, 1982). An example of this is that the DMMI measures components of ball skills, such as visual tracking, imitation of movement and gross co-ordination, while the TPBA measures the ball skill as an entity. An advantage of the DMMI is that these basic performance components underpin various performance skills and by measuring performance components small changes in behaviour development can be identified. The significant differences that were found on the TPBA do, however, seem to support the findings of the DMMI. The correlation between these two tests will be discussed under 5.6.

5.3.3 Outcomes according to the SPS

The performance of the group will now be discussed in terms of the SPS. This tool was used during the pre-intervention and post-intervention phases of the research. The aim of using the tool was to establish convergent validity between the DMMI and the SPS as well as to assess whether there was a positive change in the participant's behaviour on play development and language development. Figure 5.5 presents the mean performance of the group in weeks 1, 5, and 8 of the research period.

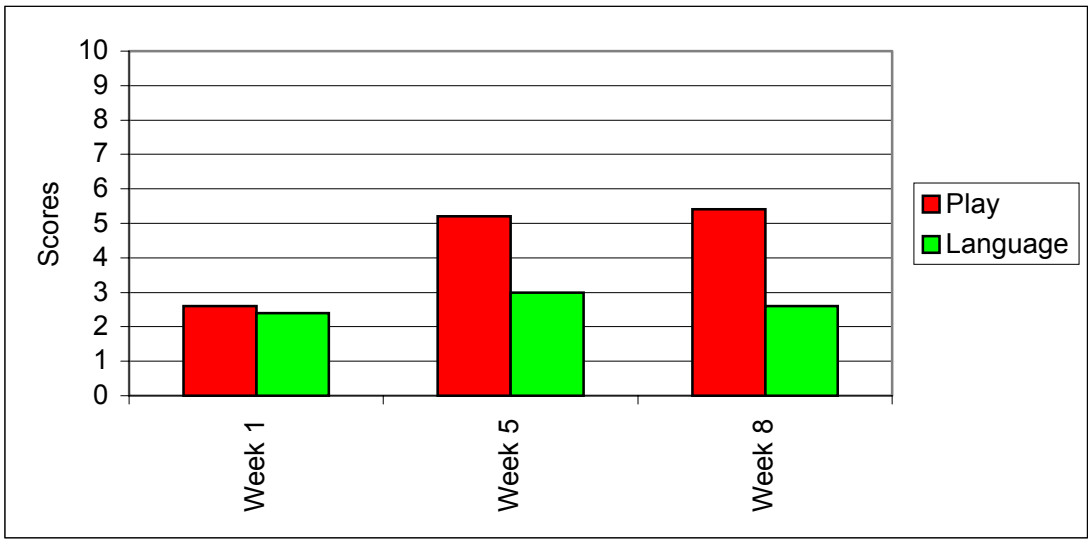


Figure 5.5 Mean of group on the SPS

In week 1 the participants scored between stage 2 and stage 3. This is between the ages 13 to 19 months, far below their chronological ages (average age = 63.6 months). In week 5 (post-intervention) the participants improved to stage 5 (24 months) on play development and showed minimal improvement on the language construct (stage 3: 17 – 19 months). With the post-withdrawal measurement the participants showed a small increase in the play development and a small decrease in language development. The statistical analysis is presented in Table 5.8.

Table 5.8 shows the mean, median and standard deviation scores as obtained from the Friedman two-way analysis of variance test for nonparametric statistics. This seems to answer the hypothesis, namely that

H_0 : there would be no positive change in behaviours across all the constructs between the pre-intervention, post-intervention, and post-withdrawal phases on the SPS.

H_1 : there would be a positive change in behaviours across all the constructs between the pre-intervention, post-intervention, and post-withdrawal phases on the SPS.

Table 5.8 Friedman test of scores obtained with the SPS

		Mean	Median	Sd	Level of significance	P-value
Play	Week 1	2.6	1	2.19089	** **	0.0429
	Week 5	5.2	5	1.09545		
	Week 8	5.4	5	1.14018		
Language	Week 1	2.4	1	1.94936		0.3499
	Week 5	3	2	2.34521		
	Week 8	2.6	1	2.30217		

**Significant at the 5% level

The individual participants' scores differ from each other and in Table 5.9 the individual scores are presented over the three phases.

Table 5.9 Individual participants' scores according to the stages on the SPS

	Week 1		Week 5		Week 8	
	Play	**Language**	**Play**	**Language**	**Play**	**Language**
Participant 1	1	1	4	1	4	1
Participant 2	5	5	7	6	7	6
Participant 3	1	1	5	2	5	1
Participant 4	1	1	5	1	5	1
Participant 5	5	4	6	5	6	4

There was variation in the scores of the individual participants. In the pre-intervention measurement three participants scored on stage 1 for both play and language, and the other two participants scored respectively on stage 5 for both play and language and stages 5 and 4 for play and language. The post-test and post-withdrawal measures showed a change in their behaviours, as all the participants improved. Most of the participants maintained the scores in these two different phases. Participant 1 improved from stage 1 (9-12 months) to stage 4 (19-22 months) on play development, but stayed consistent on stage 1 for language development throughout the research period. Participant 2 improved from stage 5 (24 months) to stage 7 (36 months) in play development and an increase from stage 5 to stage 6 (30 months) in language development. These scores were maintained for week 8. Participant 3 improved from stage 1 to stage 5 in play development in weeks 5 and 8. Her language development indicated an improvement from stage 1 to stage 2 (13-17 months) in week 5, but regressed to stage 1 after the withdrawal period. The play development of participant 4 increased from stage 1 to stage 5 as scored during weeks 5 and 8. Participant 5 improved from stage 5 on play development to stage 6, where it stayed consistent after the withdrawal period. Her language development improved from stage 4 to stage 5 in week 5, but regressed to stage 4 after the withdrawal period.

As the intervention and the assessment tools were based on play as the vehicle for the development of communication-related behaviours, the Symbolic Play Scale was included in the research.

The finding that there was a significant positive change in symbolic play behaviour, but not in language development was expected, particularly in view of the fact that "…some cognitive abilities consistently precede… linguistic structures" (Westby, 1980:154). "The major cognitive development during the preoperational period (18 months to 5-7 years) is the development of representational thought. Symbolic play provides a means of assessing children's representational abilities" (Westby, 1980:155). It therefore seems as if cognition developed to a greater extent than language, which agrees with Westby's view that cognitive abilities precede the development of language. Furthermore the intervention did not specifically target the development of language structures, but rather the facilitation of communication-related skills.

The same trends were found on the DMMI and the TPBA where communication trailed cognition. Language can never be equated to communication as "language and speech are important but are not ends in themselves…the importance of language derives from communication" (McDonald, 1980:52) as communication is a more encompassing, dynamic interpersonal process involving shifting between the receiver and the expresser. Language is the medium through which communication can take place. It is thus interesting that these trends are found in tests measuring cognition and communication and another test that measures symbolic play (cognition) and language.

From the slight decrease in performance in the language section of the test between the post-intervention and post-withdrawal phases, it can be deduced that the language behaviour was not maintained as the other communication behaviours as measured by the DMMI and TPBA. This finding was expected as language is a higher cognitive function (Vygotsky, 1962). From the above discussion of communication and language it seems evident that two different constructs are measured – communication and language. Significant changes were found in communication behaviour after intervention, but not in language, once again supporting Westby's (1980) and Vygotsky's (1962) views that language is a higher cognitive function, trailing the development of the more basic developmental domains, including communication as defined in this study.

5.3.4 Outcomes according to the VMI

This tool was used during the pre-intervention and post-intervention phases of the research. As explained in Chapter 4, this test could only be used once in the post-intervention phase, as it does not allow for quick successive retesting. This test was included as a countermeasure to investigate concurrent validity with the DMMI. Although the VMI purports to measure an integrative ability important to adequate functioning beyond visual-motor behaviour, results only reflect visual-motor integration. Based on the premise that if the intervention phase leads to no improvement on the VMI, but improvement on the four domains as measured by the DMMI, it can be concluded that VMI does not test the same constructs facilitated by this play package.

The hypotheses were formulated that

H_0 : there would be no positive change in visual-motor integration between the pre-intervention and post-intervention phases on the VMI.

H_1 : there would be a positive change in visual-motor integration between the pre-intervention and post-intervention phases on the VMI.

Figure 5.6 shows the mean performance of the participants in weeks 1 and 5 of the research period.

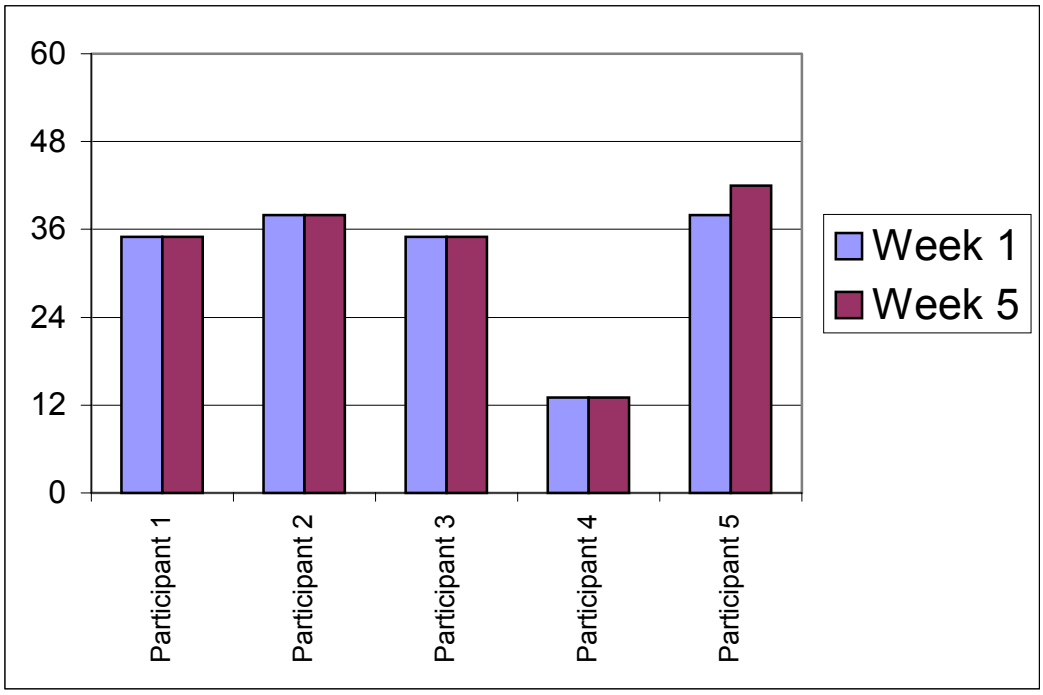


Figure 5.6 Age equivalent of each participant on the VMI

In Figure 5.6 the individual participants' performance on the VMI for week 1 and week 5 is shown. It is clear that this test indicated little or no improvement in the performance on visual-motor integration. Participants 1, 2, 3 and 4 scored the same in week 1 and after intervention in week 5. Participant 5 scored one increment higher after the intervention phase. Although the improvement (in months) differs with each participant, this is the given increment increase the test score provides.

Based on the findings that no marked improvement in visual-motor integration was found, the alternative hypothesis (H_1) was rejected and the nul hypothesis (H_0) accepted.

According to the findings as presented in Figure 5.6 three of the participants showed no development when the pre-intervention and post-intervention measurements were compared, while two showed a slight positive change. Although this test is regarded as reliable and valid (Beery, 1989) and it purports to correlate test results with children's mental age, the findings do not contribute extensive information about the participants in this study, except the lower level of functioning of this intellectually impaired group (Beery, 1989). These test results confirm the selection of the participants as being intellectually impaired.

As the test should only be used at 6-month intervals, significant improvement was not expected over a five-week period. The test-retest results are, however, an indication of reliability, as the performance of the subjects did not differ significantly. According to Beery (1989) the VMI measures an integrative ability, important to adequate functioning beyond visual-motor behaviour.

The play package aimed at the development of communication-related behaviours and did not specifically target visual-motor integration, so that no significant improvement in visual-motor integration was expected.

5.3.5 Conclusions

According to Wolf (1978) one of the criteria for the evaluation of the effectiveness of treatment is the validation of the outcomes of treatment. Based on the above findings, especially as four authentic measurement instruments were used, conclusions can be drawn about outcome validation.

A widely accepted description of effective treatment sets the criterion of the greatest improvement over the shortest time. This play package was presented to a group of intellectually impaired participants over a period of three weeks. The following was found:

- On three of the four measurement instruments a gradual and statistically significant increase in performance levels was observed on all the constructs. The question needs to be asked whether the therapeutic relationship of the Hawthorne effect could have influenced the results? The children could perform for the benefit of the researcher as they were singled out for special sessions, different to the rest of the class. Future research should investigate the possible influence of the Hawthorne effect during intervention. As the VMI tests visual-motor integration, indicative of the child's developmental level, the findings of this test did not indicate this gradual improvement. This finding was expected, as the VMI was included as a countermeasure.

- Both the DMMI and the TPBA highlighted patterns of development, development indicating a close relationship between the four areas of communication-related behaviours (the constructs).

- Furthermore, the findings support the view that communication is a higher-level function, as it trails the performance on the other constructs. Westby's (1980) statement that language development trails symbolic representation (cognition) explains the expected finding that the SPS-language test revealed a lack of significant improvement after intervention. The regression in language performance during the withdrawal period can perhaps be attributed to the fact that this behaviour had not yet been habituated – adaptation had not yet taken place.

- As no statistically significant difference could be found between the post-intervention and post-withdrawal performance levels, it can be concluded that the effectiveness of the intervention was such that the adaptive behaviours were maintained over this period.

- Although cross-validation between the different measurement instruments has not been done, certain observations can already be made about the measurement instruments:
  - There seems to be a marked similarity between the DMMI and the TBPA as compared over weeks 1, 5, and 8. As previously mentioned the DMMI measures performance components, which can be facilitated in short periods. The TPBA measures performance skills, which take longer to develop than the underlying performance components. For this reason, as well as the disadvantage that the TPBA takes long to administer, it is not a test that can be used as a daily evaluation of behaviour change during treatment.
  - Although the SPS includes both symbolic play (which involves various aspects of communication-related behaviours), as well as language, it does not cover the total field of the sensorimotor, cognitive, communication and social-emotional domains to evaluate performance. A full discussion of the differences between communication and language was presented in 5.3.3.
  - The VMI aims at testing visual-motor integration and is not supposed to be repeated in less than 6 months. As this test was included as a counter-measure, no change was expected, indicating that the play package facilitated behaviour change in the different developmental domains and not in visual motor integration.

Further analysis and interpretation of the value of these measurement instruments will follow in establishing the construct and convergent validity of the DMMI (See 5.6).

5.4 CONSTRUCT VALIDITY

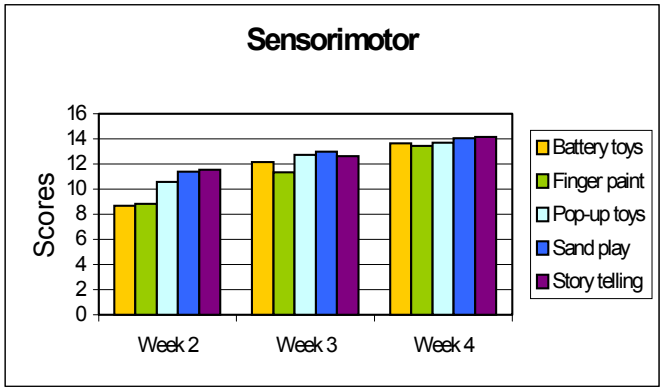
The process of validation includes validation of the assessment tool (DMMI), as well as the validation of the treatment section of the play package. The results obtained during the experimental phase were used to establish the validity of the play package.

In order to establish the validity of the play package, the reliability and validity of the measuring instrument were addressed. Therefore the DMMI, a newly developed measuring tool was scrutinised. Construct validity follows the process of the establishment of content validity of the DMMI. In Chapter 4 the process of content validation was discussed and the conclusion was that content validity of the DMMI had been established. Construct validity could only be addressed after the experimental phase of the research, as the results of the performance of the participants were needed. Construct validity concentrates on which construct the measuring instrument actually addresses (DePoy & Gitlin, 1994; Brink, 1999). It establishes the relationship between the results provided by the instrument and the underlying theoretical concepts of the instrument – in this case both the measuring instrument and the play activities. In this section sub-aims 4.3.2.3.2, 4.3.2.1 and 4.3.2.4 will be addressed.

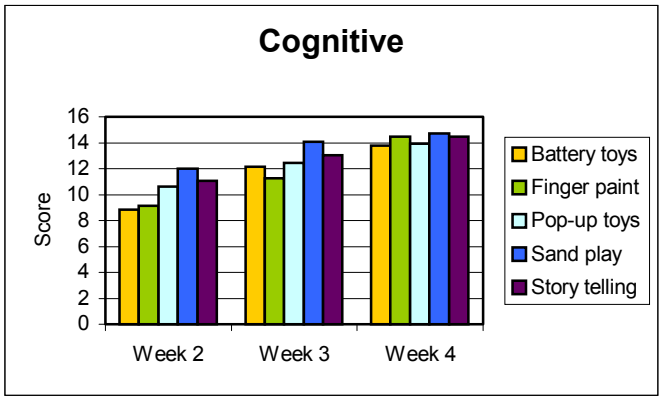
This section addresses the following issues:
Firstly, the change in the specific behaviours representing the constructs as a result of the application of the play activities is described. Secondly, the level of difficulty of the activities, relative to each other, is then presented.

5.4.1 Changes in specific behaviours representing the constructs after intervention

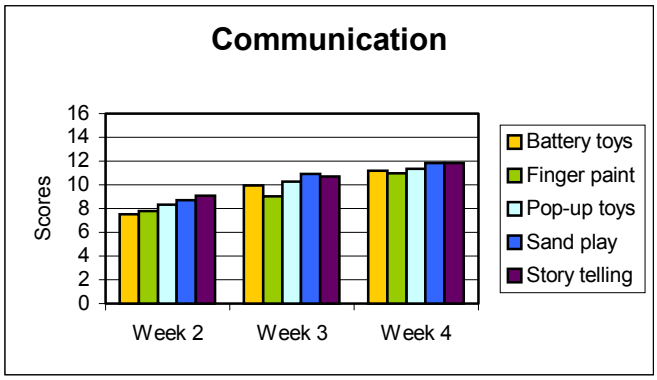
Figure 5.7 presents the four different constructs that were facilitated and measured during the intervention phase. They are the sensorimotor, cognitive, communication and social-emotional constructs. The relative gain the participants showed during the intervention is indicated for each of the five activities in the play package. These measures were obtained from the DMMI and the Friedman two-way analysis of variance test for nonparametric statistics was employed to analyse the data. The mean scores were used for the graphic presentation.



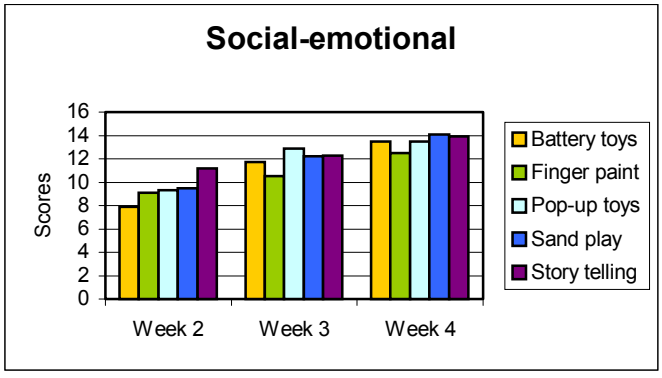
	Week 2	Week 3	Week 4	Gain	Ranking
	8.6857	12.1429	13.6286	4.9429	1
	8.8286	11.3143	13.4286	4.6	2
	10.5429	12.7429	13.7143	3.1714	3
	11.4	12.9714	14.0286	2.6286	4
	11.5429	12.6	14.1429	2.6	5
			Total gain	17.9429	



	Week 2	Week 3	Week 4	Gain	Ranking
	8.85	12.15	13.8	4.95	2
	9.1333	11.2667	14.4667	5.3334	1
	10.6	12.45	13.95	3.35	4
	12.0	14.0667	14.7333	2.7333	5
	11.05	13.05	14.45	3.4	3
			Total gain	19.7667	



	Week 2	Week 3	Week 4	Gain	Ranking
	7.5	9.95	11.175	3.675	1
	7.8	9.025	10.975	3.175	2
	8.325	10.25	11.35	3.025	4
	8.7	10.9	11.825	3.125	3
	9.1	10.725	11.85	2.75	5
			Total gain	15.75	



	Week 2	Week 3	Week 4	Gain	Ranking
	7.9	11.7	13.5	5.6	1
	9.1	10.5	12.5	3.4	4
	9.3	12.9	13.5	4.2	3
	9.5	12.2	14.1	4.6	2
	11.2	12.3	13.9	2.7	5
			Total gain	20.5	

Figure 5.7 Most gain of mean performance on all the constructs and activities

This figure indicates that there was a definitive pattern in the participants' performance during week 2. There was a gradual increase in performance in the way in which the activities were presented. The activities were presented in a set sequence as follows: battery-operated toys, finger-painting, pop-up toys, sand play and lastly storytelling (See Chapter 4). This pattern changed during weeks 3 and 4. Where there was a marked difference between the performance on the different activities during week 2, little or no difference between the performances on the different activities was presented in week 4. A gradual increase in performance on all four constructs is shown in this figure. Looking at the gain in performance on the different constructs, the participants had from least to most gain in the following order: communication, sensorimotor, cognitive, and social-emotional, as presented in Table 5.10.

Table 5.10 Ranking constructs according to most gain across all the activities on the DMMI

Construct	Difference between week 4 and week 2 in ranking order
Communication	15.75
Sensorimotor	17.9429
Cognitive	19.7667
Social-emotional	20.5

Because of the positive change in behaviour over three weeks, it is evident that learning (adaptation) took place, reflecting that the selected activities facilitated the development of behaviours representing all four constructs that were theoretically identified.

The construct validity of the play package is demonstrated in that the change in behaviours after the intervention phase was significant on all the constructs (See Table 5.2). It can therefore be concluded that the theoretical identification of the constructs and the subsequent selection of activities to facilitate the behavioural indicators, representing these constructs, were validly matched.

The data obtained during the intervention phase (weeks 2 to 4), were derived from the DMMI. The selection of items for this instrument and the adaptation of play activities in the play package were done through a process of operationalisation, in which the behavioural indicators representing the constructs were identified. There is thus a correlation between the

measurement instrument and the treatment activities. The investigation of the validity of the activities also reflects on the validity of the DMMI in that the activities facilitate the development of specific behaviours and the DMMI measures their occurrence.

The conclusion is thus that construct validity has been established for both the DMMI and the treatment.

5.5 LEVEL OF DIFFICULTY OF THE ACTIVITIES

A further analysis aimed at the investigation of the level of difficulty of the activities. Although the main focus was on the constructs measured, the independent variable, namely the play package with the five activities, were pivotal in obtaining the outcomes. Specific selected activities were included in the play package (See Chapter 4) but no literature was available on the degree of difficulty of different activities. All activities were selected for their ability to be adapted to the participants' developmental level and for the stimulation of the four different constructs. In the following section information was gathered to provide an indication of the degree of difficulty of each activity. The Friedman two-way analysis of variance test for nonparametric statistics was employed to analyse the data.

Table 5.11 shows the statistical analysis. The sum of all the constructs for the group as a whole was used in the analysis of the data.

Table 5.11 Level of difficulty of the activities

Week 2 – Total score (sum of all the constructs)					
	mean	median	sd	Level of significance	P-value
Battery toys	32.9357	27.1964	8.4893		
Finger-paint	34.8619	39.5655	8.7696	**	
Pop-up toys	38.7678	39.5714	6.0389	**	
Sand play	41.6	41.9286	4.4284		
Storytelling	42.8928	44.2143	7.9337		0.0015

Week 3 – Total score					
	mean	median	sd	Level of significance	P-value
Battery toys	45.9428	42.8929	7.0451		
Finger-paint	42.1059	44.2679	8.3263	*	
Pop-up toys	48.3428	46.3393	6.5088	*	
Sand play	50.1381	50.7083	4.5984		
Storytelling	48.675	46.6964	8.5825		0.0186

Week 4 – Total score					
	mean	median	sd	Level of significance	P-value
Battery toys	52.1035	52.875	6.4204		
Finger-paint	51.3702	53.5238	6.3864	*	
Pop-up toys	52.5143	55.2143	5.9595	*	
Sand play	54.6869	55.4821	4.4271		
Storytelling	54.3428	56.2143	5.9537		0.0093

* Significant at the 10% level
** Significant at the 5% level

For this statistical analysis the sum of gains presented by the group on all the constructs was employed.

Both the battery-operated toys and finger-painting differ significantly from storytelling during wee1k 2 at the 5% level. Finger-painting differs significantly from sand play and storytelling during weeks 3 and 4, but only at the 10% level.

In evaluating these findings, the data seem to suggest that battery-operated toys and finger-painting were the most difficult, as the initial level of performance of the group, was the lowest. However, as the gain in performance on the two activities was the greatest, the

assumption that they are more difficult needs to be questioned. It is possible that because of the selected research design a false image of difficulty appeared, as these two activities were always presented first. Carryover of the skills acquired during the battery-operated toys and finger-painting activities to pop-up, sand play and storytelling activities, could have taken place (Musselwhite, 1986).

No other significant differences could be established between the other activities. It may be concluded that there is no difference in terms of complexity of the activities. The play package should be used as a unit as each activity has its own profile of strengths in the stimulation of different constructs. This finding supports the results of the previous study by Uys (1997) in which the implementation of the package as a whole was recommended. Taking into account that carryover and reinforcement takes place during treatment (Parham & Fazio, 1997), it can be assumed that the whole is more important than the influence of the separate activities individually.

In Table 5.12 an extract of the information presented in Figure 5.6 is used. In this table the emphasis is on the gain each activity presented on each of the four constructs.

Table 5.12 Ranking activities according to the gains in performance in each construct (week 4 minus week 2)

Gain	Sensorimotor	Cognitive	Communication	Social-Emotional
Most	4.94	5.33	3.68	5.6
↕	4.6	4.95	3.18	4.6
	3.17	3.4	3.13	4.0
	2.62	3.35	3.03	3.4
Least	2.6	2.73	2.75	2.7

Battery toys	Finger-paint	Pop-up	Sand play	Storytelling

It seems as though battery-operated toys and finger-painting were the two activities in which the participants showed the greatest gain in performance on all the constructs. However, finger-painting did not have a strong influence on the behaviour representing the social-emotional construct. The other activities did not present with a specific pattern.

The influence of the activities was also analysed in terms of total gains over all the constructs. Battery-operated toys led to a total gain of 19.17; finger-paint 16.51; pop-up toys 13.55; sand play 13.08; storytelling 11.45. It is once again evident that the ranking shows the same tendency as when the constructs are taken separately, especially with regard to battery-operated toys and finger-painting.

Although the possible explanation of the sequence in which these activities were presented can be put forward for these findings, it can also be speculated that the participants were less familiar with battery-operated toys and finger-painting. The motivational value of novelty could explain the gain on battery-operated toys and finger-painting (Parham & Fazio, 1997). It should however, be taken into account that "…the implication for intervention is that we should structure young children's environments to increase the probability that they will engage in the behaviors that result in predictable but natural consequences, which in turn allow adaptive behaviour to be learned…a consequent event that functioned as a positive reinforcer for one child may not do so for another child…and the relative power of those events may change over time because of differences in the individual's physiology and learning history" (Shonkhoff & Meisels, 2000). Further research should be conducted in this area.

Table 5.13 views the ranking of constructs as presented in each activity. From this, the conclusion on the difficulty level of each activity relative to the different constructs could be drawn.

Table 5.13 Ranking constructs indicating most to least gain in each activity

Gain	Battery-operated	Finger-paint	Pop-up	Sand play	Story-telling
Most	5.6	5.33	4.0	4.6	3.4
↕	4.95	4.6	3.35	3.13	2.75
↕	4.94	3.4	3.03	2.73	2.7
Least	3.68	3.18	3.17	2.63	2.6

Sensorimotor	Cognitive	Communication	Social-Emotional

Communication seems to be the most difficult behaviour to facilitate by using this package as three out of five activities indicated least gain in this construct. The same pattern occurred for the social-emotional construct. Viewed as a whole, the sensorimotor construct trailed the cognitive construct. This finding can be explained by the participants' diagnosis of intellectual impairment, as specific sensorimotor problems are not the primary symptom. As they tested relatively high on the sensorimotor construct before intervention, a marked gain was not expected. No specific pattern was established regarding other tendencies.

This finding once again supports the view that the application of the play package as a whole is important. It does seem as though each activity has its own strengths in facilitating behaviour development.

5.6 CONVERGENT VALIDITY

A final measure of estimating validity is by comparing the results of a new instrument to the data of a criterion measure (a known instrument) at the same time (Brink, 1999). Convergent validity can, however, only be investigated after the analysis and interpretation of all the previous data.

In the establishment of convergent validity, the results according to the DMMI were compared with the results of two accepted, authentic measurement instruments, namely the TPBA and SPS. Using the Spearman's Coefficient of Correlation, correlation was established.

The results of the VMI were not included, as this test was included as a countermeasure. It was expected that not enough information on the constructs involved in this research would be revealed. Consequently there was a paucity of data to establish correlation co-efficients.

Table 5.14 presents the correlation between the DMMI and the TPBA for the pre-intervention, post-intervention and post-withdrawal measurements. This analysis is done separately as it is only in these two instruments that all four the relevant constructs were included.

Table 5.14 Correlation between TPBA and DMMI

		Week 1	Week 5	Week 8
Sensorimotor	correlation co-efficient	0.9	0.3	0.9
	p-value	0.0374**	0.6238	0.0374**
Cognitive	correlation co-efficient	0.61559	0.1	0.86603
	p-value	0.269**	0.8729	0.0577**
Communication	correlation co-efficient	1	0.87208	1
	p-value	0.0001**	0.0539**	0.0001**
Social-Emotional	correlation co-efficient	0.2	0.88388	0.7
	p-value	0.7471	0.0467**	0.1881
Total scores	correlation co-efficient	0.9	0.7	0.9
	p-value	0.0374**	0.1881*	0.0374**

** Significant at the 5% level
* Clinically significant

From this table it is evident that there is a significant correlation between these two tests on eight out of twelve measurements when the constructs are compared separately. In the sensorimotor construct there is significant correlation in weeks 1 and 8 (p-value 0.0374 and 0.0374 respectively). The same pattern was evident for the cognitive construct (p-value 0.269 and 0.0577 respectively). A correlation on all three measurements was found for communication, while on the social-emotional construct there was only a correlation in week 5 (p-value 0.0467). A certain degree of convergent validity was established between these two measurement instruments.

There is a difference between the increments used in the two measurement instruments. Where the TPBA used six developmental norm-based increments, based on complexity of behaviours, the DMMI used sixteen increments as it included complexity of behaviour, as well as frequency of occurrence of behaviour. Despite this fact, both instruments indicated significant change in behaviours on weeks 1, 5, and 8 (See Tables 5.5 and 5.7).

Secondly, as previously discussed, the basic difference between the DMMI and TPBA is that the former measures performance components while the latter measures performance skills. As such the DMMI seems to be a finer measure of gradual behaviour change.

A final decision on the convergence between the DMMI and TPBA can be based on the correlation between the total scores of week 1,5, and 8. It is evident that there is a significant correlation between the measurements on the three weeks. A statistical significance (significant at the 5% level) was established for weeks 1 and 8, and a clinical significance (significant at the 5% level) (Neetling, 2002) for week 5. It can therefore be concluded that convergent validity between the two tests has been established.

Comparing the DMMI and TPBA total scores with the SPS-play and SPS-language, separately, a further measure of estimating validity was carried out. Total scores were used because the SPS does not measure the constructs separately. The statistical analysis is presented in Table 5.15.

Table 5.15 Correlation between TPBA and DMMI and SPS

Week 1

TOTAL SCORE		DMMI	TPBA
SPS-P	correlation co-efficient	0.86603	0.86603
	p-value	0.0577**	0.0577**
SPS-L	correlation co-efficient	0.78262	0.78262
	p-value	0.1176*	0.1176*

Week 5

TOTAL SCORE		DMMI	TPBA
SPS-P	correlation co-efficient	0.67082	0.44721
	p-value	0.2152	0.4502
SPS-L	correlation co-efficient	0.87208	0.87208
	p-value	0.0539**	0.0539**

Week 8

TOTAL SCORE		DMMI	TPBA
SPS-P	correlation co-efficient	0.82078	0.71818
	p-value	0.0886*	0.1718*
SPS-L	correlation co-efficient	0.89443	0.78262
	p-value	0.0405**	0.1176*

** Significant at the 5% level
* Clinical significant

According to Table 5.15 there is a significant correlation in five out of twelve measurements, and a significant (clinically significant) correlation in another five. It is interesting to note

that where there is significant correlation between the DMMI and SPS there is also significant correlation between the TPBA and SPS, strengthening the conclusion that there is convergent validity of the DMMI when compared to the TPBA.

An interesting and expected finding was the highly significant correlation between these tests during pre-intervention measurements. This seems to indicate that the instruments do measure the same behaviours. However, the lack of correlation between the DMMI and TPBA on the one hand, and the SPS-play on the other, during week 5 was found. As the SPS-play measures performance skills, which take longer to develop than basic performance components, the skills do not seem to have developed at the measurement phase during week 5, but only after the post-withdrawal phase (week 8). The DMMI measured and found development of performance components, already the post-intervention phase (week 5). A further proof of this assumption is evident in that the correlation is not highly significant after the withdrawal phase. Seemingly the skills had not yet become habitual at this stage.

In interpreting the significant correlation between the SPS-language section and the DMMI and TPBA, it must be noted that the total scores of the DMMI and TPBA were used. It is once again evident that there is close interrelationship between the developmental domains underpinning the development of linguistic structures as tested by the SPS-language section.

In conclusion it can be stated that the above data analysis and interpretation is indicative of convergent validity of the DMMI.

5.7 VALIDITY OF THE PLAY PACKAGE

Validation involves the evaluation of four specific aspects of the intervention process, namely the goals, procedures, effects and outcomes of intervention (Kazdin, 1977; Kazdin, 1982; Wolf, 1978). Implicit in this statement is the use of reliable and valid measurement tools.

The evaluation of the goals is based on the theoretical underpinnings involved in the intervention programme. Through a process of operationalisation (Groenewald, 1988; Brink, 1999) measurable behavioural indicators, reflecting the theoretical constructs, were identified

in the pre-experimental phase of the research. Construct validation could, however, only be investigated after all the data of the experimental phase were collected.

Wolf's (1978) procedures refer to strategies and presentation methods of intervention. In the pre-experimental phase the sequence of presentation, as well as the activities included in the package were completed. After the collection and interpretation of the experimental phase data the influence of the levels of difficulty of the activities were considered in the validation of the play package.

As the validation of the play package (measurement and treatment) was based on behaviour change during the intervention phase, the outcomes (effects) of the intervention were addressed before construct and convergent validity could be established.

The process followed in the validation in this play package included four main criteria of validity (Brink, 1999), namely face and content validity (established through the participation of external raters and authorities in the field), as well as construct and convergent validity (based on the outcomes of the intervention).

Although further research on the validation is necessary, the validity of this play package has been established on these four criteria. This conclusion refers to the DMMI as measurement tool and the application of the play activities as part of the treatment.

5.8 SUMMARY

Chapter 5 dealt with the presentation, statistical analysis, description and interpretation of the results of the experiment. As the aim was to validate the play package the outcomes, constructs, and convergence were also validated. The conclusion was reached that although further research is necessary, in general the DMMI and the treatment activities have been validated.