

THE EFFECTS OF OCCUPATIONAL THERAPY MODULE ON LANGUAGE AND COGNITIVE ACQUISITION AMONG DOWN SYNDROME CHILDREN

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Abstract:

The purpose of this study is to determine the effects of an Occupational Therapy Module towards language and cognitive skills acquisition among four years old Down syndrome children. The aim of this study is also to evaluate and assess the existing strengths and weaknesses and to profile the subject's acquisition of language and cognitive skills. A case study approach with multi case and multi-site method which involves single subject A-B-A-B design was used to administer the module in four phases: Baseline (A), Intervention 1 (T), Maintenance (M) and Intervention 2 (K) in 24 sessions within a period of 6 months. The adapted language and cognitive development checklist was used to measure the level of acquisition based on a 6-point scale. A set of questionnaires was used to gather information on subjects from teachers, therapists and parents. Response of subjects tabulated in graphs and their progress was evaluated. The findings show that the use of therapeutic processes contributes towards improvement of language and cognitive skills from non-responding to responding consistently in all subjects. The implementation of Occupational Therapeutic activities stimulates the Oral Motor Movements (OMM) of the subjects which enhance their word pronunciation and comprehension. Improvement of memory and attention span were also observed in all subjects. Further work on this module should be carried out to include other categories of special children with language and cognitive impairments.

Keywords: Occupational Therapy, Modules, Language and Cognitive Acquisition, Down syndrome

INTRODUCTION

Instructional strategy and the qualities of intervention of teachers and therapists in early intervention programs will prove the achievement of language and cognitive Down syndrome children Vaughn and Fuch (2003). Teachers and therapists have to use more effective program in early intervention. They need to reflect the validity and reliability of assessment approach in designing intervention. There is some restraint in the implementation of early intervention program as to when it should be given more serious attention, especially in the approach of instruction. According to Nilonske and Mills (2014) teaching and learning activity in small groups, the role of the therapist, explicit and structured teaching also play a role in increasing the achievement of Down syndrome children. In this study, researcher chose heterogeneous Down syndrome children who require the design of early intervention programs that give focus to a model and relies on the integration of Occupational Therapy which enhance stimulation of Organ Sensory Motor-OSM (Dunbar, 2009).

BACKGROUND OF STUDY

Task to solve the problems of language and cognitive development in Down syndrome children are heavy and consisting of various levels of ability but by selecting the programs, modules and appropriate approach can improve their achievement (Deno, 2003). American and Canadian Association of Occupational Therapy (2015) view that the Occupational Therapy Module equipment have integrated mechanism which will stimulate, responsive and drive Organ Sensory Motor(OSM) internally and externally to enhance language and cognitive skills achievement. Thus teachers and therapists should have the creativity and enhance personal talents to develop the ability of language and cognitive skills of Down syndrome children (Babyak, Koorland, & Mathes, 2000).

STATEMENT OF PROBLEM

Education for Down syndrome children become more challenging as the current development in the aspect of scientific and educational technology. Language difficulties and cognitive disability in Down syndrome children need to be addressed effectively. Down syndrome children often have difficulties in the motor and sensory organ function has implications on their performance in activities of daily living skills (Dunbar, 2009). Delays in language and cognitive development can be enhanced to the optimum through the program, modules,

curriculum, therapeutic approach, structured clinical intervention style are designed to exploit the capabilities of language and cognitive abilities (Robert & Lynn, 1998). Hallahan and Mock (2003) have identified the problems faced by Down syndrome children have not found a solution.

Based on interviews, observations, reference documents and discussions with members of the multidisciplinary team in an early intervention centre, therapists are still practice the conventional way and do not refer to the current model and module. This is despite the fact that Occupational Therapy program involves various activities to enhance language and cognitive skills of children with Down syndrome (Kuhn & Stahl, 2003). Evaluation and assessment of strengths and weaknesses of children with Down syndrome should be monitored at all times to establish instructional process effective (Vaughn & Fuchs, 2003). Evaluation and assessment instruments should be appropriate to reflect the validity and reliability of the assessed skills (Fuchs & Compton, 2004).

THE OBJECTIVES OF THE STUDY

This study aimed to develop a profile of the background development of Down syndrome children. Also to measure the effectiveness of the Occupational Therapy Module to increase language and cognitive skills of the subjects. In particular, the objectives of the study such as to identify the components of language skills and components of cognitive achievement of Down syndrome children. Also to identify the extent of Occupational Therapy Module components influencing the increase of language and cognitive skills of Down syndrome children.

THE CONCEPTUAL FRAMEWORK OF THE STUDY

Forming the framework of this study is based on a combination of Learning Theory (Gagne, 1977), Cognitive Theory (Chomsky, 1965; Piaget, 1959), Assimilation Theory (Ausubel, 1965) and Behavioural Theory (Skinner, 1938). The combination of the above theories with Canada Occupational Therapy Model: How It Works that has been adapted from Hagedorn (1997) as a guide for the study. Researcher used the Occupational Therapy Module which emphasizes the stimulation process in an integrated Organ Sensory Motor (OSM) to create a positive behavioural response to increase language and cognitive components of Down syndrome children.

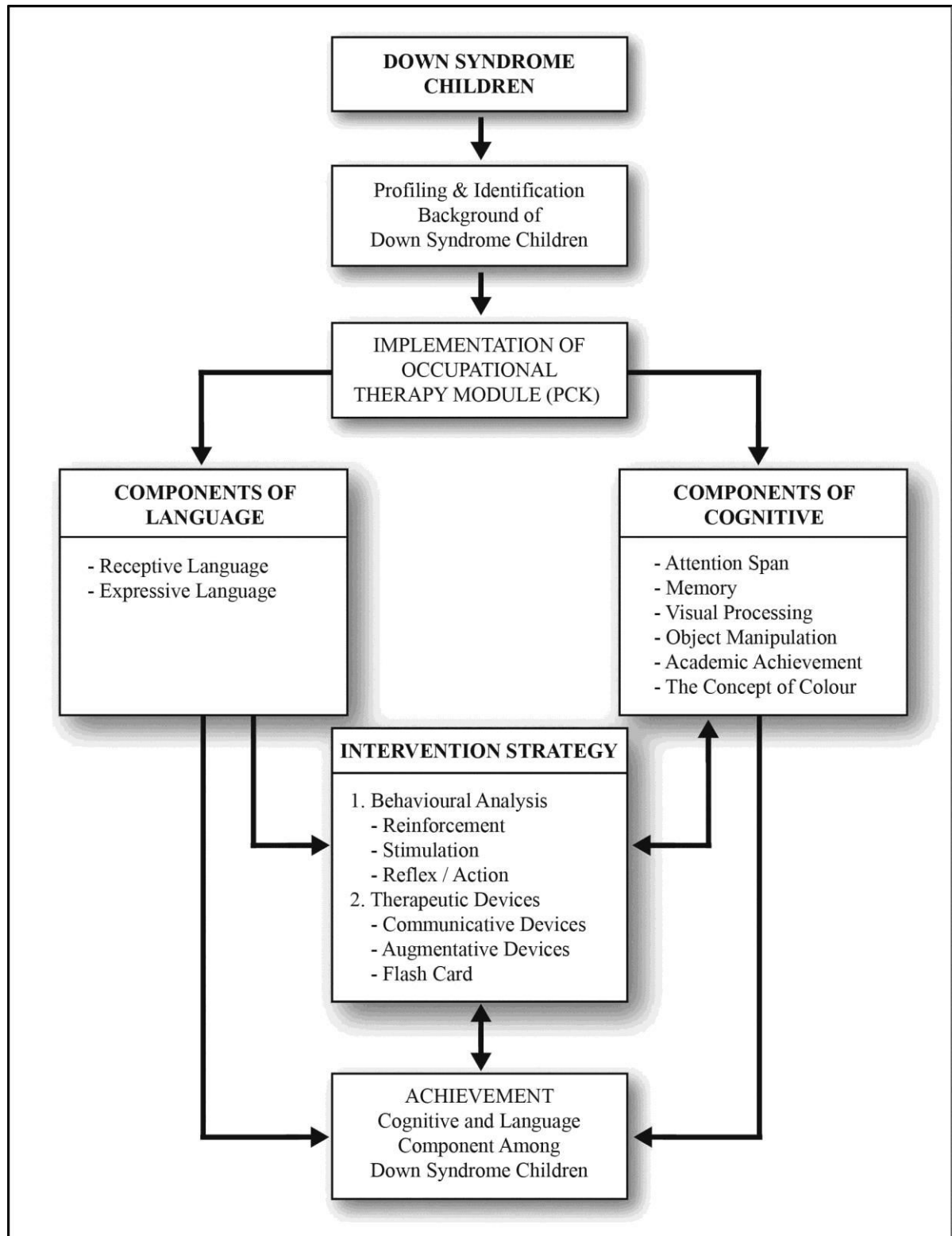


Figure 1 Conceptual framework of the study. Effects of the Occupational Therapy Module in increasing the language skills and cognitive components among Down Syndrome children.

METHODOLOGY

The Research Design and Respondents

This study is a case study of multi-case and multi-location based on A-B-A-B single subject design. Single subject design is very useful in conducting research on individuals in terms of intensive rehabilitation. The method of multiple cases and multiple locations to assess and evaluate individuals with Down syndrome in detail in terms of language and cognitive development as well as profiling the background are used. Subjects are selected from the categories of Down syndrome, aged 4 years respective of gender. Subjects were randomly selected from three early intervention centres in Malaysia which provided early intervention program. Subjects were chosen to meet the features and functions of Down syndrome children as poor motor coordination and sensory language ability are quite weak.

The Research Procedure

This study was conducted in four phases: Baseline Phase (A), Intervention Phase 1 (T), Maintenance Phase (M) and Intervention Phase 2 (K). During baseline phase (A) samples were observed their strength and weaknesses. Intervention phase 1(T) and 2 (K) researcher used Occupational Therapy Module to enhance or stimulate language and cognitive components achievement. Maintenance phase (M) as an effect of intervention 1 to reinforced Organ Sensory Motor (OSM) to maintain language and cognitive acquisition. All subjects went through 24 sessions over a period of 6 months. Language and cognitive development adapted checklist instrument which used to determine the level of increased language skills and cognitive components. Six point Likert scale was used in determining the scores for subjects in each of the skills to be included in a line graph. Questionnaires were also used for interviewing the teachers, therapists and parents to obtain information on the subject of detailed research. The findings were analysed based on qualitative data.

Table 1 Single Subject Design A-B-A-B

Y	BASELINE A Observation only. WEEK 1-6	INTERVENTION 1 T Implementation of First Occupational Therapy sessions WEEK 7-12	MAINTENANCE M Observation of Language and Cognitive skills maintenance results of Intervention 1 (T) WEEK 13-18	INTERVENTION 2 K Implementation of Second Occupational Therapy sessions. WEEK 19-24
	(Resource: Wiersma, 2000, pgs. 147)			
	X			

- A: The Baseline before therapy sessions, assessment tests and observation sessions were only held.
- T: The intervention session 1(T) – First Occupational Therapy session was carried out.
- M: The Maintenance and observation/assessment test to evaluate retention levels after the first intervention session (T).
- K: The intervention session 2 (K) was held to enhance language and cognitive skills acquisition of children with Down syndrome continued.
- Y: Components of language and cognitive achievement scores
- X: The variables of time and number of days of Occupational Therapy intervention sessions conducted

RESULTS

Background and Profile of Down syndrome Children

Interviews with teachers, therapists and parents of Down syndrome children, the background can be profiled in this study as the basis of data in the use of Occupational Therapy as a domain module on increasing language skills and cognitive components. Table 2 briefly describes the profile and background of children with Down syndrome.

Table 2
Profile Summary And Study Backgrounds

Subject	Diagnosis	Classification	Case of Birth History	Case of Infant Health Condition	Baby's Health Profile	General Inspection Case Baby Health	Referrals, Treatment & Rehabilitation	Global Evaluation & Assessment	Reference in Multi-Disciplinary Team
Ezzati	Down-Syndrome	Trisomy 21	Born with the baby's head traction device	Normal	With asthma	Normal	Government Hospital	Ability to perform gross motor activities, fine motor and self-care. Need help in speaking skills, social language and perception of orientation.	Paediatrics, Physicians for eyes, ears, nose, throat
	The second child								
Yan	Down-Syndrome	Trisomy 21	Incubator treatment	Normal	Suffered from lung fever 'pneumonia'	Suffered from complications of sight and hearing	Government Hospital	Ability in gross motor and fine motor. Need help in self-management skills, social speech, language orientation and perception.	The speech specialist, Paediatricians, The eyes, nose and mouth specialist, Specialist teachers of special education
	First-born child								
Humaira	Down-Syndrome	Trisomy 21	Caesarean surgery	Normal	Stable and there are no complications	Suffered from complications of sight and hearing	Government Hospital	Ability to perform gross motor activities, fine motor and social interaction with their own. Require physical assistance and verbal in self-management skills, language, perception and orientation.	Paediatricians, Speech pathologist, The eye, nose and throat specialist
	First-born child						<ul style="list-style-type: none"> The eye specialist The speech specialist The ear, throat and nose specialist 		

Increase in achievement of language and cognitive components of Down syndrome Children

The findings of the data obtained from Baseline Phase (A), Intervention Phase 1 (T), Maintenance Phase (M) and Intervention Phase 2 (K) can be described on a line graph, patterns of performance and increase language skills and cognitive components of Down syndrome children separately.

Comparison of the performance and acquisition of language skills and cognitive components of the subjects

The Occupational Therapy Module equipments adopted in this study contributes an effective performance and increase language skills and cognitive components of Down syndrome children. The results show that there are differences and similarities in achievement and enhancement of skills tested. Although language and cognitive skills of the subjects very low at the Baseline Phase (A) but it has been increased in the Intervention Phase 2 (K) whereby they are able to react and interact consistently.

DISCUSSION

The findings of this study indicate that the Occupational Therapy Module and the devices have been considered as the main predictor components to improve the performance of language and cognitive skills of Down syndrome children. In Occupational Therapy Module clinical methods and therapy approach emphasizes teaching and learning process that is integrated with the Stimulus and Response (S-R) to Organ Sensory Motor (OSM) has been strengthened and conditioned towards positive behaviour for language and cognitive skills of Down syndrome children. Therapeutic activities in the module of Occupational Therapy were found to influence the process of acquisition of language and cognitive components skills for Down syndrome children.

ACHIEVEMENT OF LANGUAGE COMPONENTS

Pre-Receptive Language

Based on the Figure 2, the process of Occupational Therapeutic intervention in phase 1(T) has given the an impact of visual, auditory and touch stimulation to act consistently in the pre-receptive language skills (*see the direction of sound, visual perception of the object and impressive sound source direction*). The findings of this study also support by Westling and

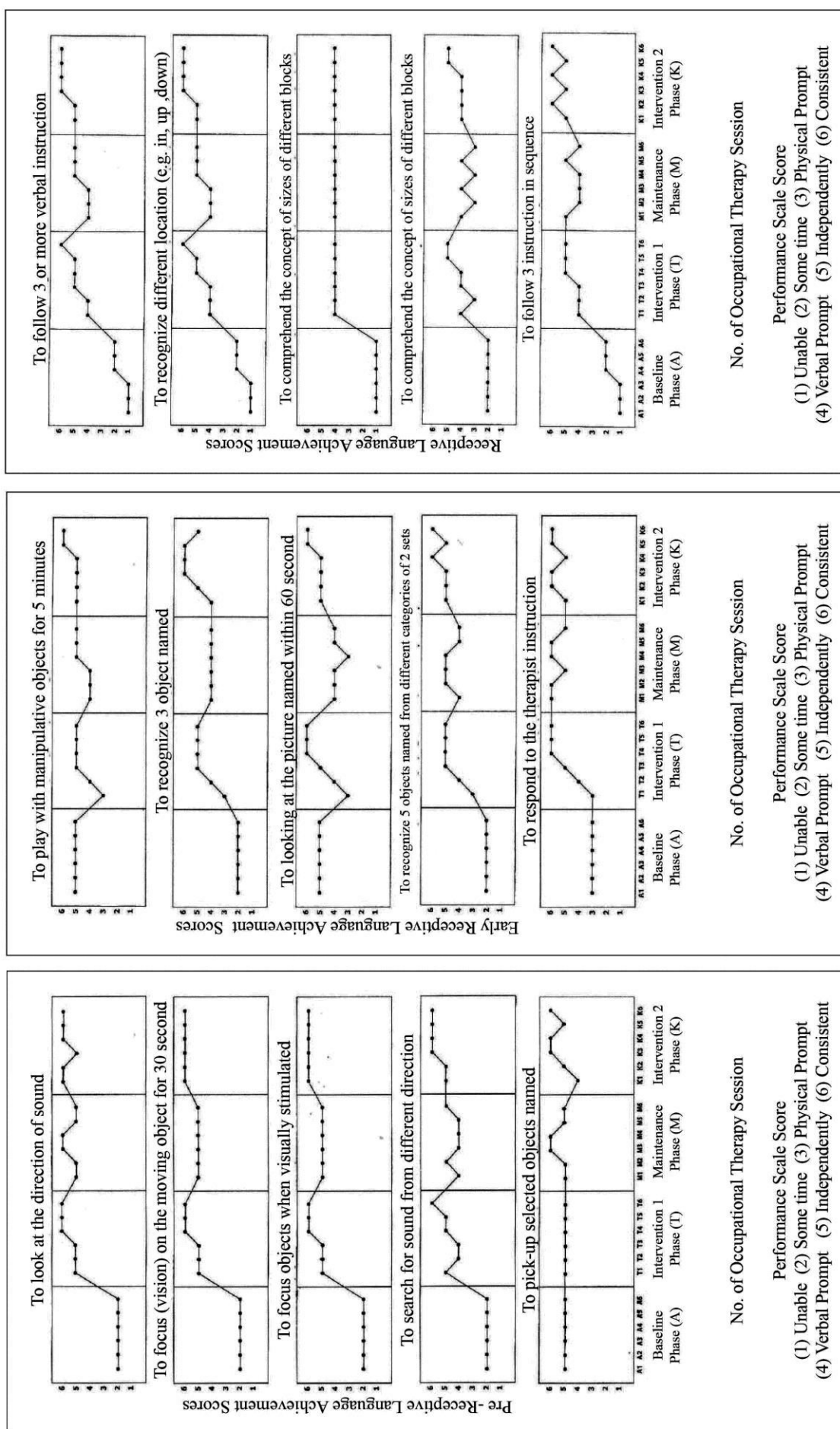
Fox (2014) which states that although Down syndrome children face extreme language and cognitive problems, if given intensive intervention function can improve the skills.

Early Receptive Language

In the meantime, the results showed weaknesses in receptive language skills early in the baseline phase (A). Figure 3 highlights, the intervention phase of the study found that subjects show interest, positive behaviour and ability to understand instructions to complete the initial language receptive activities (*playing with manipulative objects, identify objects, see picture called and respond to the therapist*). Occupational Therapeutic equipments (*Bolts, Nuts, and Supro Board Scanning Board*) have multi-dimensional function to stimulate and encourage organ sensory motor (OSM) of hearing and vision to act consistently in the early receptive language skills.

Receptive Language

The results of the study based on Figure 4 also show that there are differences and similarities in the scores of receptive language skills (*to follow verbal instructions, identification of three types of location, pointing to a set of called numbers*). Subjects were found to be able to encode, understand the concept of speech with the aid of the Occupational Therapy devices which enhanced the subjects ability to respond and interact with themselves consistently.



Pre- Expressive Language

Figure 5 shows that language skills component scores for the pre-expressive language (*imitating the tone, imitating vocal sounds, repeating the same sound, show pictures and objects*). It signifies that exposure to Occupational Therapy equipment as a tool to increase functional language has been stimulating and encouraging subjects to improve the pre-expressive language development to a level of consistently in maintenance phase(M) and in the intervention phase (T and K).

Early Expressive Language

Figure 6 below shows that the continuous interventions involving oral motor stimulation (OMS) process have been accelerating the learning process early expressive language skills (*imitates sounds, imitate the behaviour of the signal to show objects and activities*). Results of individual interventions have led subjects to improve their ability to continue to respond and interact more consistently from the maintenance phase (M) to interventions phase(T and K).

Expressive Verbal Language

Performance in the maintenance phase (M) without intervention the cognition component skills and expressive language intervention in the phase (T) has increased the level of consistency which can be maintained even in long-term memory. Based on Figure 7, in the Intervention Phase 2 subjects gained control of expressive language skills (*answer "yes", "no", use hand signals and name of the selected numbers and letters*). Teaching and learning approach in multi-dimensional of Occupational Therapy module is organ sensory motor(OSM) transform perspective of Down syndrome children to intensify the process of learning spoken language.

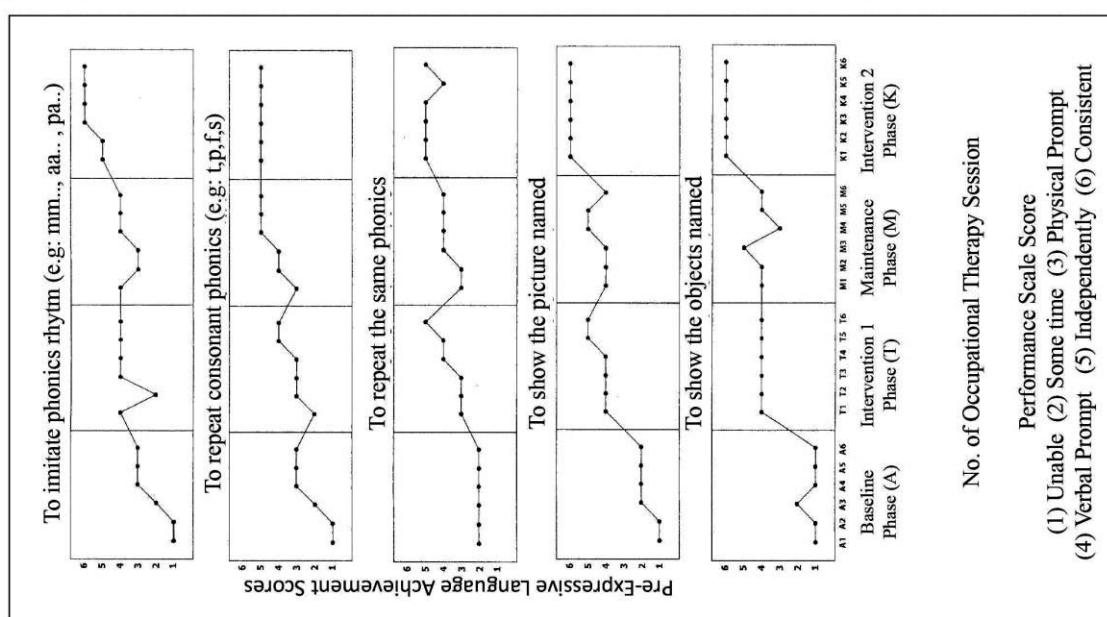


Figure 5 : Pre-expressive Language Component

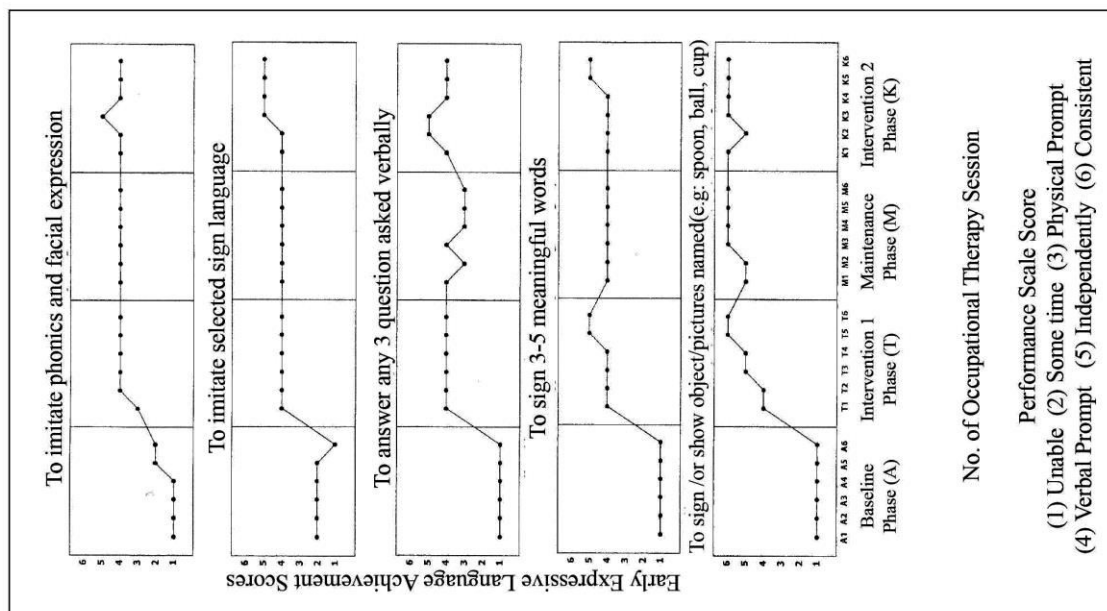


Figure 6 : Early Expressive Language Component

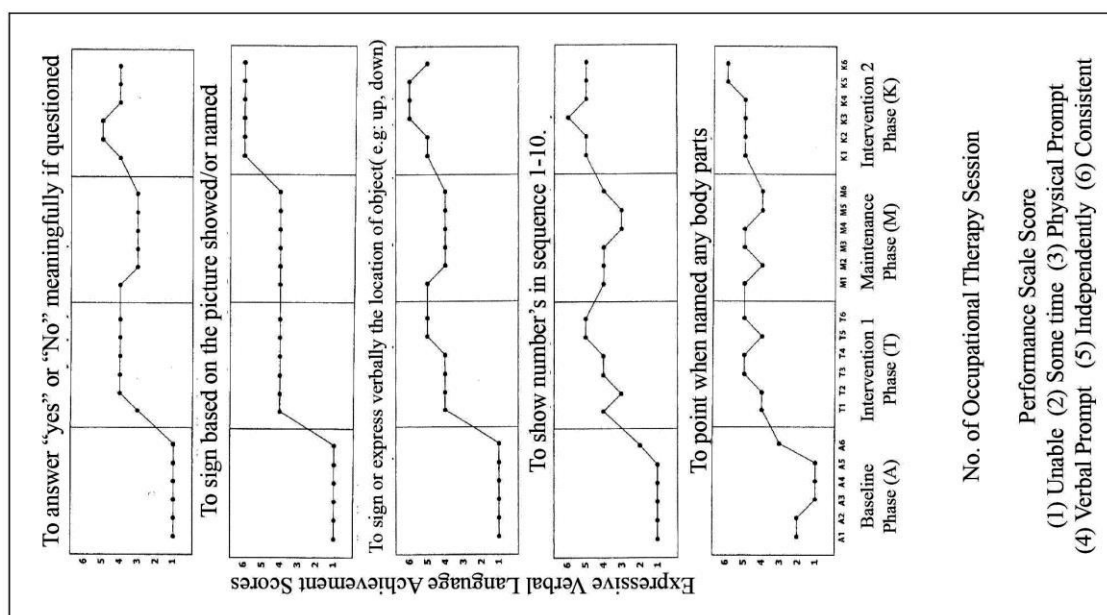


Figure 7 : Expressive Verbal Language Component

ACHIEVEMENT OF COGNITIVE COMPONENTS

Cognitive Component-Memory Skills

Figure 8 shows the differences between the cognitive component scores -memory, shows the differences between the phases. Occupational Therapeutic Module activities such as interdisciplinary combination of mind, environment and behaviour have an incentive and stimulus to understanding, interpreting and storing information in long-term memory. These findings show that Down syndrome children able to respond on their own in the phase of interference in cognitive skills-memory (*matching objects, matching pictures-PECS, complete the form and indicate the direction of moving objects*).

Cognitive Component-Attention Span

Figure 9, illustrates the outcomes of Occupational Therapy intervention, the cognitive component skills - concentration (*removing objects, matching objects, gives selected objects and organizing objects by category*) has been enhanced with the development of organ sensory motor(OSM) input such as :auditory, visual tactile, vestibular, and touch.

Cognitive Component – Visual Processing

Figure 10 illustrates that cognitive skills - visual processing, can be improved from the level of physical assistance in the baseline phase (A) to a level consistently respond in intervention phase 1 and 2. According to Ayers (1995) 75% of the processing of visual input to help the process of effective learning. This is in line with the practice of Occupational Therapeutic activities which was successful in increasing the skills above a level of consistently and independently.

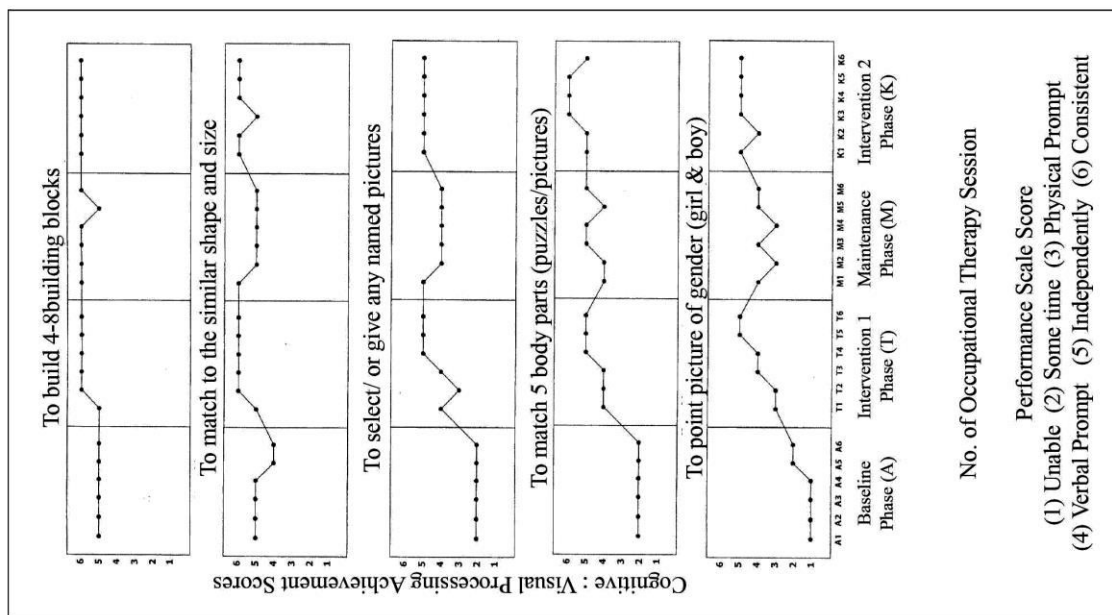


Figure 8 : Cognitive Component- Memory

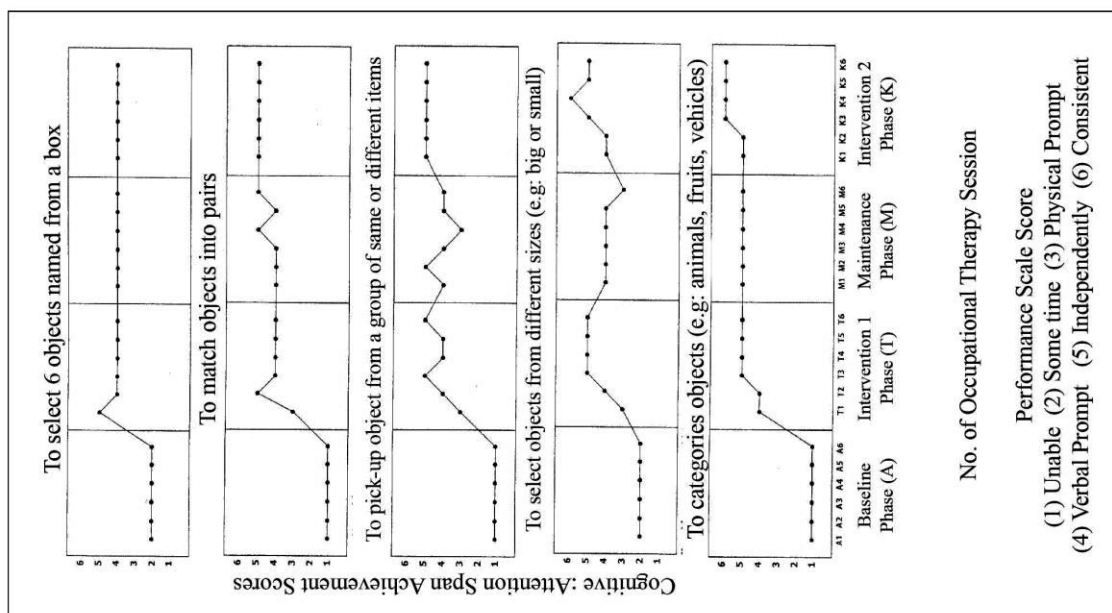


Figure 9 : Cognitive Component - Attention Span

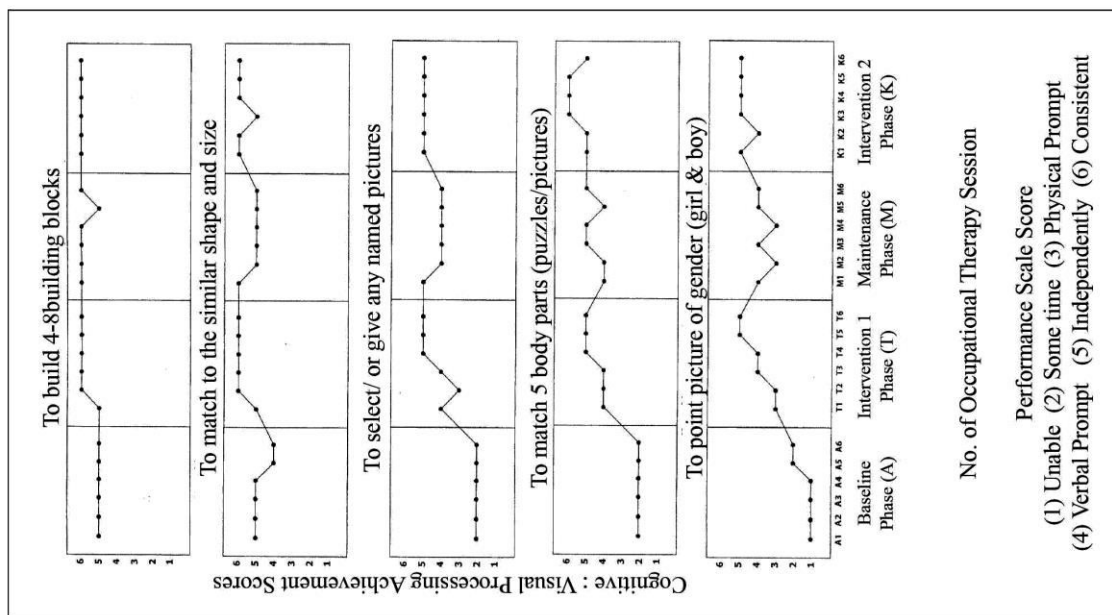


Figure 10 : Cognitive Component - Visual Processing

Cognitive Component- Objects Manipulation

Figure 11, successfully explains that the strength and ability of Down syndrome children to improve their cognitive skills are excellent in object manipulation in the intervention Phase 1 and 2. Occupational Therapy treatment devices are able to enhance the motor and hand joints(Range Of Movement-ROM) allows subjects to respond consistently.

Cognitive Component –Academic Performance

Figure 12 shows that Down syndrome children have the ability of cognitive skills (*matching, tracing and write the alphabet, numbers and pictures*). The role of motivation and Applied Behaviour Analysis (ABA) strategy enhance the ability of subjects to respond independently.

Cognitive Component –Colour Concepts

Figure 13, shows that subjects perceived the ability in cognitive skills, enhanced the achievement of understanding of concept of colour stimuli and motor responses of visual and auditory occasionally in baseline phase to the level of consistently perform in intervention phase (T and K).

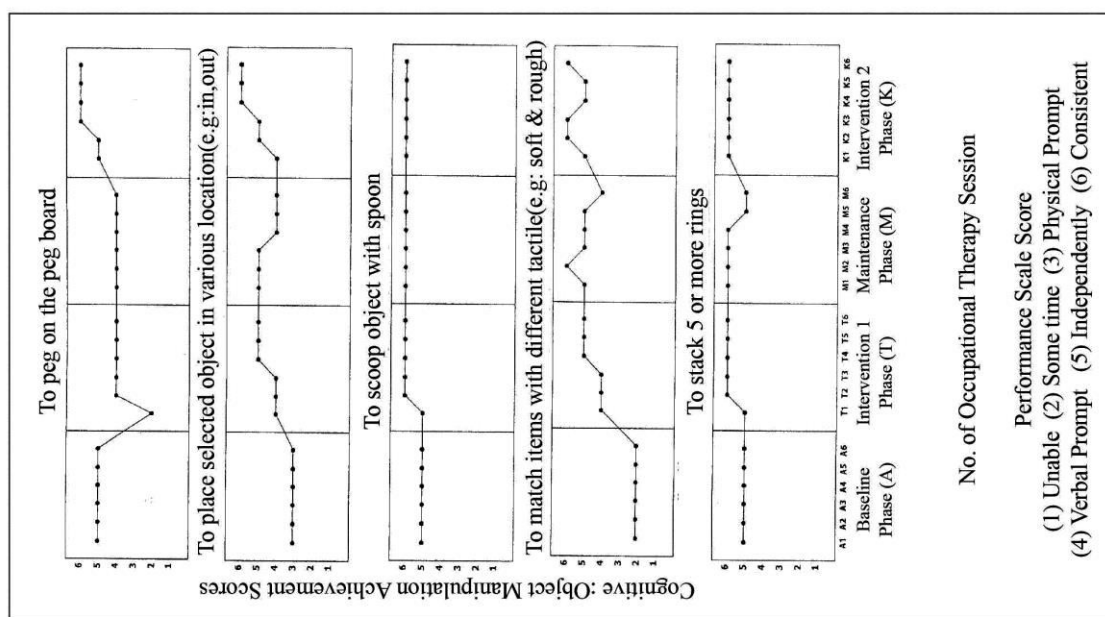


Figure 11 : Cognitive Component – Object Manipulation

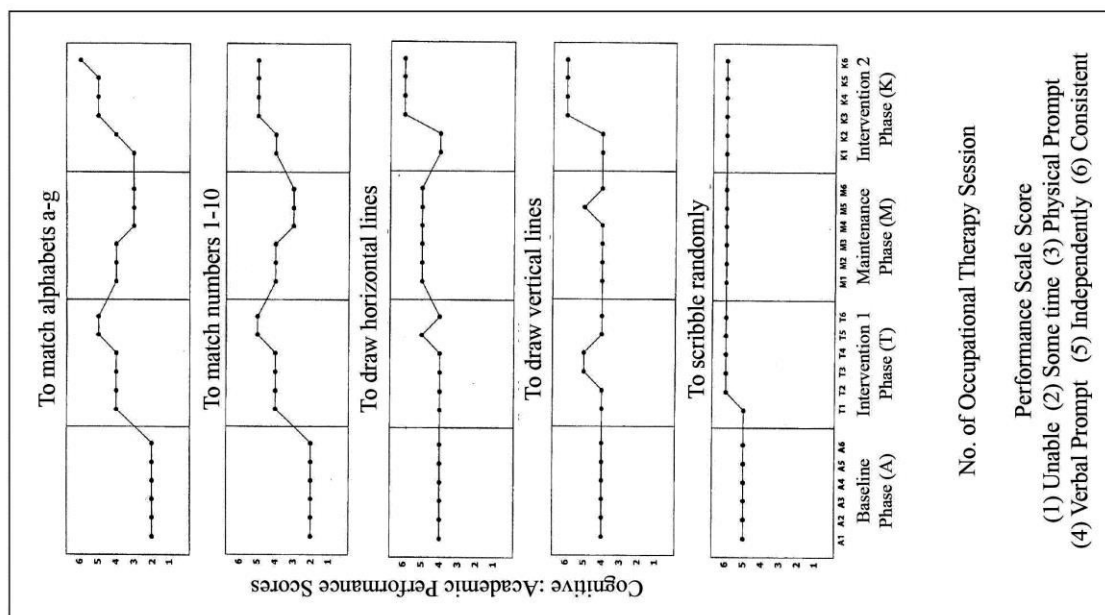


Figure 12 : Cognitive Component- Academic Performance

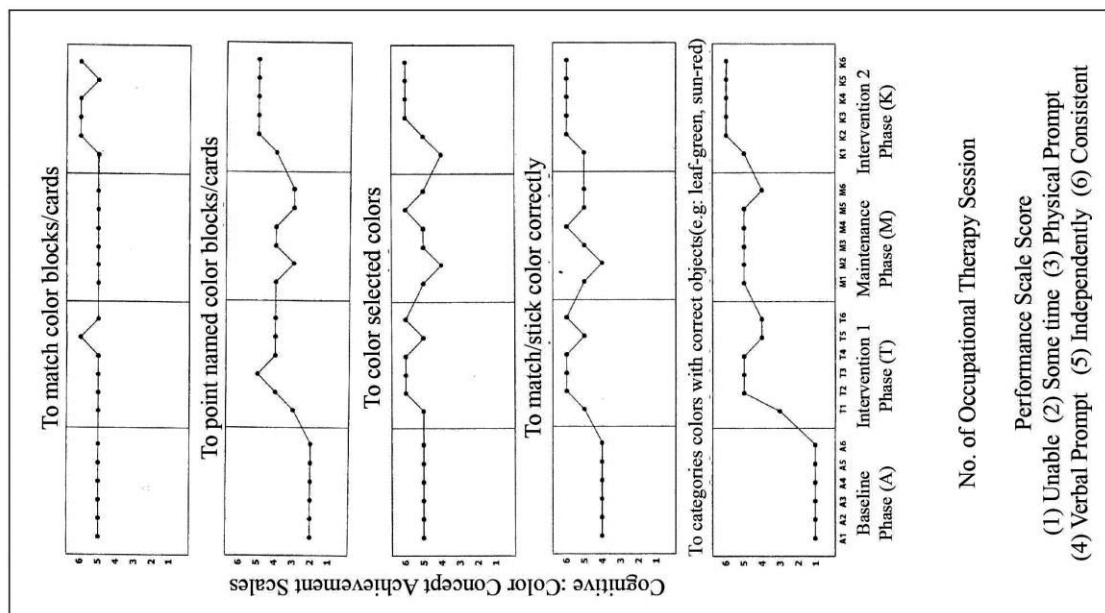


Figure 13 : Cognitive Component- Colour Concept

SUMMATIVE ANALYSIS

This study found that the practice of centred-activities integration module of Occupational Therapy Stimulus with Response(S-R) components to improve language skills progressively, from the level of underperformance to the level of consistently responding during intervention phase for all subjects. The augmentative devices of Occupational Therapeutic modules enhance the sensory motor stimulation process towards a positive response in acquisition of language skills and cognitive components of the subjects as reflected in Figure 14.

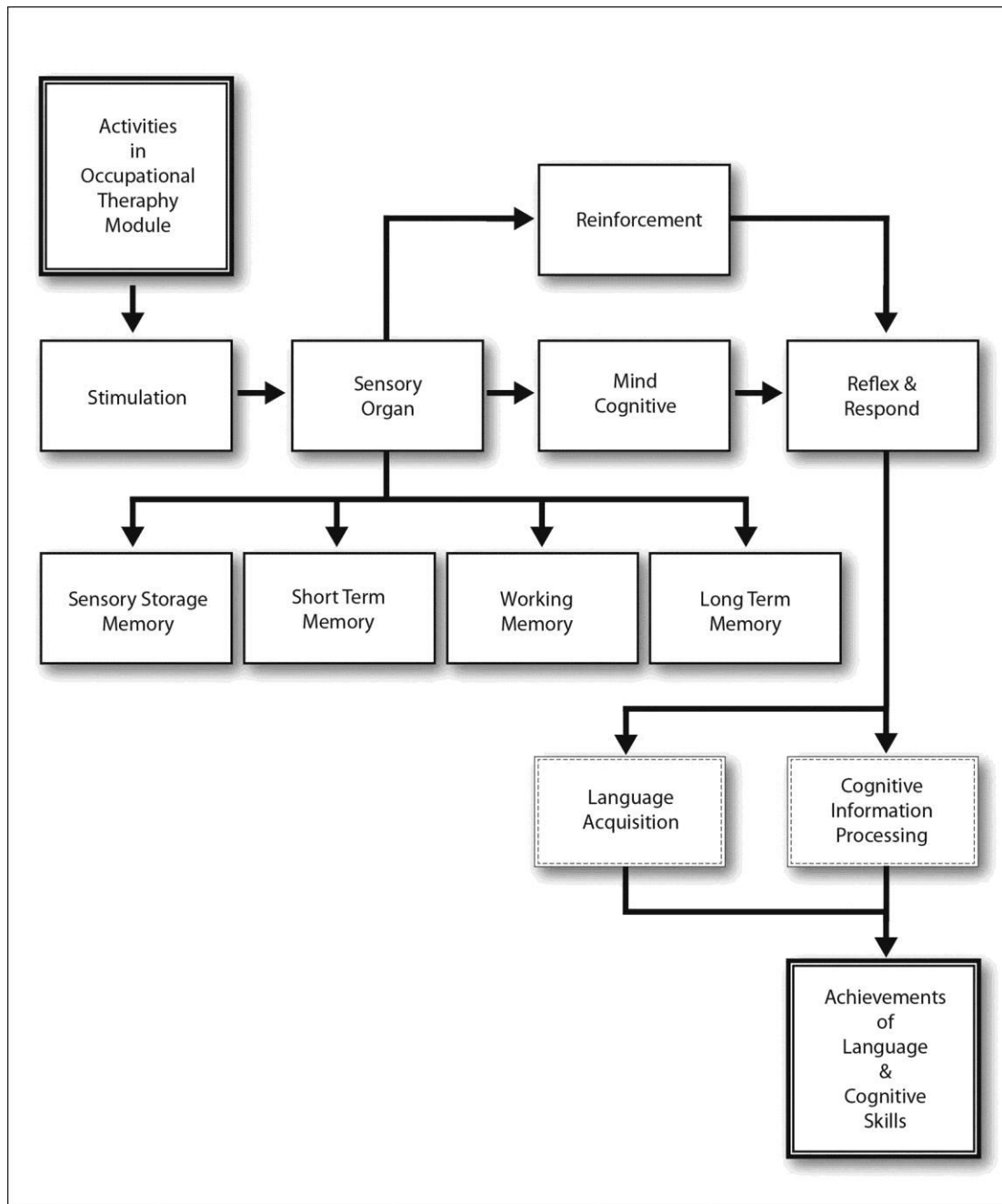


Figure 14 Domain of Occupational Therapy Module Approach

Activities of Occupational Therapy Module stimulates the Organ Sensory Motor(OSM) to realize the conditioning, behaviour encouragement and understanding the behaviour of the subjects. The input of minds-cognitive process encourage the respond of Down syndrome children to act to increase the skills of language proficiency and cognitive ability on a continuous basis.

IMPLICATIONS OF THE STUDY

The Occupational Therapy Module activities encourage interaction process, stimulate the understanding, motivate learning and support active learning in creating a positive environment. The use of Occupational Therapy Module as pilot projects in the early intervention program has succeeded in creating excellent results. Theories presented in this study related to teaching and learning of language behaviour and cognitive skills should be reflect in interventions session to improve language and cognitive components of Down syndrome children.

Teachers and therapists should have expertise and qualification in identifying the syndrome disorder and the biological, physiological and psychological of Down syndrome children. Parental involvement with multidisciplinary team members in early intervention program should exist at all times. Parents also should know the factors that affect language and cognitive development of their children. Early intervention program administrators should be aware of the category and the levels of Down syndrome children are heterogeneous and they should be assessed and evaluated as a whole.

CONTRIBUTION OF STUDY

Occupational Therapy Module can manage to overcome weaknesses in the approach to the conventional of teaching and learning at the centre of early intervention. Occupational Therapy Module contributed clinical therapeutic styles that are useful to teachers, therapists and parents. The study contributes to the set of instruments that can measure and assess the strengths and weaknesses of cognitive skills and language components of Down syndrome children. Occupational Therapy Modules also serve as a guide to the formulation and forming curricula, modules, and Individual Education Plans (IEP's) for Ministry of Education, Department of Social Welfare and Centre for Early Infant Stimulation and Early Intervention.

SCOPE FOR FUTURE RESEARCH

This research proposes that similar studies can be conducted with a large number of samples so that generalizations can be made on an international. It is proposed that Occupational Therapy Module is used for other categories of children with learning disabilities. Follow up studies can be conducted in the form of ANOVA and MANOVA in order to determine the study variables that will determine the effectiveness of the Occupational Therapy Module. Teachers and therapists in early intervention programs need to emphasize the diversity of methods of teaching, the characteristics of children, follow-up training and background to understand the subjects. Parents need to focus on their child's development as a whole. Early detection of symptoms, diagnosis, and placement in appropriate programs must be executed immediately. The ministry and the department relating to education, health and welfare of Down syndrome children should collaborate.

CONCLUSION

Results of the Occupational Therapy Module intervention displays performance and increase language skills and cognitive components of Down syndrome children. Similarities and differences in scores between and within the Baseline (A), Maintenance (M) Intervention 1 (T) and Intervention 2 (K) phases can be observed. The findings provide practice of scientific, educational technology, holistic, humanistic and parenting implications for the practice of an Early Intervention Program(EIP). Approach of intervention, therapy, instructional strategy, curriculum and modules to be in accordance with individuals with Special Needs Education (SEN) at all times.

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