CHAPTER 6

Summary, Conclusions
and Implications
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6.0 Introduction
This chapter presents the summary and conclusions of the research study “Effectiveness of HANDLE & SI Intervention Techniques on Perceptual Cognitive & Behavioral Skills of Children with Autism Spectrum Disorders”. It also presents the educational implications and suggestions for further research.

6.1 Objectives of the study

• To study the effect of HANDLE intervention program on the development of perceptual cognitive and behavioral skills in children with ASD.
• To compare the effect of HANDLE intervention program on perceptual cognitive and behavioral skills between the treatment group and the control group.
• To correlate mean gain scores of POS (Parent’s Observation Schedule) and SPCBS (Scale for Perceptual Cognitive and Behavioral Skills in Children with ASD).

6.2 Hypotheses

Hypothesis 1

1. HANDLE intervention program will significantly enhance the perceptual cognitive and behavioral skills in children with ASD.

1(a) Use of HANDLE intervention program will significantly improve the experimental group’s perceptual cognitive skills.

1(b) Use of HANDLE intervention program will significantly improve the experimental group’s positive behaviors.

1(c) Use of HANDLE intervention program will significantly reduce the experimental group’s negative behaviors.
**Hypothesis 2**

2. Children with ASD who receive HANDLE intervention program will improve significantly in perceptual cognitive and behavioral skills in comparison to those who do not receive it.

2(a) In comparison with the control group, children in the experimental group will manifest significant improvement in perceptual cognitive skills.

2(b) In comparison with the control group, children in the experimental group will manifest significant improvement in positive behaviors.

2(c) In comparison with the control group, children in the experimental group will manifest significant reduction in negative behaviors.

**Hypothesis 3**

3. The mean gain score on POS will correlate positively with the mean gain scores on SPCBS.

6.3 **Sample selection:** The selection process of the sample followed the course described below:

Stage I – Twenty one special schools specifically for children with ASD or regular schools with inclusive setups in Mumbai were identified.

Stage II – Children from 15 of these schools were randomly selected.

Stage III – A total of 80 children with autism (from both sexes), between the age group of 5 to 13 years receiving sensory integration were identified from school records.

Stage IV – The eligibility test was administered on them. Eight children did not meet the selection criteria.

Stage V – A total of 52 children with ASD were selected randomly from the 72 children who met the eligibility criteria.

Stage VI – Finally, 50 children participated (N=50). They were randomly assigned to an experimental group (N=25) and a control group (N=25).
6.4 Tools

The following tools were used for the study.

1) Tool for identification and selection of sample

Eligibility test – All children were tested on the eligibility tool prepared by the researcher. This tool was subdivided into two parts namely; Part A and Part B. Part A dealt with perceptual cognitive difficulties related to sensory processing difficulties, while Part B dealt with negative behaviors. The child had to score a minimum of 10 points in Part A and display any one behavior in Part B to be a suitable sample for the study. The scoring was done by the researcher by observing the child and taking into account direct inputs from the respective parent.

2) Tool for treatment

Some of the more frequently administered HANDLE intervention activities administered on the treatment group were Buzz Snap, Face Tapping, Two Finger Spinal Massage, Skull Tapping, Ear Muff, Hug and Tug, Rope Turning, Clapping Game, Accentuation Stomp, Crazy Straw and Jiggle Bridge.

3) Tool for measurement

1. Scale for Perceptual Cognitive and Behavioral Skills (SPCBS), a measurement instrument was specifically developed for the study to measure the Perceptual Cognitive and Behavioral skills in children with ASD. SPCBS was divided into three parts, namely:
   
i. Part A Perceptual Cognitive skills
   ii. Part B(i) Positive Behavior Patterns
   iii. Part B(ii) Negative Behavior Patterns

Part A measured the Perceptual Cognitive skills which were subdivided into Attentional Priorities, Visual and Auditory Discrimination, Visual and Auditory Sequencing, Figure Ground Perception, Visual Motor Coordination, Pattern Recognition, Visual Closure, Form Constancy, Position in Space, Spatial Relationship, Decision Making, Problem Solving, Concept Formation and Causal Relationship.

Part B(i) measured the Positive behavior patterns such as social smile, cooperating with others, waiting for a turn, sharing with others, seeking permission, offering help, expressing emotions, etc.
Part B (ii) of the tool assessed the negative behavior patterns which are categorized under stereotyped and repetitive behavior, violent behavior, self injurious behavior, disruptive behavior, and odd behavior.

The tool was designed to measure the scores on a 5-point scale from ‘Never’ to ‘Always’ where the skills were recorded as ‘Never, Rarely, Sometimes, Mostly or Always’. ‘Never’ scored 1 point and ‘Always’ scored 5 points in Part A and Part B (i) of the tool. For Part B (ii) of the tool, the scale was reversed as it dealt with negative behavior patterns. Therefore, the better the performance of the child, the higher the score in Part A and Part B (i) and the lesser the negative behavior, the higher the score in Part B (ii) of the tool. Therefore, the higher the composite scores, the better the functioning of the child.

The tool was content validated and subsequently pilot-tested on 6 children with ASD who were similar to the children of the study in age and eligibility criteria.

The reliability of the tool was established using Cronbach’s Alpha (0.961), Split-half-Spearman-Brown Formula (0.972) and Split-half-Guttman’s Formula (0.971). The concurrent validity was established with Motor–Free Visual Perception Test (MVPT) on a sample of 30 children. MVPT is a standardized test of visual perception which avoids motor involvement. It comprises of five types of perception, namely spatial relationship, visual discrimination, figure ground, visual closure and visual memory. Pearson Correlation was established with Part A of the tool ‘SPCBS’ and MVPT \( r = 0.7 \). Correlation is significant at 0.01 level.

This tool was used at both pretest and posttest by direct observation by the researcher and by consulting the concerned special educator and parent. The pretest scores of both the groups were analyzed to ensure parity among the children. There was no significant difference found between the groups \( t=1.38, df=48, p>0.05 \).

2. Parents Observation Schedule (POS) measured the child’s progress post intervention as observed by their parents. The tool was designed by the researcher to determine the observations and feedback of the parents. The tool comprises of 5 areas namely Independent living skills, Motor skills, Communication skills, Awareness and Cognition, General behavior and health. Each positive response is assigned 1 point.
6.5 Procedure for data collection

The data collection of the study was done as follows:

**Phase 1 Subject selection**

After securing permission from the special schools and regular school with inclusive setups, 80 children with ASD based on the selection criteria listed earlier were identified. From the obtained sample, (N=72) were selected on the basis of an eligibility test from which (N=52) were randomly selected. Finally 50 children participated. They were randomly assigned to an experimental (N=25) and a control group (N=25).

**Phase 2 Administration of pretest**

Subjects of both experimental and control groups were measured for their perceptual cognitive and behavioral skills on the SPCBS. This was done by direct observation by the researcher along with input from the respective teacher and parent.

**Phase 3 Treatment**

The experimental group of children received HANDLE intervention program over 25 individualized sessions. Keeping in mind the fundamentals of ‘Gentle Enhancement,’ each child was given intervention for 30 minutes 2 to 3 times a week. Treatment mainly focused on strengthening the weak sensory systems using organized movement activities in small, measured doses. Viewing the child’s requirement, the researcher designed activity programs for each child. Parents were involved in observing the program initially and later they were encouraged to learn the HANDLE activities required for their child.

The parents of the control group were briefed about the HANDLE intervention program while the group continued with regular activities in the school curriculum.

**Phase 4 Administration of posttest**

After the completion of 25 intervention sessions with each subject of the experimental group, the perceptual cognitive and behavioral skills of the experimental group and the control group were measured on SPCBS.
**Phase 5 Administration of POS**
This was administered on the parents of the experimental group only after intervention. Correlation between the mean gain on Parents Observation Schedule (POS) and the Scale for Perceptual Cognitive and Behavioral Skills (SPCBS) was established.

6.7 Results
The results obtained on quantitative analysis of the data are discussed below with respect to the hypotheses proposed for the study.

**Hypothesis 1**: HANDLE intervention program will enhance the perceptual cognitive and behavioral skills in children with ASD.

- The composite mean score (293.40) by the experimental group in posttest was significantly higher than that obtained in pretest (228.52). The derived t value (t=21.12, df=24) was highly significant (p<0.001).
- This suggests that there is a significant change in the perceptual cognitive and behavioral skills in children of the experimental group following HANDLE intervention program.

Therefore Hypothesis 1 is accepted.

**Hypothesis 1(a)**: Use of HANDLE intervention program will significantly improve the experimental group’s perceptual cognitive skills.

- The obtained mean score (99.88) by the experimental group in posttest was significantly higher than that obtained in pretest (74.80). The derived t value (t=10.97, df=24) was highly significant (p<0.001).
- This suggests that there is a significant change in the perceptual cognitive skills in children of the experimental group following HANDLE intervention program.

Therefore Hypothesis 1(a) is accepted.
**Hypothesis 1(b):** Use of HANDLE intervention program will significantly improve the experimental group’s positive behaviors.

- The obtained mean score (61.36) by the experimental group in posttest was significantly higher than that obtained in pretest (42.64). The derived t value (t=14.36, df=24) was highly significant (p<0.001).
- This suggests that there is a significant improvement in the positive behaviors in children of the experimental group following HANDLE intervention program.

**Therefore Hypothesis 1(b) is accepted.**

**Hypothesis 1(c):** Use of HANDLE intervention program will significantly reduce the experimental group’s negative behaviors.

- The obtained mean score (132.16) by the experimental group in posttest was significantly higher than that obtained in pretest (111.08). The derived t value (t=14.54, df=24) was significant (p<0.001).
- This suggests that there is a significant reduction in the negative behaviors in children of the experimental group following HANDLE intervention program.

**Therefore Hypothesis 1(c) is accepted.**

**Hypothesis 2:** Children with ASD who receive HANDLE intervention program will improve significantly in perceptual cognitive and behavioral skills in comparison to those who do not receive it.

- The composite mean score (293.40) by the experimental group was significantly higher than that obtained by the control group (261.40). The derived t value (t=2.14, df=48) was significant (p<0.05).
- This suggests that in comparison to the control group, there is a significant change in the perceptual cognitive and behavioral skills in children of the experimental group following HANDLE intervention program.

**Therefore Hypothesis 2 is accepted.**
**Hypothesis 2(a):** In comparison with the control group, children in the experimental group will manifest significant improvement in perceptual cognitive skills.

- The mean gain in the experimental group (25.08) was higher than the mean gain in the control group (5.80). The derived t value ($t=7.73, \text{df}=48$) was highly significant ($p<0.001$).
- This suggests that the experimental group showed greater improvement than the control group in perceptual cognitive skills.

Therefore **Hypothesis 2(a) is accepted.**

**Hypothesis 2(b):** In comparison with the control group, children in the experimental group will manifest significant improvement in positive behaviors.

- The obtained mean score (61.36) by the experimental group was significantly higher than that obtained in the control group (48.80). The derived t value ($t=3.36, \text{df}=48$) was highly significant ($p<0.05$).
- The mean gain in the experimental group (18.72) was higher than the mean gain in the control group (5.32). The derived t value ($t=8.69, \text{df}=48$) was highly significant ($p<0.001$).
- This suggests that the experimental group showed greater improvement than the control group in positive behaviors.

Therefore **Hypothesis 2(b) is accepted.**

**Hypothesis 2(c):** In comparison with the control group, children in the experimental group will manifest significant reduction in negative behaviors.

- The obtained mean score (132.16) by the experimental group was significantly higher than that obtained in the control group (118.68). The derived t value ($t=5.77, \text{df}=48$) was highly significant ($p<0.05$).
• The mean gain in the experimental group (21.08) was higher than the mean gain in the control group (2.40). The derived t value (t=8.78, df=48) was highly significant (p<0.001).
• This suggests that the experimental group showed greater reduction in negative behaviors.

Therefore Hypothesis 2(c) is accepted.

Hypothesis 3: The mean gain score on POS will correlate positively with the mean gain score on SPCBS.

• The obtained mean gain scores on POS correlates significantly with the mean gain on SPCBS (0.515).
• This suggests that there is a significant correlation between POS and SPCBS (p<0.004).

Therefore Hypothesis 3 is accepted.

Conclusion
The statistical analyses of the data indicate the following conclusions:
1. HANDLE intervention program was effective in significantly enhancing perceptual cognitive and behavioral skills in children with ASD.
2. HANDLE intervention program was effective in the development of perceptual cognitive skills in children with ASD.
3. HANDLE intervention program was effective in the development of positive behavior patterns in children with ASD.
4. HANDLE intervention program was effective in the reduction of negative behaviors in children with ASD.
5. Children with ASD who received HANDLE intervention program improved significantly in perceptual cognitive and behavioral skills in comparison to those who did not receive it.
6. Children with ASD who received HANDLE intervention program improved significantly in perceptual cognitive skills in comparison to those who did not receive it.
7. Children with ASD who received HANDLE intervention program improved significantly in manifesting positive behavior skills in comparison to those who did not receive it.
8. Children with ASD who received HANDLE intervention program improved significantly in reducing negative behaviors in comparison to those who did not receive it.
9. Parents of children who received HANDLE intervention program had a positive experience of the program. The mean gain scores of POS and SPCBS showed significant correlation.

Since ASD intervention is an emerging field in India and for many, ASD still remains a puzzling condition, the findings of this research can contribute to:
(1) greater awareness to the efficacy of HANDLE,
(2) greater focus on sensory integration intervention, and
(3) developing low-cost, no-infrastructure, effective intervention for Indian children with ASD.

6.9 Implications
Children with ASD experience difficulties in processing sensory information. This in turn affects perception, cognition and behavior of these children. The aim of intervention for these children is to maximize their potentials, facilitate social interaction, and help them become productive members of the society, thereby reducing their liability on their family and community.

In the Indian scenario, standard therapies are subject to several constraints: a lack of trained professionals, expensive equipment, impracticality over a prolonged period of time, space constraints, special venues (not home-based). These are, in fact, the drawbacks of most intervention programs. With the aim of introducing an intervention program apt for India in terms of cost, space availability, practicality of usage by the rural population, results visible in a short time span is the need of the hour. Though numerous policies and legislations have been introduced to ensure the rehabilitation
of individuals with disability, the definition of disability in India was extended to include ASD as recently as 13 years ago. India’s economy and demographics make it difficult for the state to meet the needs of its large disabled population. New scientific programs that make intervention for the disabled more economical and accessible are critical for India.

The HANDLE intervention program aims to address the sensory processing dysfunctions of individuals with ASD, thereby reducing the perceptual cognitive and behavioral deficits seen in children with ASD. The present study has proven the benefits of this intervention program. This study has implications for a range of stakeholders, including children with ASD, caregivers, professionals - including therapists and educators, administrators and the community as a whole.

**Children with ASD**

The most important stakeholder in a scenario of a child with ASD is the child himself. This study provides evidence of the significant benefits of HANDLE intervention program on perceptual cognitive and behavioral skills in children with ASD. Activities of the HANDLE intervention program help attentional priorities, differentiation, lateralization and interhemispheric integration thus having a wide range of impact on the individual’s social, academic and independent living skills. This is because of the sensory–motor interdependency and interaction. Sensory processing dysfunctions impact every sphere of activity for an individual that is otherwise taken for granted. Having a holistic approach to sensory intervention enhances the overall development of the child, making him comfortable within his body and in relation to his environment, thus improving the quality of his life. This redressal is imperative not just for the affected individual but also for the community, making it a community responsibility as well.

**Primary caregivers**

As primary caregivers, parents face a lot of challenges when faced with dealing with their child’s sensory difficulties. Simple everyday tasks seem like gigantic hurdles to be surmounted, some from hour to hour. Understanding a behavioral difficulty and correlating it with a sensory dysfunction reduces half the problem. Providing the appropriate HANDLE intervention activity to minimize a behavior difficulty at the
appropriate time helps reduce the sensory problems and enhances learning. Empowering the parent with this intervention ensures compliance with the home program, thus increasing the effectiveness of the program.

**Rehabilitation personnel**

Therapists or educators are the professionals working with children with ASD on a regular basis. They are involved in planning and implementation of individualized intervention programs and providing ongoing support and guidance to the families throughout the developmental and rehabilitative years of individuals with ASD. This study implies effective intervention for children with ASD facing sensory processing difficulties. The use of HANDLE intervention program along with the ongoing therapies and educational programs would enhance learning as the sensory difficulties affecting learning would be addressed, making learning and teaching an enjoyable experience. Reduction in challenging behaviors would improve learning. Providing the appropriate HANDLE activity would enhance the perceptual cognitive skills, thus helping not only in perceptual skills but also academic and independent living skills. The importance of HANDLE intervention program has been recognized in western countries and administrators are making efforts to accommodate it in their organizations. However, this process is still to develop in India. The implementation cost of this program is low as no special equipment is required for it. Its key operational features make it a practical model for India: low cost, nil infrastructure and minimum space requirement. Training professionals to conduct the program would represent the major cost involved. Importantly, parents and home-based caregivers can be trained to administer the home-based program after initial intervention by a trained professional. This ensures sustained intervention and continuing benefits of the program regardless of the economic background or location of the affected individual and family.
6.10 Suggestions for further research

In order to provide more empirical support to the findings of this study, further research should be undertaken. Suggestions for the same are proposed below:

- A study may be undertaken on a larger sample to facilitate generalization of the results to the target population.
- A longitudinal study may be conducted beyond the intervention phase to assess the long-term benefits of HANDLE intervention program and evaluate the follow-up program for parents and their role in carrying out the intervention program at home.
- A similar study may be conducted on adolescents with ASD to study the effect of HANDLE intervention program on behavior during the transition period.
- A study may be conducted to analyze the effect of HANDLE intervention program on other neurological disabilities.
- A study may be conducted to analyze the effect of HANDLE intervention program across multiple domains such as language and communication and academic performance in children with ASD.
- A study may be conducted on children with ASD in the rural set up. Rural children who are unable to avail the facility of Sensory Integration Therapy should be targeted to establish the efficacy of the HANDLE intervention program for sensory processing difficulties.
- A comparative study may be carried out on the effect of HANDLE intervention program and other sensory intervention programs on the development of sensory processing.
- A study can be conducted to evaluate the effect of HANDLE intervention program on the academic performance of regular school going children in the mainstream school set up.