CHAPTER 3

Methodology

The literature review suggests that there is a need to study the writing subtype of learning disabilities (APA, 1994). Furthermore, learning disabilities also occur with co-morbid conditions. Studies recommend that the intervention programs designed for children with LD must include intervention for the associated problems (Graham & Harris, 2000). In the present study, the investigator has attempted to study writing disability and the intervention strategies for writing disability. Moreover, the investigator has tried to study the impact of intervention strategies targeted for the specific LD as well as the behavior problems. This chapter gives a detailed report of the method followed to conduct the present research.

Statement of the problem

To study the effect of intervention strategies on Learning Disabilities (LD) and associated problems.

Purpose of the Study

Learning disabilities often manifests with co-morbid conditions. Maladjusted or behavior problems have been observed amongst children with LD in India (Mukerjee, Hirisave & Kapur, 1995). Studies have recommended that intervention programs designed for LD should include intervention for the co-morbid behavior problems for the improvement in overall performance (Graham & Harris, 1999).

The primary objective of this research is to study the impact of intervention strategies designed to help children with a specific Learning disability (writing

disability) and the associated behavior problems. The investigator attempted to achieve this objective with the help of two secondary objectives. First, the investigator studied the impact of the intervention strategy designed for the remediation of writing disabilities amongst the participants of this study. The intervention strategy designed for this study used techniques from self-regulated strategy design (SRSD) (Graham & Harris 1997; Harris & Graham 1992) and the self-monitoring of performance (SMP) (Harris 1986, Di Gangi, Maag & Rutherford 1991). The benefits of using strategies based on SRSD and SMP for helping children with learning problems have been documented by a number of studies (Graham & Harris 1997, 2000, 2001; Harris & Graham 1992; Harris, Graham, Mason & Saddler 2002; Graham, Harris Mason 2005; Graham & Perrin 2006; Graham & Mason 2006). Secondly, the investigator studied the effect of intervention strategies that included remediation for writing as well as behavior problems on the participants of this study. Behavior modification therapy was used in the present study. This method of therapy has been found to be effective in dealing with the behavior problems commonly seen amongst school going population (Allyson & Azrin, 1964, 1965; Miranda et al, 2002).

Through this study the investigator tried to achieve two purposes. The study shows the effect of the intervention strategies studied in the present study for the remediation of LD and associated behavior problems. Moreover, this study also makes a valuable addition to the limited research resource in the area of LD in India.

Research Questions

This study tries to answer the following research questions.

1. How do intervention strategies designed for the remediation of "writing

disabilities" affect the performance of students on writing tasks as well as associated behavior problems?

2. How do intervention strategies designed for the remediation of "writing disabilities" and "behavior problems" affect the performance of students on writing tasks and associated behavior problems?

3. How does the impact of intervention strategies designed for the remediation of "writing disabilities and behavior problems" compare to the impact of intervention designed only for the remediation of "writing disabilities" of students?

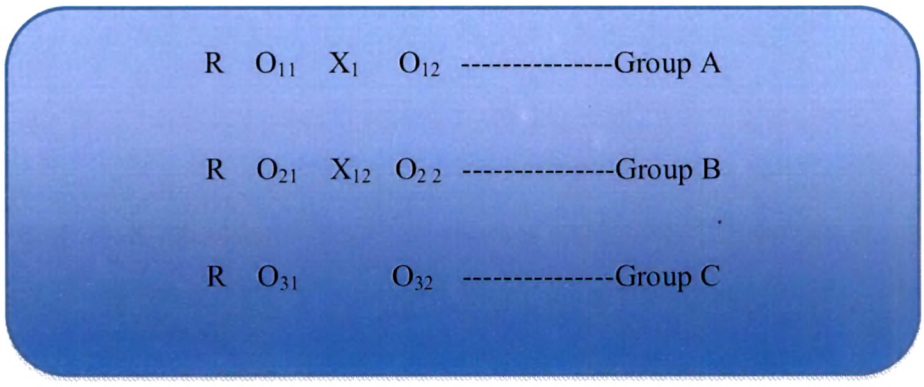
To answer these questions, the investigator decided to conduct a study on children with LD, subtype writing disabilities and associated behavior problems. The study involved assessment and intervention for LD and associated behavior problems. From the review of relevant literature, the investigator decided to use self-monitoring of performance for the intervention of LD and behavior modification therapy for the intervention of behavior problems.

Research Design:

The present study employed the pretest-post test control group design. There were two experimental groups and one control group. Each of the three groups were tested three times, that is before intervention (pre-test), after intervention (post-test) and follow-up. Following is a brief description of the design.

Justification of the pretest-posttest control group design: The present study used the pretest-posttest control group design. In the area of education and psychology, this type of experimental design has been found to be favorable (Singh 1998). This design helps in reducing the threats to the internal as well as external

validity of the experiment. The effects of maturity, history, instruction etc are controlled by the use of this design. According to Campbell & Stanley (1963), the pretest-posttest control group design assures the external validity of the study. The statistical representation of the design of the present study is as follows:



Note:

X: A treatment (intervention) employed in the study. HereX_1 shows intervention only for "writing problems". X_{12} shows intervention for "writing and behavior problems". The control group is not given intervention.

O: An Observation. Here, observation for three different groups has been shown.

In the pretest-posttest control group design, each group is tested (observed) two times, once before intervention and once after intervention. Here, O_{11}& $O_{12}$are pre-test and post-test scores for group A. O_{21}& $O_{2\,2}$ are pre-test and post-test scores for group B and finally O_{31}& O_{32} are pre-test and post-test scores for group C.

R: Random assignment to groups. The selected participants are assigned to the experimental and control groups employing the method of random assignment.

Figure No. 1: Statistical representation of the Design.

Variables

A variable is a concept or construct that can vary or have more than one value (Campbell & Stanley, 1963). A research study involves different types of variables. Three types of variables that have been mentioned here are independent, dependent and confounding variables.

Dependent Variables: There are two dependent variables for this study.

1. The performance of the participants on NIMHANS INDEX for SLD-subtest on writing.
2. Behavior problems as reported by the class teachers on the child behavior checklist.

Independent Variables: The experimental treatments or interventions given to the two experimental groups are the independent variables.

1. Intervention for the remediation of "writing problems" given to Group A.
2. Intervention for the remediation of "writing problems and behavior problems" to Experimental group B.

Confounding Variables: Any variable other than the independent variable that can potentially play a role in the outcome of a study but which is not part of the study is called a confounding variable. Researchers often keep these variables constant to control their effect on the results of the study (Kothari, 2004). In the present study, age, medium of instruction and sex of the students were the control variables that were kept constant. Moreover, the design employed in the present study further assists in controlling the effect of these extraneous variables that may confound the effect of the independent variables.

Hypotheses

The study was designed to test the following hypotheses.The statistical hypotheses for the present study are enumerated below. Although previous research studies support the research hypotheses about the effectiveness of the intervention strategies used in this study, for the ease and precision of analysis null hypotheses

were formulated. Moreover, the hypotheses for the two dependent variables are presented one after the other for convenience. The first section presents the hypotheses for the first dependent variable and the second section presents the hypotheses for the second dependent variable.

Hypotheses for the first dependent variable "writing problems"

$H_0 1$: There will be no statistically significant difference between the pre-test, post-test and follow up-test scores for writing problems of Group A, Group B and Group C when the three groups are compared with each other.

$H_0 2$: There will be no statistically significant difference between i) pre-test and post-test; ii) post-test and follow-up; iii) pre-test and follow-up test intervention scores on "writing problems" of the intervention group A.

$H_0 3$: There will be no statistically significant difference between i) pre-test and post-test; ii) post-test and follow-up; iii) pre-test and follow-up test intervention scores on "writing problems" of the intervention group B.

$H_0 4$: There will be no statistically significant difference between i) pre-test and post-test; ii) post-test and follow-up; iii) pre-test and follow-up test intervention scores on "writing problems" of the control group C.

$H_0 5$: There will be no statistically significant difference in the post test scores for writing problems between i) group A and group B; ii) Group B and Group C and iii) Group A and Group C.

$H_0$6: There will be no statistically significant difference in the follow-up test scores for writing problems between i) group A and group B; ii) Group B and Group C and iii) Group A and Group C.

Hypotheses for the second dependent variable "behavior problems":

$H_0$7: There will be no statistically significant difference between the pre-test, post-test and follow up-test scores for "behavior problems" of Group A, Group B and Group C when the three groups are compared with each other.

$H_0$8: There will be no statistically significant difference between i) pre-test and post-test; ii) post-test and follow-up; iii) pre-test and follow-up test intervention scores on "behavior problems" of the intervention group A.

$H_0$9: There will be no statistically significant difference between i) pre-test and post-test; ii) post-test and follow-up; iii) pre-test and follow-up test intervention scores on "behavior problems" of the intervention group B.

$H_0$10: There will be no statistically significant difference between i) pre-test and post-test; ii) post-test and follow-up; iii) pre-test and follow-up test intervention scores on "behavior problems" of the control group C.

$H_0$11: There will be no statistically significant difference in the post test scores for "behavior problems" between i) group A and group B; ii) Group B and Group C and iii) Group A and Group C.

$H_0$12: There will be no statistically significant difference in the follow-up test scores for "behavior problems" between i) group A and group B; ii) Group B and Group C and iii) Group A and Group C.

Inclusion criteria: Following is the criteria considered for the inclusion of participants.

a. Sample comprised school going children.
b. Children falling in the age range of 8-12 years.
c. Children identified by teachers as having poor academic performance.
d. Children scoring full scale IQ of 80 and above on Malin's Intelligence Scale for Indian Children.
e. Children studying in schools where English is the medium of instruction.
f. Children diagnosed as having specific learning disability in writing (handwriting, spelling, composition) from DSM-IV and confirmed after assessment on NIMHANS Index for specific learning disability.
g. Children identified with behavioral problems by their teachers.
h. Children going to school with at least 75% attendance.

*Exclusion criteria:*Following is the criteria considered for the exclusion of participants.

a. Children with mental retardation. Full scale IQ less than 80 when measured on Malin's Intelligence scale for Indian Children.
b. Children with gross and uncorrected visual or auditory sensory handicaps which could influence school performance.
c. Children with medical conditions such as epilepsy and head injury which could impair the ability to learn.
d. Children who scored 10 or more on Bender Gestalt (BG) test for Visual motor integration. High Scores on BG are predictors of brain damage.
e. Children with poor visual and auditory memory.

The sample/participants

A total of 63 students were selected for the study. The final data presented in the results section takes into account a total of 60 students randomly distributed amongst three groups. Three additional students were included in the study in view of any attrition during the study period. The screening procedure and the sampling procedure is discussed in detail under the section titled plan and procedure

Characteristics of the selected sample: The selected sample belonged to the age group of 8-12. All the participants studied in schools where English was the medium of instruction. The grade and gender wise distribution of the selected sample is shown in the table X 1.

Table 3.1: Grade and Gender wise distribution of the sample

	Grade				
Gender	III	IV	V	VI	Total
Male	11	24	9	6	50
Female	3	3	2	2	10
Total	14	27	11	8	60

Assignment of the participants into three groups: The selected participants were randomly assigned to three groups. Random assignment of the participants assures control from extraneous factors such as fatigue, experience gained from repeated exposure to the test etc (Garrett, 1969 & Kothari, 2004). One of the experimental groups (Group A) received treatment only for the writing problem and the other experimental group (Group B) received treatment for the writing problem

and behavior problem. The last remaining group was the control group (Group C) that did not receive any treatment. Each of these groups had 20 participants each. Grade and gender wise distribution of the sample after random assignment to the three groups is presented in Table No. X 3

Table 3.2: Grade and Gender wise distribution of the three groups

	Group A			**Group B**			**Group C**			**Total**
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
III	04	01	05	03	01	04	04	01	05	14
IV	07	01	08	08	01	09	09	01	10	27
V	03	01	04	03	01	04	03	00	03	11
VI	02	01	03	02	01	03	02	00	02	8
Total	16	04	20	16	04	20	18	02	20	60

The setting

The study was conducted in five schools in the city of Baroda in India. The medium of instruction in these schools was English. Three of the five schools followed the curriculum for state board examination and the remaining two followed the curriculum for the central board examination.

Tools for Data Collection

A standard battery was used to screen the participants for the study as well as for assessing the progress. The screening tools are as follows:

1) NIMHANS Index for Specific LD: The battery was originally developed by John in 1989. It was administered to a sample of 50 students in the age group 8-12 years old. The test was routinely used in the Child and Adolescent Mental Health Unit, NIMHANS. In 1992 Kapur et al compiled the following tests into a battery and named it NIMHANS Index for SLD (NIMHANS ISLD). It comprises the following tests:

1) Attention test (number cancellation)
2) Language test (Reading, writing, spelling and comprehension)
3) Arithmetic (Addition, subtraction, multiplication, division and fractions)
4) Visuo motor skill (The Bender Gestalt Test and the Developmental Test of Visuo-motor Integration)
5) Memory.

There are two levels in this test. The items in level I is appropriate for younger students belonging to the age range from five to seven years. Level II can be administered on students belonging to the age range of eight to twelve years.

For the purpose of the present study, level II was administered on the

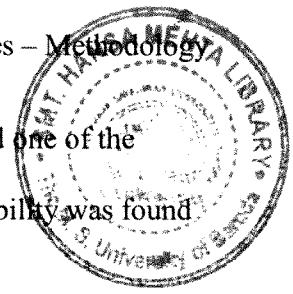
participants who belonged to the age range of eight to twelve years. This tool has been used in several studies and has been found to be a reliable and valid tool for the assessment of learning disabilities in India.

*2) Malins Intelligence Scale for Indian Children (MISIC):*This test is the Indian adaptation of the Weschler's Intelligence Scale for Children (WISC) 1949. Malin in1969 developed the Indian adaption. The test is designed for children belonging to the age group of 5-15 years.

MISIC is divided into two sub-groups, verbal and performance.It consists of 11 tests as opposed to WISC that comprises 12 subtests. The performance subtest of picture arrangement has been excluded in the Indian adaptation. The verbal tests comprises 6 subtests vis-à-vis General information, comprehension, arithmetic, similarities, vocabulary and digit span whereas the performance test comprises the picture completion, block design, object assembly, coding and maze test (Malin 1969).

A full score falling within the range of 90-110 is considered as normal/average intelligence Quotient (IQ). The reliability and validity of this scale is similar to the original WISC.

3) Child behavior checklist (2005): This tool was developed by the investigator at the Department of Psychology, The Maharaja Sayajirao University of Baroda. This check list consists of 30 items. The checklist has three subcategories (Appendix III). This tool may be given to the teacher or parent of the child under study. For the present study, teachers were asked to assess the referred students' behavior. The total number of maladaptive behaviors checked by the teachers was taken as the total score for the participant. Two teachers assessed each of the



participants to account for inter-rater reliability. The class teacher and one of the subject teachers of the student were chosen to assess. Inter-rater reliability was found to be 0.96.

The tools for assessing progress:

The performance of the participants on the writing subtest of the NIMHANS INDEX for SLD and the child behavior checklist were noted three times during the study for the selected participants. The measures collected on the above mentioned two tools, during the screening procedure were considered as pre-test scores, the measure collected after the intervention was considered for post-test score and follow-up scores were collected after a gap of one month from the post-test. Intelligence test was not utilized for assessing progress.

Before conducting the main study with the proposed sample size of 60 students, the investigator conducted a pilot study using the single subject design with a total number of three students. According to Singh (1998), pilot study is essential to test the procedure designed for the main study, the values of the variables and to understand likely pitfalls for the actual experiment. The findings of the pilot study are presented in the following section.

Pilot Study

I. Introduction: Studies on LD have also shown that children with LD often show co-occurring emotional and behavior problems. Researchers have recommended that the intervention for LD should also target the associated problems such as behavior problems. Children with LD face difficulties in any of the academic areas: reading, writing or mathematics. In this study, the investigator has focused on the writing subtype of LD. Moreover, the investigator in an attempt to accept the

recommendations of earlier studies has also taken an account of the behavior problems co-existing with the learning problem faced by the participants. The investigator intends to compare the performance of the participants on the written task and their behavior during i) intervention for writing; and ii) during intervention for writing and behavior problems.

For the intervention for writing, self-regulation techniques have been used. Behavior modification therapy has been used for the intervention of the behavior problems found in the participants. Studies showing the research base of these two types of therapies have been discussed in the second chapter. This study served as the preliminary research for the main study.

Research questions:

1. How does the impact of intervention for LD (writing only)(self-regulation techniques) compare to the impact of intervention for LD (writing) and behavior problems (self-regulation techniques + Behavior modification therapy) on measures of academic performance in writing for participants with LD (writing) as well as behavior problems?
2. How does the impact of intervention for LD (writing only)(self-regulation techniques) compare to the impact of intervention for LD (writing) and behavior problems (self-regulation techniques + Behavior modification therapy) on the classroom behavior of participants with LD (writing) as well as behavior problems?

II. Methodology: This study was conducted as a preliminary study for the main study. A single-subject design with multiple baselines across participants design was used in this study.

Justification of single-subject design: The investigator employed the single subject design with multiple baselines across participants design for the pilot study. This design has been used to test conceptual theories and the efficacy of educational interventions (Horner et al., 2005). Single subject research allows the researcher to demonstrate experimental control, similar to randomized group designs, allowing the researcher to focus on individual characteristics of the participants involved and the effects the independent variables have on each participant. Large group designs do not allow for individual analysis, which is an important characteristic of this study.

Variables:

Dependent Variables: There are two dependent variables for this study.

1. The performance of the participants on the writing exercise was the first dependent variable.

2. The behavior of the participants observed during the intervention sessions was the second dependent variable.

Measures on the dependent variable: As mentioned above, there are two dependent in this study.

The measure on the first dependent variable that is the participants' performance in writing was derived from the following three measures.

1. The participants' performance on the handwritingwas derived from the results of the copy test. For the copy test, the participants were given a grade appropriate paragraph from the tool. The written performance of the participants was

scored for type and number of errors. A list of the type of errors assessed in this study is attached as Appendix I for reference.

2. The participants' performance in spellings was assessed by the spelling test. NISLD uses Schonell's spelling list for the spelling test. The performance of the participants was scored for total number of correct spellings.

3. The participants' performance in written expression was assessed by the composition test. The composition test involved a single essay on a subject such as my school, my home, my family etc. Since NISLD does not have a defined method of scoring the essay, the investigator used the [1]6+1 trait approach to assess the written composition. 6+1 trait assesses the written performance on the 7 (6+1) triats namely Idea, Organisation, Voice, Word choice, Sentence fluency, Conventions and Presentation.

The second dependent variable was behavior problems identified in the participants. The measure on this dependent variable was derived from the child behavior checklist rated by the teachers. The number of items checked by the teachers was taken as the score for this measure.

Independent Variables: The two experimental conditions were the independent variables. The first experimental treatment involved the intervention for the writing problems only. Self-regulation techniques were used during this phase. The second experimental treatment comprised the combination of self-regulation techniques and behavior modification therapy.

[1] 6+1 traits approach is a analytical model for assessing and teaching writing. It comprises 6+1 key qualities that define strong writing (Culham, 2003; Collns, 2004).

The sample/participants: A total of three students from one school participated in this study. Out of the students referred by the class teachers, those students who met the inclusion criteria were selected for the study. The characteristics of the participants are given below:

Participants 1: Ayush (name changed) was a male student from grade 3 and his age was 8 years 5 months. He had been referred for illegible writing and copying errors. His essays were short and were below his grade level. He also showed some reading difficulties. His comprehension skills were appropriate for his grade level. His teachers assessed him to be inattentive and distracted in class. He had difficulty following instructions in class.

Participant 2: Amit (name changed) was a male student from grade 3 and his age was 8 years 9 months. He had been referred by his teachers for writing problems. His written work had several copying errors. He had phonetic difficulties that led to spelling errors. Furthermore, his composition skills were inadequate for his grade level. He was found to be easily distracted and hyperactive by his teachers.

Participant 3: Rita (name changed) was a female student from grade 3. Her age at the time of testing was 8 years and 11 months. She was referred for handwriting problems. Her teachers complained of incomplete and shabby work. Rita was also seen as a stubborn child who was often found to be difficult to handle.

The setting: The study was conducted in the city of Baroda, India. All the participants belonged to one school. This school followed the state board examination curriculum for Gujarat state.

Tools for Data Collection: The psychological tools used for this study were

mainly for the screening procedure. After the testing procedure, participants were selected on the basis of the inclusion criteria depending on their performance on the standardized tools. Following are the tools used during the screening procedure

1) NIMHANS Index for Specific LD: The details of this tool has been discussed in the earlier section.

2) Malins Intelligence Scale for Indian Children (1969). The details of this tool has been discussed in the earlier section.

3) Child behavior checklist (2005). The details of this tool have been discussed in the earlier section.

Plan and procedure for the pilot study: The study was conducted in different stages. First the students were identified through reference from class teachers. The teachers were given a brief presentation about the problem under study and the participant requirements. Once the teachers made references, the students were taken for screening. The screening procedure involved a battery of standardized tools measuring the students' IQ, visual motor coordination and assessment for specific learning disabilities for writing. Once the students fulfilled the criteria, a written permission was taken from the parents/guardians. Out of the students who were screened as fitting for the study, the first three students for whom the parents' permission was received were selected for this study. The characteristics of the three participants have been described earlier. The participants were observed for 30 sessions lasting approximately for two months.

The design involved four different phases. All 3 students were observed during all four phases of the study. The four phases did not start for all the participants

together. As per the procedure followed in multiple baseline studies, the baseline was collected for the first participant for five successive sessions. Subsequently, the first intervention phase was started. Once the participant was successfully trained, the participants' performance was recorded for five sessions. At this point the second participants' performance was recorded.

Once the second participants' performance had been recorded for the first intervention phase for five successive sessions, the third participants' observation was started. After each participant completed phase three, a break of a week was taken. In the final stage, the participants' performance was recorded for five sessions. During this stage no intervention was given. This phase recorded the maintenance effect of the intervention strategies on the participants' academic performance in writing and their classroom behavior.

As mentioned above, the study involved two experimental conditions: self-regulation only and self-regulation plus behavior modification therapy. All of the three participants were exposed to both the experimental treatments. Furthermore, the study was conducted in 4 experimental phases: baseline, self-regulation only, self-regulation plus behavior modification therapy and fading. Following is the description of each of these phases.

First Phase; Baseline: For at least five days, the participants were observed for their performance on the three areas of writing: transcription, spelling and composition. Additionally, their behavior was observed during the therapy sessions. The participants were given three definite tasks' each of these days. First, the participants were asked to copy a paragraph consisting approximately 100 words from their text-book (chosen by the investigator). Once they completed this task, they were

given a spelling test consisting ten words. These words were derived from the paragraph they had written previously. Following this activity, they were asked to write an essay of their own choice. During this phase, the investigator recorded the number of errors for the copy test, number of words correctly spelt for the spelling test and number of elements in the composition test. The duration of baseline phase for the 1st, 2nd and 3rd participant was 5, 10 and 15 days.

Second Phase; Self-regulation: The detailed description of the intervention procedure is presented in the section on intervention procedure in the main section of methodology. Please refer page number 76 for the detailed report on intervention.The student's performance on writing was not recorded for formal purpose until the student attained autonomy over the procedure and was able to use all the strategies during the session.

Third Phase; Self-regulation plus behavior modification therapy: During this phase the students continued to use self-regulation as mentioned above. In addition, the investigator used techniques of behavior modification therapy for the behavior problems in the participants. The techniques used were, time-out, social rewards, positive reinforcement. These techniques were used with the participants during the normal therapy session. Whenever the student exhibited any undesirable behavior, an appropriate techniques suitable for the situation was used. The detailed description of the intervention procedure is presented in the section on intervention procedure in the main section of methodology. Please refer page number 82 for the detailed report on intervention.

During this phase, the teachers were asked to rate the participants' behavior in their respective classroom during the study duration.

Fourth phase;Maintenance: This phase was conducted a week after the third phase ended. This phase was used to record the maintenance effect of the strategies on the students' academic performance and behavior modification. This was a no intervention phase.

Data Analysis: The means and standard deviation of the scores of the participants on writing tasks' and behavior checklist were recorded. The trend of the participant's performance was also observed through trend lines. A trend line is a straight or curved line on a graph that indicates thegeneral pattern or direction of scores presented in sequence over time.

III. Findings: This study was conducted as a preliminary research for the main study presented in the thesis. The preliminary study tested the effect of the intervention strategies on the performance of the students on their academic performance in writing. The results of the single subject design with multiple baseline across participants used in this study with three participants has been discussed in this section. The participant's performance and the behavior of each of the participants have been presented.

As mentioned in the methodology section, each participant was given intervention for writing as well as behavior problem in a phase wise manner. The participants' performance in writing as well as their classroom behavior was recorded during all four phases of the study. The results are discussed for each of the research questions.

Question 1: How does the impact of intervention for LD (writing only)(self-regulation techniques) compare to the impact of intervention for LD (writing) and behavior

problems (self-regulation techniques + Behavior modification therapy) on measures of academic performance in writing for participants with LD (writing) as well as behavior problems?

The participants' academic performance in writing was measured as a) Number of errors per paragraph in the copy test. b) Number of correctly spelt words (out of 10) in the spelling test. c) Number of elements (out of 7) in the composition test. The performance of the three participants is discussed for each test separately in the following section.

Performance of the participants in the Copy test: As seen in the Table No. 3.3,the mean and standard deviation for the number of errors for participants in the copy test were recorded for baseline, SR, SR + BMT and the maintenance phase respectively.

Table 3.3: Performance of participants in the copy test (Number of errors) Mean (SD)

Participant	**Baseline**	**Intervention 1 (SR)**	**Intervention 2(SR + BMT)**	**Maintenance**
		Mean of errors and SD		
Participant 1	18.6 (1.82)	6.2 (2.4)	2.6 (.89)	2.6 (1.34)
Participant 2	19.5 (1.26)	6.5 (0.55)	5 (0.71)	10.2 (1.10)
Participant 3	24.9 (0.74)	12.2 (1.64)	8 (1.22)	8.6 (0.55)

In the case of participant 1, his performances as indicated in fig X show that the number of errors decreased after baseline. The number of errors decreased steadily from SR to SR + BMT phases. There is an overlap in the mean number of errors

during the third and fourth phase of the study. Hence, the improvement in the copy exercise can be found even in the maintenance phase.

The mean number of errors found in the copy test of Participant 2 for five successive sessions are 19.5, 6.5, 5 and 10.2respectively. From fig. 2 it can be said that the number of errors committed after the first intervention session was less than the baseline. Subsequently, a further decrease in the number of errors has also been recorded during the second intervention phase where self-regulation as well as behavior modification techniques were used. Unlike participant 1, the number of errors increased during the maintenance phase for Participant 2. However, it may be noted that the participant committed fewer errors during the maintenance phase as compared to the errors during the baseline.

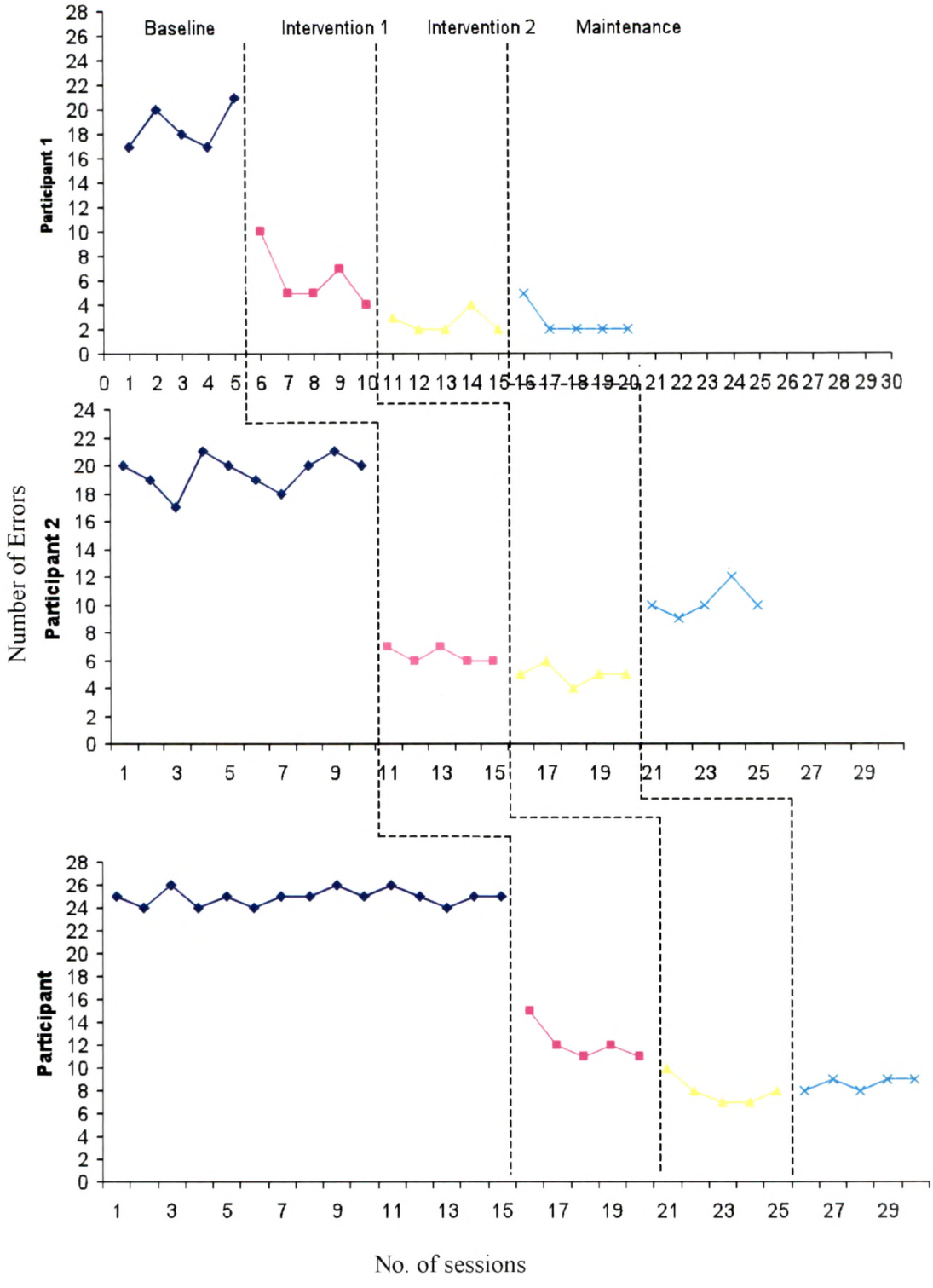


Figure No. 2: Performance of participants on the copy test.

Table No. 3.6: Range of errors in the copy test (Number of errors)

Participant	Baseline	SR only	SR+BMT	Maintenance
	No. of errors	No of errors	No. of errors	No. of errors
Participant 1	17-21	4-10	2-4	2-5
Participant 2	17-21	6-7	4-6	9-12
Participant 3	24-26	11-15	7-10	8-9

Participant 3 had the highest numbers of errors. The mean of the number of errors recorded across all four phases are 24.9, 12.2, 8 and 8.6 (Table 3.3). Fig 2 shows the trend of errors for the number of errors in the copy test. The number of errors decelerates in the second and third phase and then accelerates a little. The number of errors decreases steadily after the baseline. During the maintenance phase the number of errors increases however the errors are much fewer than the baseline. The trend lines show a steady decrease in the number of errors.

In conclusion, the intervention for writing produced positive effect on the participants' skills in the copy test. The intervention for writing and behavior produced a greater improvement in the copy test.

Performance of the participants in the spelling test: Table No. 3.3, shows the mean of the number of correct words attempted by the participants during the spelling exercise. The performance on the spelling test for Participant 1 are recorded as 2, 4, 4.4 and 2.12 respectively for each of the four phases of the study. There is an overlap in the number of correct spellings during the two intervention

phases. The performance of the participant reverted back to baseline during the maintenance phase. The trend lines for the spelling exercise show a slow acceleration during the second and third phase; however during the maintenance phase the number of correct spellings is similar to the baseline data.

Table No. 3.4: Performance of the participants in the spelling test:

(Number of correct spellings) Mean (SD)

Participants	**Baseline**	**Intervention 1 (SR)**	**Intervention 2 (SR + BMT)**	**Maintenance**
		Mean of correct spellings		
Participant 1	2 (0.71)	4 (0.71)	4.4 (1.14)	3.2 (0.84)
Participant 2	3.1(0.74)	4 (0.71)	4.6 (0.89)	4 (0.70)
Participant 3	3.4 (0.74)	4.2 (0.45)	3.2 (0.45)	3.8 (0.84)

The mean of the number of correct spellings in the spelling exercise for participant 2 were recorded as 3.1, 4, 4.6 and 4.6 for the four phases. Although the average number of correct spellings during the last three phases of the study is more than the baseline, the difference is only marginal. Fig No. 3 shows the trend lines for the performance of participant 2 during this exercise. Similar to participant 1 and 2, participant 3's performance during the spelling exercise did not change much during the four phases. The mean of the number of correct spelling increased approximately by one on an average through out the four phases.

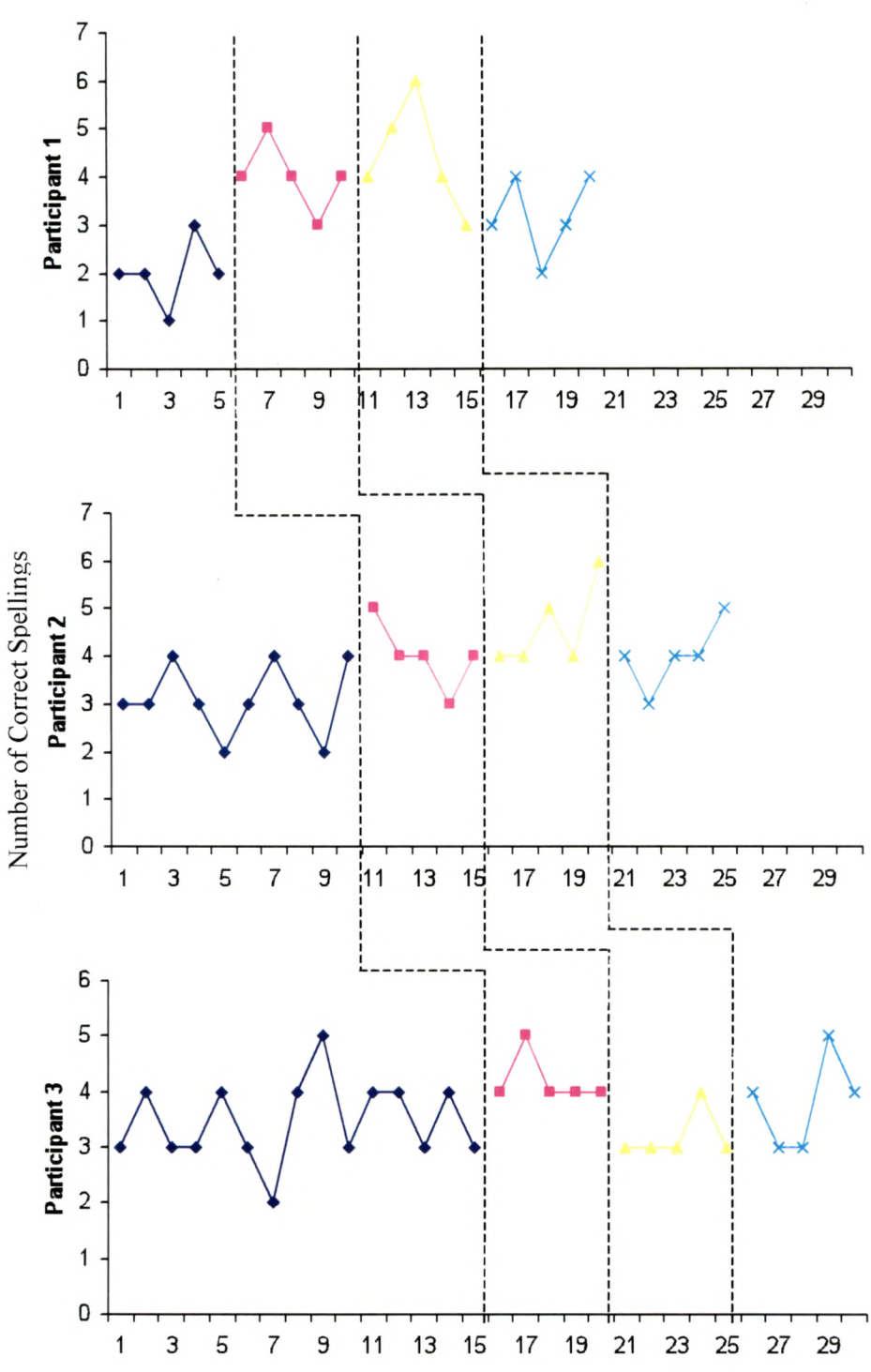


Figure No. 3: Performance of the participants on the spelling task.

Table No. 3.6: Range of scores in the spelling test(Number of correct words out of 15)

Participant	Baseline	SR only	SR +BMT	Maintenance
	No. of words	No. of words	No. of words	No. of words
Participant 1	1-3	3-5	3-6	2-4
Participant 2	2-4	3-5	4-6	3-5
Participant 3	3-5	4-5	3-4	3-5

The table no. 3.6 shows the range of the correct spellings in the spelling test. The Fig No. 3 shows stable trend lines for this measure of writing performance. The mean of the number of elements found in participant 3's composition are also similar to the other participants in the intervention phase of self-regulation. The trend decelerates during the third phase.

Performance of the participants in the composition test: The performance in the composition test was assessed as the number of elements found in the compositions of the participants. Table no. 3.7 show the mean of the number of elements (out of 7) for the participants. It can be seen from the table that the number of elements increased after the intervention and were also maintained two weeks after the intervention. The trend line seen in Fig.No. 4 also indicates an acceleration of performance in the composition exercise for participant 1. The number of elements overlaps during the SR, SR + BMT and the maintenance phase.

Similar to participant 1's performance, participant 2 also showed an increase in performance in the composition exercise. An overlap in the number of elements can

be seen during the last three phases (Fig 4). The trend lines for this exercise also show an increase in performance.

Table No. 3.7: Performance of the participants in the composition test: (Number of elements)Mean (SD)

Participant	Baseline	Intervention 1 (SR)	Intervention 2 (SR + BMT)	Maintenance
	Mean of the number of elements present in the composition			
Participant 1	2.4 (0.55)	6.4 (0.89)	6.8 (0.45)	6.4 (0.89)
Participant 2	1.8 (0.63)	6.4 (0.89)	6.8 (0.44)	6.2 (0.83)
Participant 3	1.3 (0.7)	6 (1.22)	6.4 (0.55)	6.4 (0.55)

Table No. 3.7: Range of errors in the composition test (Number of elements out of 7)

Participant	Baseline	SR only	SR +BMT	Maintenance
	No. of Elements			
Participant 1	2-3	5-7	6-7	5-7
Participant 2	1-3	5-7	6-7	6-7
Participant 3	0-3	4-7	6-7	6-7

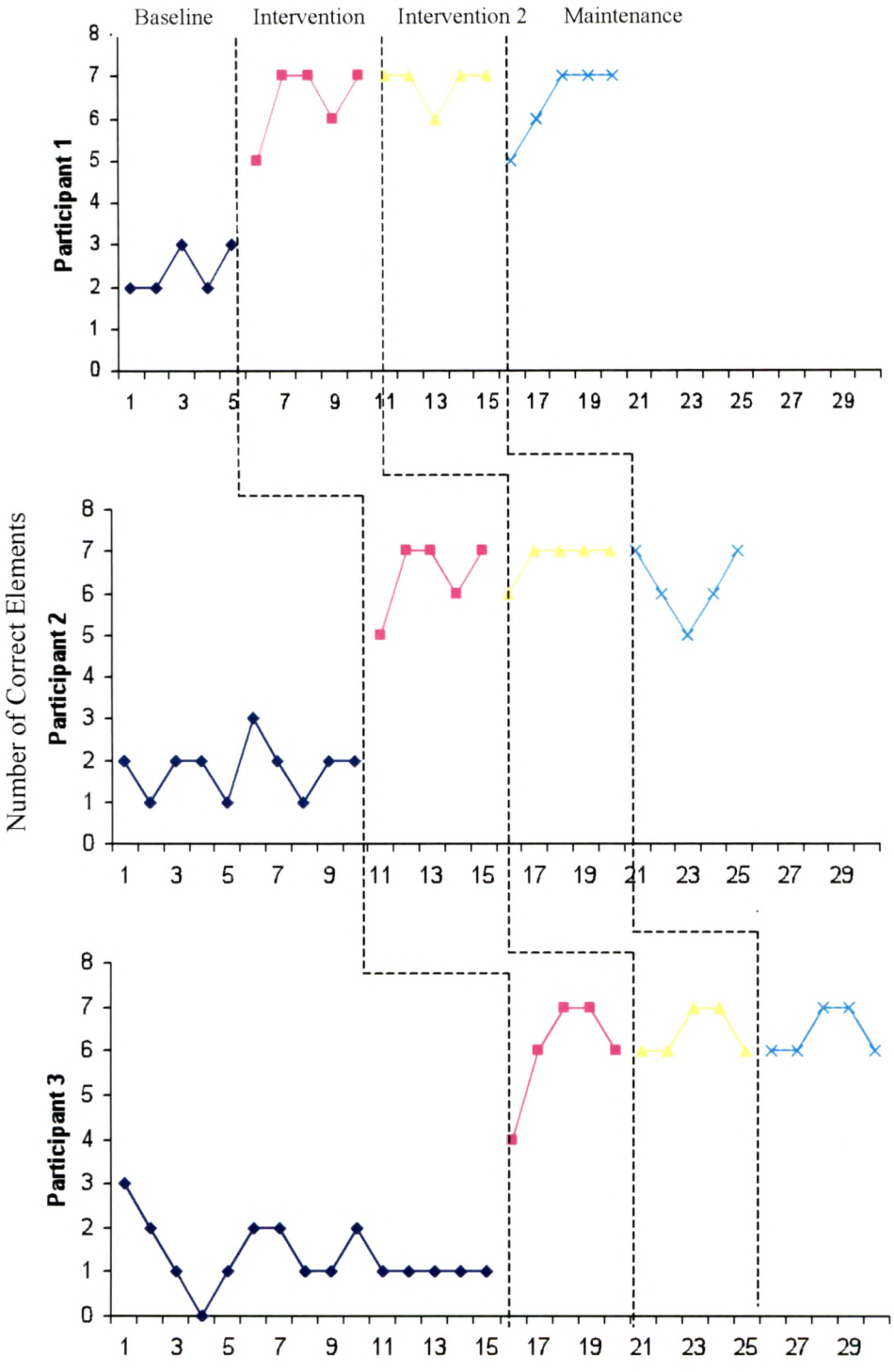


Figure No. 4: Performance of the participants on the composition tasks.

Question 3: How does the impact of intervention for LD (writing only)(self-regulation techniques) compare to the impact of intervention for LD (writing) and behavior problems (self-regulation techniques + Behavior modification therapy) on theclassroom behavior of the participants?

Classroom behavior was recorded by the teachers of the participants in their regular classroom. The teachers were asked to record the participants' behavior during all four phases of the study. The record sheets were collected at the end of the day from the respective teachers. The means and standard deviation of the number of behavior problems recorded by the teachers are presented in the table 3.8. The list of problems observed in the participants is presented intable 3.9.

Table 3.8: Classroom Behavior rated by the teachers during the study period. Score on the behavior checklist.(Mean and SD)

Participant	**Baseline**	**Intervention 1 (SR)**	**Intervention 2 (SR + BMT)**	**Maintenance**
		Mean of errors and SD		
Participant 1	12 (0.70)	12.2 (0.84)	7.6 (0.89)	7.6 (0.55)
Participant 2	13.4 (0.84)	13.4 (1.14)	6.8 (0.84)	6.8 (0.84)
Participant 3	9.47 (0.52)	9.6 (0.55)	5.2 (0.45)	6.4 (0.55)

Table No. 3.9: List of items checked in the Behavior checklist (out of 30) by teachers during the study.

Sr. No.	Behavior problems	Participant 1	Participant 2	Participant 3
1	Is an attention seeker	Yes	Yes	Yes
2.	Exhibits distracting habits	Yes	Yes	Yes
3	Shows physical aggressiveness	Yes	Yes	
4.	Impulsive behavior	Yes	Yes	Yes
5.	Restlessness	Yes	Yes	Yes
6.	Hyperactivity	Yes	Yes	Yes
7.	Thumb sucking	Yes	Yes	
8.	Roughhousing behavior during games (cheating in games, bullying, not waiting for one's turn, kicking, pushing or abusing others etc.)	Yes	Yes	Yes
9.	Destroys property in the classroom or school (breaking window panes, damaging desks and chairs etc)	Yes	Yes	Yes
10	Difficulty paying attention	Yes	Yes	Yes
11	Does not follow directions	Yes	Yes	Yes
12	Disrespects others possessions (throwing or tearing books of classmates, breaking pencil box, pencils, pens etc, tearing bags etc.)	Yes	Yes	Yes
13	Lies	Yes	Yes	Yes
14	Enuresis		Yes	

IV.Conclusion: This study tried to test the effect of the two intervention strategies used in the study on the participants' academic performance in writing as well as their class room behavior. Three participants were included in this single subject design with multiple baselines across participants. All the three participants were from third grade and were identified as students with LD as well as behavior problems. Studies have shown the co-occurrence of LD and behavior problems. Researchers in the area of education have recommended that interventions for students with LD should also target the associated problems co-existing with the learning problems such as behavior problems. The main objective of this study was to find the differential effect of intervention that targets the participants' writing problem only and intervention that targets the participants writing problem as well as behavior problems.

In the present study, self-regulation technique was used for the intervention for writing. In addition, behavior modification therapy was used for the intervention of behavior problems. The participants' performance in writing and classroom behavior was recorded during the four phases of the study.

This section discusses the findings of the study in two parts. The first part deals with the first dependent variable that is the performance of the participants on writing tasks. This part discusses the findings for the three separate measures for assessing the participants writing performance. The results of copy task, spelling task and the composition task have been discussed. The second part deals with the behavior problems of the participants.

The writing task as earlier mentioned was measured through three separate tasks. First of all let us discuss the findings for copying skills. The findings suggest that all three participants showed an improvement in the copy task. The number of errors decreased for all three participants. The differences in the mean number of errors show that the participants committed fewer errors after intervention. This effect was also seen during the maintenance phase. Two out of the three participants showed similar trend in the performance during the copy task. Hence, it may be concluded that the technique used for the remediation of mechanical writing was effective. The maximum increase in performance is seen after the introduction of behavior modification therapy. Hence, is may be concluded that mechanical skills of copying increased maximum after the introduction of behavior modification therapy.

The effect of intervention on the spelling test was studied through all four phases. The number of correct spellings increased for all three participants however the increase was marginal. The number of correct spellings decreased during the maintenance phase in the case of all three participants. Two participants showed an increase in performance during the third phase; however the third participant showed a drop in the number for correct spellings. The investigator observed that the self-regulation techniques may not be sufficient for the remediation of problems in spellings. Additional intervention involving phonological training may be used.

The performance of all the participants increased throughout the first three stages for the composition test. The number of elements increased to 7 for all the three participant during at least one of the sessions. The maintenance effect is also positive. The trend lines also indicated positive trend in the performance on composition tasks. Hence the composition skills of the participants improved after the intervention.

The behavior of the participants was assessed by the teachers during their regular class period. All three participants showed a drop in the behavior problems following intervention. The effect of the behavior modification therapy can be seen in the maintenance phase where the teachers have reported fewer behavior problems in comparison to the baseline and intervention 1 stage.

In conclusion, the intervention strategies for writing have been found to be effect on the three writing tasks and behavior modification therapy has been found to be effective for the intervention of behavior problems. Moreover, the writing related problems improved during the phase where behavior problems were been treated. Hence the effect of the intervention is greater when the writing as well as the behavior problems is targeted together.

The experience gained from the pilot study was used to plan the intervention for the main study. The following section presents the plan and procedure of the main study.

Plan and procedure:

Consent was taken from the school authorities, the teachers and the parents of the participants before the study commenced. There was no available ethical committee in the university department under which the study was conducted, however the investigator and the academic supervisor decided on following widely / commonly used ethical guidelines for the study. The study was conducted in six stages.

a. Pilot study.
b. Identification of participants.

c. Sampling of the participants into 3 randomized matched groups.

d. Intervention.

e. Post test.

f. Follow-up test.

g. Analysis of the data.

Identification of participants: Through a screening procedure involving the use of standard battery and other psychometric tools, participants who met the criteria were selected for this study. The participants were screened by a step wise screening procedure. 110 students from 5 schools who were identified as having writing problems by their teachers were screened. Following is the detailed account of the screening procedure.

The students were tested individually in a private and quiet location within the school. All the materials and tools required for the test were arranged prior to the student's arrival. A battery of psychometric tools was used for screening the participants. A total of 63 students were selected for the study. The data of 60 students is discussed in the study. The inclusion and exclusion criteria considered for the selection of participants for the study have been mentioned earlier. The scores obtained during the screening procedure were considered as pre-test scores. Following is a schematic representation of the screening procedure.

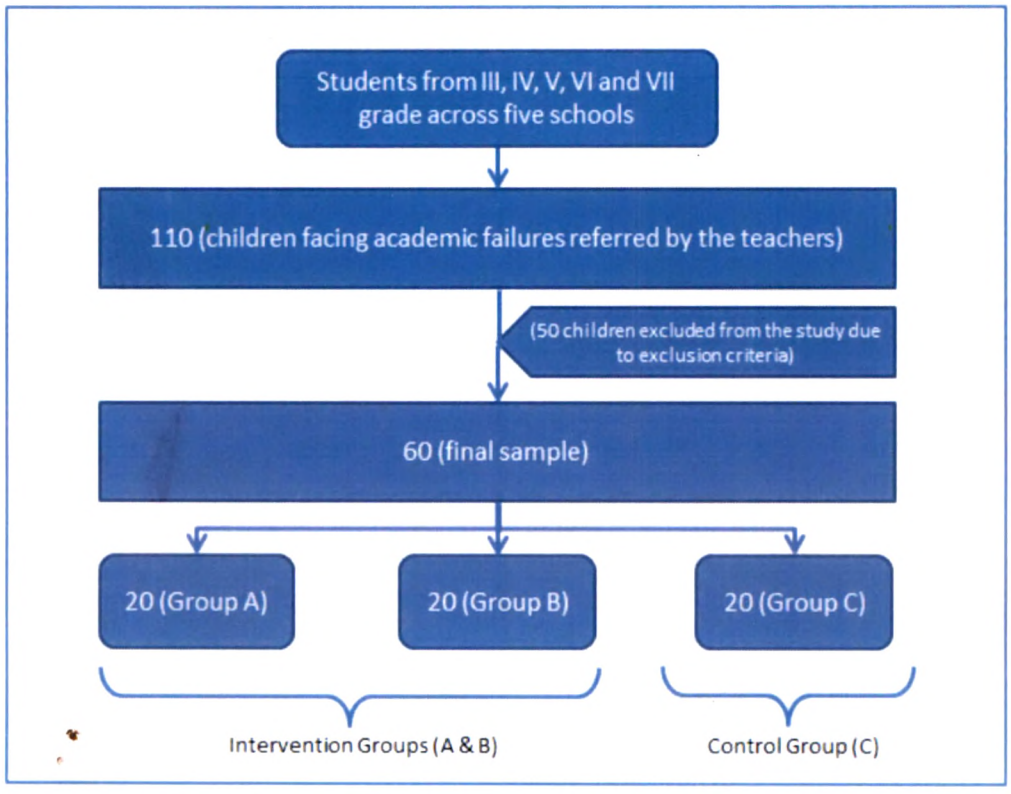


Figure No. 5: Schematic representation of screening of participants

Intervention Phase: Once the participants were randomly assigned to three groups, the intervention phase started. Intervention was given to the two experimental groups, namely Group A and Group B. Group C was not given any intervention. In the present study, two types of intervention strategies were used. One intervention targeted writing disability and the second intervention targeted the behavior problems in the participants.

The two experimental groups were further broken down into sub-groups of five students. This was done for two reasons. The investigator was concerned about the effect of the group size on intervention and also felt that it was easy and more effective to conduct intervention in small groups of 5. The second reason was that the students belonged to five different schools located in five different locations in the city. Since the intervention had to take place in the students own school, it was not possible to conduct intervention for all 20 students together. However appropriate measures were taken to assure fidelity of the treatment procedure. Intervention for writing problems was uniform for both the groups. Intervention for behavior problems was given only to the participants of Group B. Following is a description of the two intervention procedures.

Intervention procedure for writing disability using self-regulation techniques: Intervention for writing problems was based on the theory of self regulation. Techniques from the self-regulated strategy design and self-monitoring of performance were used for intervention (Graham & Harris). The intervention of writing problems included intervention for handwriting, copying skills and written composition.

The intervention program involved two processes. The intervention provided by the investigator to the individual needs of the students and the students own evaluation of their performance during each session. The investigator designed a simple method to include all the areas of writing in a single session, evaluate their performances, encourage the students to evaluate their own performance and help them with their problems. A chart was designed that included no. of errors, handwriting, neatness and time. The same type of chart was used for spellings and composition. The investigator as well as the students had the chart. At the end of each session the investigator would discuss the work with each student and help them to evaluate their own performance. The investigator would also have a comparison chart on the board showing the performance of the students in that group.

During each session, the participants were asked to do the following tasks.

1.They were asked to write the alphabets from A-Z.

2. Write words (picked up from the passage given for copying).

3.A passage to copy and a story/essay to write.

After all the tasks were completed, the investigator would discuss and evaluate the work with each student individually. The investigator would provide guidance wherever necessary. The performance for the day was noted down in the chart described earlier. The students' notebook had a chart where they would note their performance each session. As the sessions progressed, the students were encouraged to monitor their performance until they gained complete autonomy.

The aim of the intervention was to teach the participants to use self-regulation procedures along with strategies for writing. The self-regulation procedures used in this intervention were self-instruction, goal setting and self-monitoring. Each of these procedures was used for teaching writing strategies for all three areas of writing.

For handwriting skills they were given instruction on correct letter formation, punctuation, legibility etc. After the investigator modeled the correct transcription skills, the participants were encouraged to come up with self-instructions for themselves. The investigator worked with the participants and derived a few common self-instructions.

1. All Letters on the lines except for f, g, p, q, y and z.
2. Not to hurry nor too late
3. Mind the signs (For punctuations)
4. Watch the words
5. Look before you give (checking the written work)

Each of the participants was asked to make a goal for the day. The goals were expected to be as simple as, "I will not make any mistakes" or "I will make fewer mistakes" or "I will write in good handwriting". Each day they were expected to set some goal. Once they finished the task of writing they were asked to go through their written work and evaluate it by comparing with the original piece given to them for copying. During the initial stages, the investigator evaluated their work with them. Once they learnt to evaluate by themselves, they were asked to evaluate independently. However, the investigator also personally evaluated their work separately. Once they finished evaluating their work, they were asked to count the number of errors in their work and record it on a chart that was attached on the last page of their notebook.

For spellings, they were given instructions to use the sound of the word. Similar sounds were provided to help them to learn spellings using sound as a cue. The students were taught to evaluate their spellings with the key and record the

number of correctly spelt words. They were also told to write the incorrectly spelt words, use the key, find the correct spellings and practice them. The participants were asked to set goals for the spelling exercise as well. Following are the examples of goals set by the participants.

1. "I will concentrate on the task patiently".
2. "I will follow the specific instructions given for the task".
3. "I will review my work before I hand it over".

For composition skills, the instruction included a lesson on using the "POW + WWW What -2 How-2" strategy (Mason, Graham & Harris 2004). The acronym used for planning stands for P= Pick your ideas, O= Organize you're notes, W= Write and say more. While the acronym used for teaching writing stories, essays and personal narratives was WWW what 2, How 2 stands for W=Who is the main character of the story, W=when does the story take place, W=Where does the story take place, W= what do the main character and other characters do or want to do?, What=what happens then, What do the other characters do?, How=How does the story end?, How= How do the main character and other characters feel? These 7 elements were also used to assess their written compositions. This strategy was taught through modeling. The teacher would point out these elements in stories or narratives from books while reading the stories aloud. Later the students were asked to point at the elements while the teacher or student read a story. After that, the student was encouraged to write a story around the seven elements. Once they would have all the seven elements they were asked to use POW and write the story or narrative in the book. They were asked to remember the acronym and use it as self-instruction. Here again scaffolding of techniques continued until the student's attained autonomy.

It may be noted that although the self-regulation strategies were taught separately for each of the exercises, the participants were taught to use the strategies wherever applicable. For example, the instructions for transcription skills were not limited to the transcription exercise only; they were also to be used for spelling as well as composition task. Similarly, the strategies for spelling exercise were also to be used during composition exercise.The students used self-instruction, goal setting and self-monitoring while performing any of the three tasks' that they were expected to perform.

Intervention for behavior problems using behavior modification therapy: The participants in group B were given intervention for behavior problems in addition to the intervention for writing problems. The investigator chose to use behavior modification therapy for this purpose. The investigator used a story circle for this therapy. During the session the students were asked to form a circle. The students would then be asked to say a story one by one in the circle. The investigator responded with positive or negative reinforcements for the specific behavior of the students. Time-out, positive reinforcements such as applause, group encouragement, extra chance to tell a story etc were used. The sessions lasted for the length of one class period of approximately 55 minutes. Intervention of writing problems was given for 45 sessions and intervention for behavior problems also lasted for 45 sessions. Following is a description of the behavior modification techniques used during the study.

The techniques used to modify behaviors in the study may be broadly classified into a) those used to increase desirable behaviors b) those used to decrease undesirable behaviors. Positive reinforcements were used to increase desirable

behaviors. These techniques involve presentation of a rewarding or pleasant stimulation in order to increase the likelihood that a response will occur. Depending on the participants behavior rewards were decided.

a) Social rewards: Positive gestures for encouragement such as "good", "well done" (verbal) etc and non verbal gestures such as pat on the back, nod, smile etc were used (Love, Carr & LeBlanc, 2002).

b) Activity rewards: This type of reward involves permitting the child to engage in activities that they like. Examples of such activities are listening to music, watching TV, playing with toys, singing a song, drawing, telling a story etc.

In the present study activity rewards that were desirable for the participants such as a chance to tell a story or a joke, performing mimicry of their favorite characters, sing a song or drawing were given. Most of them engaged in distracting behaviors, impulsivity, physical aggression etc. If the students showed these behaviors less frequently, they were given activity rewards. One of the participant (Pratik) engaged in distracting behaviors and physical aggression during the story circle on a regular basis. During a particular story circlehe enjoyed the session without distracting others or engaging in physical aggression. For this good behavior he was given a chance to performance a dance after the end of the session. He was told that because he showed good behavior, everyone was going to watch his dance.

c)Privileges: This is a type of reward that boosts the status of the child. For example, privilege such as making the child the monitor/ leader of the group was used as reinforcement.

Neha who used to bully others was made the monitor of the class every time she was good and friendly to the other children of her group. She was told that she was allowed to be the leader of the session because she behaved well with her group mates.

Negative reinforcements are those that decrease the probability of the occurrence of a behavior. The following negative reinforcements were used in the present study.

a) Extinction: Here the consequences of an undesirable behavior are re-arranged so that the attention or activity rewards that generally follow do not do so. This technique included non presentation of a reward. For example, ignoring or not scolding the child while the child engages in an undesirable behavior.

Honey used to engage in distracting behaviors. Whenever, the teacher/ elder reacted to his behavior, he would become excited and continue doing the behavior. It was realized that the attention he received soon after his behavior was the reinforcement. Hence, the investigator ignored his behavior. He was neither scolded nor punished for his behavior. This lead to a decrease in his behavior.

b) Time out. Here the child is removed from the activity area to a non-reinforcing area. The child is put in a situation where any possibility for reward is removed entirely for a short period of time (Coleman & Webber, 2002; Stage & Quiroz, 1997; Wallace & Kauffman, 1986). For example the participants were made to stand in the corner of the room facing away from the group or asked to keep their head down on the desk if they exhibited undesirable activity.

Harsh liked to tell stories and jokes. He would not let anybody complete the joke. He would constantly interrupt and also engage in mild physicalaggression. If he showed this behavior, he was asked to stand in the corner of the room away from the group for 5 minutes. He was told that he would loose his chance of performing because of the behavior he had exhibited.

c) Response cost: In this technique an already awarded reinforcement is withdrawn following an undesirable behavior. The child pays the cost of doing a particular undesirable behavior (Kauffman et al, 1998; Reid, 1999). In this study, the privileges or activity rewards were withdrawn if the participants indulged in undesirable behaviors.

Each child was given positive reinforcements for showing desirable behavior. Prakash was given the reinforcement of performing a dance and mimicry of Mr. Beans, during the story circle for not picking a fight during the previous class. However, the next day he started teasing his group mate and engaged in physical aggression (kicking and hitting). This behavior cost him his chance to perform the mimicry of Mr. Beans and dance during the class.

Post-test Phase: After 45 sessions of intervention, the participants were assessed on the NIMHANS ISLD and the teachers were given the child behavior checklist to rate the participants' behavior. The post-test was conducted after a gap of 5 days.

Follow-up test Phase: The same procedure was repeated after a months time to observe the maintenance effect of the intervention. Hence the progress of the intervention was measured at two occasions namely the post-test and follow-up test.

Analysis of the Data: The means and standard deviation of the scores on dependent variable obtained by the students were calculated for all the three groups. A 3X3 Two way mixed ANOVA with repeated measures on only one of the factors (time of testing) was used to analyze the data.

The Main effect was analyzed for treatment (treatment 1, treatment 2 and no treatment) and time of testing (pre, post and follow up). The interaction effect between treatment and time of testing was also analyzed. The paired wise comparisons of the groups and time of testing was also done.The results of the analysis are discussed in chapter four.

Summary

This chapter discussed the research methodology of the presented study. The research questions, hypotheses, design, sample, setting, variables, tools and procedure of the study have been discussed. Moreover, the pilot study conducted prior to the conduction of the main study has also been presented. The results of the study are presented in the next chapter.