CHAPTER VIII
CHAPTER VIII
IMPACT OF REDUCTION IN READING PROBLEMS ON NEUROPSYCHOLOGICAL ABILITIES AND SUB SKILLS OF READING
(SPELLING AND WRITING)

The present chapter aims at studying the side effects of treatment on neuropsychological abilities and sub skills of reading i.e. spelling and writing. It revolves around the testing of following hypotheses:

1. Reduction in reading difficulties would result in improvement of neuropsychological abilities of dyslexic children.
2. Reduction in reading difficulties would improve spelling and writing expression of dyslexic children.

TESTING OF HYPOTHESIS 1

The first hypothesis, mentioned above has been tested with the help of the following Tables 8.1.1, 8.1.2, 8.1.3, 8.1.4, 8.1.5, 8.1.6, 8.1.7, 8.1.8, 8.1.9, 8.1.10 and 8.1.11.

Table 8.1.1 represents means, SDs and mean differentials (t-values) between pre and post test scores on visual discrimination of different EGs. Mean pre- and post-test scores (M_1 and M_2) of EG_1 were 3.17 and 6.50 respectively. Its SD_1 and SD_2 were 0.75 and 1.05 respectively and t-value between pre- and post-test scores of EG_1 was recorded 6.32 (P<.01). M_1 and M_2 of EG_2 were 3.17 and 5.33 respectively and SD_1 and SD_2 were found to be 0.75 and 0.82 respectively. Its t-value was 4.77 (P<.01).
Table 8.1.1
Mean Differentials between Pre- and Post-test Scores with regard to Visual Discrimination (VD) of Different EGs

<table>
<thead>
<tr>
<th>Groups</th>
<th>M₁</th>
<th>M₂</th>
<th>SD₁</th>
<th>SD₂</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG₁</td>
<td>3.17</td>
<td>6.50</td>
<td>0.75</td>
<td>1.05</td>
<td>6.32*</td>
</tr>
<tr>
<td>EG₂</td>
<td>3.17</td>
<td>5.33</td>
<td>0.75</td>
<td>0.82</td>
<td>4.77*</td>
</tr>
<tr>
<td>EG₃</td>
<td>3.00</td>
<td>5.83</td>
<td>0.89</td>
<td>0.75</td>
<td>5.93*</td>
</tr>
<tr>
<td>EG₄</td>
<td>2.67</td>
<td>7.33</td>
<td>0.82</td>
<td>1.21</td>
<td>7.82*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence

EGs = Experimental groups

M₁ = Mean of pre-test scores of different EGs
M₂ = Mean of post-test scores of different EGs
SD₁ = Pre-test
SD₂ = Post-test
Figure 8.1.1
Mean Differentials between Pre- and Post-test Scores with regard to Visual Discrimination (VD) of Different EGs

EG = Experimental Group,
Table 8.1.1 further shows that $M_1$, $M_2$, $SD_1$ and $SD_2$ of EG$_3$ were 3.00, 5.83, 0.89, and 0.75 respectively. Its t-value was 5.93 which was significant beyond .01 level. $M_1$, $M_2$, $SD_1$, and $SD_2$ of EG$_4$ were 2.67, 7.33, 0.82, and 1.21 respectively. Its t-value was found to be 7.82 which was significant beyond .01 level of confidence. These significant t-values ($p<0.01$) of all EGs clearly indicated that as a result of intervention there is an upward trend in visual discrimination of all subjects. Figure 8.1.1 has been prepared to highlight the differentials in the pre- and post-tests of all EGs on visual discrimination.

Table 8.1.2 represents means, SDs and mean differentials (t-values) between pre- and post-test scores on sound discrimination of different EGs. $M_1$, $M_2$, $SD_1$ and $SD_2$ of EG$_1$ were 2.50, 5.67, 1.05, and 1.37 respectively. Its t-value was 4.50 which was significant beyond .01 level. $M_1$, $M_2$, $SD_1$, and $SD_2$ of EG$_2$ were 3.00, 4.67, 1.41, and 1.23 respectively. Its t-value was found to be 2.28 which was significant at 0.05 level. $M_1$, $M_2$, $SD_1$ and $SD_2$ of EG$_3$ were 2.50, 5.33, 1.05, and 1.37 respectively. Its t-value was 4.02 ($p<0.01$). Table 8.1.2 further shows that $M_1$, $M_2$, $SD_1$, and $SD_2$ of EG$_4$ were 2.50, 6.83, 1.05, and 1.33 respectively. Its t-value between pre and post test scores was recorded 6.26 which was beyond 0.01 level of confidence. Results of pre- and post-tests on sound discrimination have been presented in Figure 8.1.2.
Table 8.1.2
Mean Differentials between Pre- and Post-test Scores with regard to Sound Discrimination (SD) of Different EGs

<table>
<thead>
<tr>
<th>Groups</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG₁</td>
<td>2.50</td>
<td>5.67</td>
<td>1.05</td>
<td>1.37</td>
<td>4.50*</td>
</tr>
<tr>
<td>EG₂</td>
<td>3.00</td>
<td>4.67</td>
<td>1.41</td>
<td>1.23</td>
<td>2.28**</td>
</tr>
<tr>
<td>EG₃</td>
<td>2.50</td>
<td>5.33</td>
<td>1.05</td>
<td>1.37</td>
<td>4.02*</td>
</tr>
<tr>
<td>EG₄</td>
<td>2.50</td>
<td>6.83</td>
<td>1.05</td>
<td>1.33</td>
<td>6.26*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence
** Significant at 0.05 level of confidence

EGs = Experimental groups

$M_1$ = Mean of pre-test scores of different EGs

$M_2$ = Mean of post-test scores of different EGs

$SD_1$ = Pre-test

$SD_2$ = Post-test
Figure 8.1.2
Mean Differentials between Pre- and Post-test Scores with regard to Sound Discrimination (SD) of Different EGs

EGs = Experimental Groups
Table 8.1.3 represents means, SDs and t-values between pre-and post-test scores on visual sequential memory of different EGs. \(M_1, M_2, SD_1\) and \(SD_2\) of EG1 were 3.00, 6.42, 0.71 and 0.97 respectively. Its t-value was 6.97 which was significant beyond .01 level. \(M_1, M_2, SD_1\) and \(SD_2\) of EG2 were 3.00, 4.83, 0.71, and 0.68 respectively. Its t-value was 4.56 \((p<0.01)\). \(M_1, M_2, SD_1\) and \(SD_2\) of EG3 were 3.00, 5.50, 0.71 and 0.89 respectively, its t-value was 5.38 \((p<0.01)\). Table 8.1.3 further shows that \(M_1, M_2, SD_1\) and \(SD_2\) of EG4 were 3.00, 7.33, 0.71 and 0.82 respectively. Its t-value was 9.82 which was significant much beyond 0.01 level of confidence. Figure 8.1.3 has been prepared to highlight the results of pre- and post-tests of all EGs on visual sequential memory.

Table 8.1.4 represents means, SDs and t-values between pre and post-test scores on auditory sequential memory of different EGs. \(M_1, M_2, SD_1\) and \(SD_2\) of EG1 were 2.17, 5.42, 0.75 and 0.97 respectively. Its t-value was 6.48 which was significant much beyond 0.01 level. \(M_1, M_2, SD_1\) and \(SD_2\) of EG2 were 2.33, 4.92, 0.82 and 1.16 respectively. Its t-value was recorded 4.46 which was significant beyond 0.01 level.

Further Table 8.1.4 shows \(M_1, M_2, SD_1\) and \(SD_2\) of EG3 were 2.17, 5.33, 0.76 and 0.60 respectively. Its t-value was 8.02 which was much beyond .01 level. \(M_1, M_2, SD_1\) and \(SD_2\) of EG4 were 2.42, 6.42, 0.92 and 0.82 respectively. Its t-
Table 8.1.3

Mean Differentials between Pre- and Post-test Scores with regard to Visual Sequential Memory (VSM) of Different EGs

<table>
<thead>
<tr>
<th>Groups</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$EG_1$</td>
<td>3.00</td>
<td>6.42</td>
<td>0.71</td>
<td>0.97</td>
<td>6.97*</td>
</tr>
<tr>
<td>$EG_2$</td>
<td>3.00</td>
<td>4.83</td>
<td>0.71</td>
<td>0.68</td>
<td>4.56*</td>
</tr>
<tr>
<td>$EG_3$</td>
<td>3.00</td>
<td>5.50</td>
<td>0.71</td>
<td>0.89</td>
<td>5.38*</td>
</tr>
<tr>
<td>$EG_4$</td>
<td>3.00</td>
<td>7.33</td>
<td>0.71</td>
<td>0.82</td>
<td>9.82*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence

EGs = Experimental groups

$M_1$ = Mean of pre-test scores of different EGs

$M_2$ = Mean of post-test scores of different EGs

$SD_1$ = Pre-test

$SD_2$ = Post-test
Figure 8.1.3

Mean Differentials between Pre- and Post-test Scores with regard to Visual Sequential Memory (VSM) of Different EGs

EGs = Experimental Groups
value was 7.78 which was much beyond .01 level of confidence.

Figure 8.1.4 has been prepared to show significant mean differentials of pre- and post-test scores (t-values) of auditory sequential memory of different EGs.

Table 8.1.5 represents means, SDs and mean differentials of pre- and post-test scores (t-values) on sound blending of different EGs. $M_1$, $M_2$, $SD_1$ and $SD_2$ of $EG_1$ were $2.42$, $5.92$, $0.82$ and $1.32$ respectively. Its t-value was $5.44$ which was significant at .01 level. $M_1$, $M_2$, $SD_1$ and $SD_2$ of $EG_2$ were $2.50$, $5.08$, $0.89$ and $0.97$ respectively. Its t-value was recorded $4.79$ which was significant beyond 0.01 level.

Table 8.1.5 further show $M_1$, $M_2$, $SD_1$ and $SD_2$ of $EG_3$ were recorded $2.25$, $5.33$, $0.76$ and $0.93$ respectively. Its t-value was $6.29$ which was significant beyond 0.01 level. $M_1$, $M_2$, $SD_1$ and $SD_2$ of $EG_4$ were $2.17$, $6.50$, $0.75$ and $0.84$ respectively. Mean differential between pre- and post-test scores of $EG_3$ was $9.43$ which was significant much beyond 0.01 level of confidence. The differences between the pre- and post-test results on sound blending have been presented graphically in Figure 8.1.5.
Table 8.1.4

Mean Differentials between Pre- and Post-test Scores with regard to Auditory Sequential Memory (ASM) of Different EGs

<table>
<thead>
<tr>
<th>Groups</th>
<th>M₁</th>
<th>M₂</th>
<th>SD₁</th>
<th>SD₂</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG₁</td>
<td>2.17</td>
<td>5.42</td>
<td>0.75</td>
<td>0.97</td>
<td>6.48*</td>
</tr>
<tr>
<td>EG₂</td>
<td>2.33</td>
<td>4.92</td>
<td>0.82</td>
<td>1.16</td>
<td>4.46*</td>
</tr>
<tr>
<td>EG₃</td>
<td>2.17</td>
<td>5.33</td>
<td>0.76</td>
<td>0.60</td>
<td>8.02*</td>
</tr>
<tr>
<td>EG₄</td>
<td>2.42</td>
<td>6.42</td>
<td>0.92</td>
<td>0.86</td>
<td>7.78*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence

EGs = Experimental groups

M₁ = Mean of pre-test scores of different EGs

M₂ = Mean of post-test scores of different EGs

SD₁ = Pre-test

SD₂ = Post-test
Figure 8.1.4
Mean Differentials between Pre- and Post-test Scores to Auditory Sequential Memory (ASM) of Different EGs

EGs = Experimental Groups
Figure 8.1.5

Mean Differentials between Pre- and Post-test Scores with regard to Sound Blending (SB) of Different EGs

EGs = Experimental Groups
Entries in Table 8.1.6 show that means \((M_1)\) of EG$_1$, EG$_2$, EG$_3$ and EG$_4$ were 6.50, 5.33, 5.83 and 7.33 respectively. Mean \((M_2)\) of control group (CG) was found to be 3.00 likewise, SDs \((SD_1)\) of EG$_1$, EG$_2$, EG$_3$ and EG$_4$ were 1.05, 0.82, 0.75 and 1.21 respectively. SD of CG \((SD_2)\) was 0.89. The mean differentials of post-test scores \((t\text{-values})\) of EG$_1$-CG, EG$_2$-CG, EG$_3$-CG and EG$_4$-CG were found to be 6.21, 4.71, 5.93 and 7.05 respectively. All the obtained \(t\text{-values}\) were significant much beyond .01 level of confidence.

Figure 8.1.6 corresponding to Table 8.1.6 highlights the gains in visual discrimination in all EGs but not in CG.

Table 8.1.7 presents a comparative picture of mean differentials between the four EGs and CG with regard to the sound discrimination during treatment period. This table shows that means \((M_1)\) of EG$_1$, EG$_2$, EG$_3$ and EG$_4$ were recorded 5.67, 4.67, 5.33 and 6.83 respectively. Mean of control group \((M_2)\) was 2.67. Likewise SDs \((SD_1)\) of EG$_1$, EG$_2$, EG$_3$ and EG$_4$ were 1.37, 1.23, 1.37 and 1.33 respectively. SD of control group was 0.82. Further, \(t\text{-values}\) computed between EG$_1$ and CG, EG$_2$-CG, EG$_3$-CG, EG$_4$-CG were found to be 4.61, 2.68, 4.10 and 6.54 respectively. All the obtained \(t\text{-values}\) were significant at \(p<.01\) level except of EG$_2$ which was significant at 0.05 level of confidence. Figure 8.1.7 has been prepared to show the post differential results of all EGs and CG on sound discrimination.
Table 8.1.6
Mean Differentials of Post-test scores between different EGs and CG with regard to Visual Discrimination (VD)

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>$t$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$EG_1$-CG</td>
<td>6.50</td>
<td>3.00</td>
<td>1.05</td>
<td>0.89</td>
<td>6.21*</td>
</tr>
<tr>
<td>$EG_2$-CG</td>
<td>5.33</td>
<td>3.00</td>
<td>0.82</td>
<td>0.89</td>
<td>4.71*</td>
</tr>
<tr>
<td>$EG_3$-CG</td>
<td>5.83</td>
<td>3.00</td>
<td>0.75</td>
<td>0.89</td>
<td>5.93*</td>
</tr>
<tr>
<td>$EG_4$-CG</td>
<td>7.33</td>
<td>3.00</td>
<td>1.21</td>
<td>0.89</td>
<td>7.05*</td>
</tr>
</tbody>
</table>

* All the obtained $t$-values were significant at $p<0.01$ level.

$M_1$ = Mean of post-test scores of different EGs

$M_2$ = Mean of post-test scores of control group

EGs = Experimental groups

CG = Control group
Figure 8.1.6
Mean Differentials of Post-test Scores between different EGs and CG with regard to Visual Discrimination (VD)

EG1-CG
EG2-CG
EG3-CG
EG4-CG

Post test of EG 6.5
Post test of EG 5.33
Post test of CG 3

Post test of EG 5.63
Post test of EG 7.33
Post test of CG 3

Post test of EG
Post test of CG

EGs = Experimental Groups, CG = Control Group
Table 8.1.7
Mean Differentials of Post-test scores between different EGs and CG with regard to Sound Discrimination (SD)

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG$_1$-CG</td>
<td>5.67</td>
<td>2.67</td>
<td>1.37</td>
<td>0.82</td>
<td>4.61*</td>
</tr>
<tr>
<td>EG$_2$-CG</td>
<td>4.67</td>
<td>2.67</td>
<td>1.23</td>
<td>0.82</td>
<td>2.68**</td>
</tr>
<tr>
<td>EG$_3$-CG</td>
<td>5.33</td>
<td>2.67</td>
<td>1.37</td>
<td>0.82</td>
<td>4.10*</td>
</tr>
<tr>
<td>EG$_4$-CG</td>
<td>6.83</td>
<td>2.67</td>
<td>1.33</td>
<td>0.82</td>
<td>6.54*</td>
</tr>
</tbody>
</table>

* All the obtained t-values were significant at p<0.01 level.

** Significant at 0.05 level of confidence

$M_1$ = Mean of post-test scores of different EGs

$M_2$ = Mean of post-test scores of control group

EGs = Experimental groups

CG = Control group
Figure 8.1.7

Mean Differentials of Post-test Scores between different EGs and CG with regard to Sound Discrimination (SD)

EG1-CG
EG2-CG
EG3-CG
EG4-CG

Mean Scores

Post test of EG
Post test of CG

EGs = Experimental Groups, CG = Control Group
Table 8.1.8 presents a comparative picture of mean differentials between EGs and CG with regard to visual sequential memory after treatment period. This table shows that means of EG1, EG2, EG3 and EG4 were 6.42, 4.83, 5.50, 7.33 respectively. Mean of (M2) of control group was 3.08 likewise SDS of (SD1) EG1, EG2, EG3 and EG4 were 0.97, 0.68, 0.89 and 0.82 respectively. SD2 of control group was 0.73. Further t-values computed between EG1-CG, EG2-CG, EG3-CG and EG4-CG were found to be 6.70, 4.26, 5.11 and 9.47 respectively. All the obtained t-values were significant at p<.01 level of confidence. Figure 8.1.8 was prepared to show that visual sequential memory was improved during the treatment period of all experimental groups but not of CG.

Entries in Table 8.1.9 shows comparative picture of all EGs and CG with regard to auditory sequential memory recorded after the treatment period. It shows that means of (M1) of EG1, EG2, EG3, and EG4 were recorded 5.42, 4.92, 5.33 and 6.42 respectively. Mean of CG (M2) was 2.25 likewise SDs of (SD1) EG1, EG2, EG3 and EG4 were recorded 0.97, 1.16, 0.60 and 0.86 respectively. SD of control group (SD2) was 0.52. Further t-values computed between EG1-CG, EG2-CG, EG3-CG and EG4-CG were found to be 7.03, 5.13, 9.42, 10.12 respectively. All the obtained t-values were significant at p<.01 level. Figure 8.1.9 has been prepared to highlight the post-test results of all EGs and CG on auditory sequential memory.
Table 8.1.8
Mean Differentials of Post-test scores between different EGs and CG with regard to Visual Sequential Memory (VSM)

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>M₁</th>
<th>M₂</th>
<th>SD₁</th>
<th>SD₂</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG₁-CG</td>
<td>6.42</td>
<td>3.08</td>
<td>0.97</td>
<td>0.73</td>
<td>6.70*</td>
</tr>
<tr>
<td>EG₂-CG</td>
<td>4.83</td>
<td>3.08</td>
<td>0.68</td>
<td>0.73</td>
<td>4.26*</td>
</tr>
<tr>
<td>EG₃-CG</td>
<td>5.50</td>
<td>3.08</td>
<td>0.89</td>
<td>0.73</td>
<td>5.11*</td>
</tr>
<tr>
<td>EG₄-CG</td>
<td>7.33</td>
<td>3.08</td>
<td>0.82</td>
<td>0.73</td>
<td>9.47*</td>
</tr>
</tbody>
</table>

* All the obtained t-values were significant at p<0.01 level.

M₁ = Mean of post-test scores of different EGs
M₂ = Mean of post-test scores of control group
EGs = Experimental groups
CG = Control group
Figure 8.1.8

Mean Differentials of Post-test Scores between different EGs and CG with regard to Visual Sequential Memory (VSM)

<table>
<thead>
<tr>
<th></th>
<th>EG1-CG</th>
<th>EG2-CG</th>
<th>EG3-CG</th>
<th>EG4-CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Scores</td>
<td>6.42</td>
<td>4.83</td>
<td>5.5</td>
<td>7.33</td>
</tr>
<tr>
<td>Post test of EG</td>
<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
</tr>
<tr>
<td>Post test of CG</td>
<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
<td>3.08</td>
</tr>
</tbody>
</table>

EGs = Experimental Groups, CG = Control Group
Mean Differentials of Post-test Scores between different EGs and CG with regard to Auditory-Sequential Memory (ASM)

<table>
<thead>
<tr>
<th>EG</th>
<th>Post test of EG</th>
<th>Post test of CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG1-CG</td>
<td>2.25</td>
<td>5.42</td>
</tr>
<tr>
<td>EG2-CG</td>
<td>2.25</td>
<td>4.92</td>
</tr>
<tr>
<td>EG3-CG</td>
<td>2.25</td>
<td>5.33</td>
</tr>
<tr>
<td>EG4-CG</td>
<td>2.25</td>
<td>6.42</td>
</tr>
</tbody>
</table>

EGs = Experimental Groups, CG = Control Group
Table 8.1.10 presents a comparative picture of main differentials between EGs and CG with regard to sound blending ability during treatment period. This table shows that means ($M_1$) of $EG_1$, $EG_2$, $EG_3$ and $EG_4$ were 5.92, 5.08, 5.33 and 6.50 respectively. $M_2$ of control group was 2.25. Likewise SDs ($SD_1$) of $EG_1$, $EG_2$, $EG_3$ and $EG_4$ were 1.32, 0.97, 0.93 and 0.84 respectively. $SD_2$ of CG was 0.76. The t-values of $EG_1$-CG, $EG_2$-CG, $EG_3$-CG and $EG_4$-CG were found to be 5.90, 5.63, 6.29 and 9.21 respectively. All the obtained t-values were significant at $p<.01$ level. Figure 8.1.10 has been prepared to highlight the post-test results of all EGs and CG on sound blending.

Table 8.1.11 represents means, SDs and mean differentials of pre- and post-test scores of visual discrimination (VD), sound discrimination (SD), visual sequential memory (VSM), auditory sequential memory (ASM), and sound-blending (SB). $M_1$ of VD, SD, VSM, ASM and SB were 3.00, 2.62, 3.00, 2.27 and 2.33 respectively and their $M_2$ were recorded as 6.25, 5.62, 6.02, 5.52 and 5.71 respectively. $SD_1$ of VD, SD, VSM, ASM and SB were 0.78, 1.09, 0.66, 0.76 and 0.76 respectively and their $SD_2$ were 1.19, 1.55, 1.25, 1.03 and 1.11 respectively. Mean differentials between pre-and post-test scores (t-values) were found to be 6.23, 4.46, 5.49, 7.49 and 7.16 respectively. All obtained t-values were significant at 0.01 level of confidence. Figure 8.1.11 has been prepared to show the pre-and post-test results of all neuropsychological abilities of total treatment groups.
Table 8.1.10
Mean Differentials of Post-test scores between different EGs and CG with regard to Sound-Blending (SB)

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>M₁</th>
<th>M₂</th>
<th>SD₁</th>
<th>SD₂</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG₁-CG</td>
<td>5.92</td>
<td>2.25</td>
<td>1.32</td>
<td>0.76</td>
<td>5.90*</td>
</tr>
<tr>
<td>EG₂-CG</td>
<td>5.08</td>
<td>2.25</td>
<td>0.97</td>
<td>0.76</td>
<td>5.63*</td>
</tr>
<tr>
<td>EG₃-CG</td>
<td>5.33</td>
<td>2.25</td>
<td>0.93</td>
<td>0.76</td>
<td>6.29*</td>
</tr>
<tr>
<td>EG₄-CG</td>
<td>6.50</td>
<td>2.25</td>
<td>0.84</td>
<td>0.76</td>
<td>9.21*</td>
</tr>
</tbody>
</table>

* All the obtained t-values were significant at p<0.01 level.

M₁ = Mean of post-test scores of different EGs
M₂ = Mean of post-test scores of control group
EGs = Experimental groups
CG = Control group
Figure 8.1.10

Mean Differentials of Post-test Scores between different EGs and CG with regard to Sound-Blending (SB)

EGS = Experimental Groups, CG = Control Group
Table 8.1.11

Mean Differentials between Pre- and Post-test Scores of all treatment groups with regard to different Neuropsychological Abilities

<table>
<thead>
<tr>
<th>Neuro. abilities</th>
<th>$M_1$ (n=24)</th>
<th>$M_2$ (n=24)</th>
<th>SD$_1$</th>
<th>SD$_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD</td>
<td>3.00</td>
<td>6.25</td>
<td>0.78</td>
<td>1.19</td>
<td>6.23*</td>
</tr>
<tr>
<td>SD</td>
<td>2.62</td>
<td>5.62</td>
<td>1.09</td>
<td>1.55</td>
<td>4.46*</td>
</tr>
<tr>
<td>VSM</td>
<td>3.00</td>
<td>6.02</td>
<td>0.66</td>
<td>1.25</td>
<td>5.49*</td>
</tr>
<tr>
<td>ASM</td>
<td>2.27</td>
<td>5.52</td>
<td>0.76</td>
<td>1.03</td>
<td>7.49*</td>
</tr>
<tr>
<td>SB</td>
<td>2.33</td>
<td>5.71</td>
<td>0.76</td>
<td>1.11</td>
<td>7.16*</td>
</tr>
</tbody>
</table>

* All the obtained t-values were significant at $p<0.01$ level.

$M_1$ = Mean of pre-test scores of different EGs

$M_2$ = Mean of post-test scores of different EGs

VD = Visual discrimination, SD = Sound Discrimination,

VSM = Visual Sequential Memory, ASM = Auditory Sequential Memory

SB = Sound blending, Neuro.abilities = Neuropsychological abilities

SD$_1$ = Pre-test

SD$_2$ = Post-test
Figure 8.1.11
Mean Differentials between Pre- and Post-test Scores of all treatment groups with regard to different Neuropsychological Abilities

VD = Visual Discrimination, SD = Sound Discrimination, VSM = Visual Sequential Memory
ASM = Auditory Sequential Memory, SD = Sound Blending
Discussion of Results

Although it appears that dyslexics possess lower visual discrimination ability as compared to normals (Stanley, 1976, O'Neill and Stanley, 1979). There have been dyslexics in the some studies (Coleman, 1953 and Stanley, 1976) who did not show much a trend. Ellis and Miles (1979) have reported a series of experiment based on the view that there is a distinctive limitations in dyslexics which reduces their ability to process information. Results obtained from the present study (Table 8.1.11 and Table 8.1.6) show that dyslexics were deficient in visual discrimination (Aston Index) but improved significantly in visual discrimination ability when they were given training with different remedial strategies to reduce their reading difficulties.

The dyslexics showed a normal phonemic confusability effect, although their overall recall was much poorer than that of their peer controls. (Steinhagen et al., 1971; Johnson & Rhona, 1982). The dyslexic children were deficient to recall auditorily presented letters and letter strings in the present study. These children showed significant gain in sound discrimination (Table 8.1.2, 8.1.7) in different remedial programmes which were conducted for reducing reading difficulties of dyslexic children.

It is observed that the number of studies related to identifying visual sequential memory (VSM) as a factor responsible for dyslexics have been inadequate. Although
deficiency in visual sequential memory among dyslexics has been observed by some investigators (Stanley and Hall, 1973) there has been no such difference as observed by others (Hicks, Carolyn, 1980). The present findings are in line with findings of Stanley and Hall (1973), Thomson and Wilsher (1978). However, dyslexics gained significantly in post-test results (Table 8.1.3, 8.1.8) in visual sequential memory who were included in the treatment groups and not others as controls.

Belmont and Birch (1966), Goldon et al. (1975), Spring (1976) and Badian (1977) pointed out the existence of significant auditory sequential memory deficiencies in dyslexics. It was observed that dyslexics were deficient in ASM but they gained significantly in ASM (Table 8.1.4, 8.1.9) with different remedial strategies which were used to reduce reading difficulties of dyslexic children.

Golden and Steiner (1969) Hammill and Larsen (1974) have found that good readers were significantly superior to poor readers on sound blending. Vernon (1977) also observed that dyslexics were poor in analysing word sounds into phonemes.

Butler (1989, 1990) observed in remedial integrated reading programme that sound discrimination ($t=2.09; p<.05$) and sound blending reached almost significant ($t=1.96; p<.05$). Results of the present study showed significant gains in sound blending (Table 8.1.5, 8.1.10) in the same line as Butler (1989, 1990).
Further Table 8.1.11 showed significant mean differentials in the pre-and post-test scores of some neuropsychological abilities (VD, SD, VSM, ASM and SD) of all EGs which were significant beyond $p<.01$ level. Thus, the first hypothesis namely, "Reduction in reading difficulties would result in improvement of neuropsychological abilities of dyslexic children" stands verified.

**TESTING OF HYPOTHESIS 2**

The second hypothesis was verified with the help of results obtained on spelling and free writing, which have been presented in Tables 8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.2.5 and 8.2.6 for all EGs.

Table 8.2.1 represents pre-test, post-test means, SDs and t-values between pre- and post-test with regard to spellings of different experimental groups (EGs). This table shows that $M_1$, $M_2$, $SD_1$ and $SD_2$ and t-values between pre-and post-test scores of EG$_1$ were 66.16, 72.16, 3.81, 4.83 and 2.38 respectively. $M_1$, $M_2$, $SD_1$, $SD_2$ and t-value of EG$_2$ were 64.16, 70.66, 3.71, 3.77 and 2.61 respectively. $M_1$, $M_2$, $SD_1$, $SD_2$ and t-value of EG$_3$ were 63.33, 73.00, 5.16, 4.42 and 2.28 respectively. $M_1$, $M_2$, $SD_1$, $SD_2$ and t-value of EG$_4$ were 68.00, 77.33, 4.60, 5.39 and 2.53 respectively. All obtained t-values were significant at 0.05 level of confidence. Figure 8.2.1 corresponding to Table 8.2.1 has been prepared to show the mean differentials of pre- and post-test scores of different EGs.
Table 8.2.1

Mean Differentials between Pre- and Post-test Scores with regard to Spellings of Different EGs

<table>
<thead>
<tr>
<th>Groups</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG_1</td>
<td>66.16</td>
<td>72.16</td>
<td>3.81</td>
<td>4.83</td>
<td>2.38*</td>
</tr>
<tr>
<td>EG_2</td>
<td>64.16</td>
<td>70.66</td>
<td>3.71</td>
<td>3.77</td>
<td>2.61*</td>
</tr>
<tr>
<td>EG_3</td>
<td>63.33</td>
<td>73.00</td>
<td>5.16</td>
<td>4.42</td>
<td>2.28*</td>
</tr>
<tr>
<td>EG_4</td>
<td>68.00</td>
<td>77.33</td>
<td>4.60</td>
<td>5.39</td>
<td>2.53*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence

EGs = Experimental groups

$M_1$ = Mean of pre-test scores of different EGs

$M_2$ = Mean of post-test scores of different EGs

$SD_1$ = Pre-test

$SD_2$ = Post-test
Figure 8.2.1
Mean Differentials between Pre- and Post-test Scores with regard to Spellings of Different EGs

EGs = Experimental Groups
Table 8.2.2 represents means, SDs and t-values between mean post-test scores of spellings of different EGs and the CG. Means of EG$_1$, EG$_2$, EG$_3$, EG$_4$ and CG were 72.16, 70.66, 73.00, 77.33 and 64.66 and their SDs were 4.83, 3.77, 4.42, 5.39 and 4.36 respectively. The t-values computed of post-tests of spellings between EG$_1$ and CG, EG$_2$ and CG, EG$_3$ and CG and EG$_4$ and CG were found to be 2.31, 2.84, 2.70 and 3.05 respectively. The t-values of first three EGs were significant at .05 level and t-values of EG$_4$ was significant at .01 level. This indicates that significant gains were found in spellings as a result of reduction in reading difficulties of the dyslexic children. Figure 8.2.2 has been prepared to highlight results between different EGs and CG on spellings.

Table 8.2.3 represents mean differentials between pre- and post-test scores of all EGs with regard to spellings of dyslexic children. This table shows that M$_1$, M$_2$, SD$_1$ and SD$_2$ and t-value between pre-and post-test scores of all the four EGs were 65.41, 73.29, 4.32, 5.01 and 2.26 (p<.05) respectively. It indicates that there was over all improvement in spellings of the four EGs as a result of reduction in reading problems of the children. Figure 8.2.3 has been prepared ot highlight the pre-and post-test results of all treatment groups on spellings.
Table 8.2.2
Mean Differentials of Post-test scores between different EGs and Control Group with regard to Spellings

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG$_1$-CG</td>
<td>72.16</td>
<td>64.66</td>
<td>4.83</td>
<td>4.36</td>
<td>2.31**</td>
</tr>
<tr>
<td>EG$_2$-CG</td>
<td>70.66</td>
<td>64.66</td>
<td>3.77</td>
<td>4.36</td>
<td>2.84**</td>
</tr>
<tr>
<td>EG$_3$-CG</td>
<td>73.00</td>
<td>64.66</td>
<td>4.42</td>
<td>4.36</td>
<td>2.70**</td>
</tr>
<tr>
<td>EG$_4$-CG</td>
<td>77.33</td>
<td>64.66</td>
<td>5.39</td>
<td>4.36</td>
<td>3.05*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence
** Significant at 0.05 level of confidence

$M_1$ = Mean of post-test scores of different EGs
$M_2$ = Mean of post-test scores of control group

Table 8.2.3
Mean Differentials between pre- and Post-test scores of all treatment groups with regard to Spellings

<table>
<thead>
<tr>
<th>Groups</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=24)</td>
<td>(n-24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All EGs</td>
<td>65.41</td>
<td>73.29</td>
<td>4.32</td>
<td>5.01</td>
<td>2.26**</td>
</tr>
</tbody>
</table>

** p<0.05.

$M_1$ = Mean of pre-test scores of all EGs
$M_2$ = Mean of post-test scores of all EGs
$SD_1$ = Pre-test
$SD_2$ = Post-test
Figure 8.2.2
Mean Differentials of Post-test Scores between different EGs and CG with regard to Spellings

EG1-CG
Post-test of CG 64.66
Post-test of EG 72.16
EG2-CG
Post-test of CG 64.66
Post-test of EG 70.66
EG3-CG
Post-test of CG 64.66
Post-test of EG 73.00
EG4-CG
Post-test of CG 64.66
Post-test of EG 77.33

EGs = Experimental Groups, CG = Control Group
Mean Differentials between Pre- and Post-test Scores of all treatment groups with regard to Spellings
Table 8.2.4 represents means, SDs and t-values between pre-and post-tests for free writing of different EGs. This table shows that $M_1$, $M_2$, $SD_1$, $SD_2$ and t-value between pre-and post-test of EG$_1$ were 2.00, 5.33, 0.89, 1.03 and 5.97 respectively. The t-value was significant at 0.01 level. Further table 8.2.4 shows that $M_1$, $M_2$, $SD_1$, $SD_2$ and t-value of EG$_2$ were 2.00, 3.67, 0.89, 1.03 and 2.98 respectively. Hence t-value was significant at 0.05 level. Further $M_1$, $M_2$, $SD_1$, $SD_2$ and t-value of EG$_3$ were 2.17, 4.83, 0.75, 1.17 and 4.69 respectively. The t-value of EG$_3$ was significant at 0.01 level.

Again Table 8.2.4 shows that $M_1$, $M_2$, $SD_1$, $SD_2$, and t-value of EG$_4$ were 2.00, 6.50, 0.89, 1.05 and 7.99. It shows that t-value of EG$_4$ was much beyond .01 level of confidence. Hence, it is clear from Table 8.2.4 that means of post-test for writing of all EGs are significantly higher than the means of pre-test of all EGs. These results are in consonance with the expectations of the investigator. Figure 8.2.4 has been presenting graphically the results of pre-and post-tests of different EGs on free writing.

Table 8.2.5 represents means, SDs and t-value between mean post-test scores (writing) of different experimental groups and the control group. Means of EG$_1$, EG$_2$, EG$_3$, EG$_4$ and CG were 5.33, 3.67, 4.83, 6.50 and 2.00 and their SDs were 1.03, 1.03, 1.17, 1.05 and 0.63.
Table 8.2.4

Mean Differentials between Pre- and Post-test Scores with regard to Free Writing of Different EGs

<table>
<thead>
<tr>
<th>Groups</th>
<th>$M_1$</th>
<th>$M_2$</th>
<th>$SD_1$</th>
<th>$SD_2$</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG₁</td>
<td>2.00</td>
<td>5.33</td>
<td>0.89</td>
<td>1.03</td>
<td>5.97*</td>
</tr>
<tr>
<td>EG₂</td>
<td>2.00</td>
<td>3.67</td>
<td>0.89</td>
<td>1.03</td>
<td>2.98**</td>
</tr>
<tr>
<td>EG₃</td>
<td>2.17</td>
<td>4.83</td>
<td>0.75</td>
<td>1.17</td>
<td>4.69*</td>
</tr>
<tr>
<td>EG₄</td>
<td>2.00</td>
<td>6.50</td>
<td>0.89</td>
<td>1.05</td>
<td>7.99*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence
** Significant at 0.05 level of confidence

EGs = Experimental groups

$M_1$ = Mean of pre-test scores of different EGs

$M_2$ = Mean of post-test scores of different EGs

$SD_1$ = Pre-test

$SD_2$ = Post-test
Figure 8.2.4
Mean Differentials between Pre- and Post-test Scores with regard to Free Writing of Different EGs

EGs = Experimental Groups
respectively. The t-values computed of post-tests between 
EG₁ and CG, EG₂ and CG, EG₃ and CG and EG₄ and CG were found 
to be 6.74, 3.37, 5.22 and 9.00 respectively. All the 
computed t-values were significant at .01 level of 
confidence. This indicates that significant gains in writing 
were found as a result of reduction in reading problems of 
dyslexic children. Figure 8.2.5 has been showing graphically 
the mean differentials between different EGs and CG on free 
writing.

Mean differentials between pre-and post-test scores 
of all treatment groups with regard to writing were entered 
in Table 8.2.6. This table shows that M₁, M₂, SD₁, SD₂ and 
t-value between pre-and post-test of all four EGs were 2.04, 
5.08, 0.81, 1.44 and 5.06 respectively. The t-value was 
significant beyond .01 level of confidence. It indicates 
that there was improvement in writing of the all EGs as a 
result of reduction in reading problems of the dyslexic 
children. Figure 8.2.6 has been prepared to highlight the 
pre-and post-test results of all treatment groups on free 
writing.

DISCUSSION OF RESULTS

Results obtained from Table 8.2.1, 8.2.2, 8.2.3, 
8.2.4, 8.2.5, and 8.2.6 shows that there were significant 
gains in all the experimental groups with regard to spelling 
and writing of the subjects, but there was no gains in 
writing and spelling of the control group. This suggests 
that children who were provided training through various
### Table 8.2.5

Mean Differentials of Post-test scores between different EGs and Control Group with regard to Free Writing

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>( M_1 )</th>
<th>( M_2 )</th>
<th>( SD_1 )</th>
<th>( SD_2 )</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( EG_1 )-CG</td>
<td>5.33</td>
<td>2.00</td>
<td>1.03</td>
<td>0.63</td>
<td>6.74*</td>
</tr>
<tr>
<td>( EG_2 )-CG</td>
<td>3.67</td>
<td>2.00</td>
<td>1.03</td>
<td>0.63</td>
<td>3.37*</td>
</tr>
<tr>
<td>( EG_3 )-CG</td>
<td>4.83</td>
<td>2.00</td>
<td>1.17</td>
<td>0.63</td>
<td>5.22*</td>
</tr>
<tr>
<td>( EG_4 )-CG</td>
<td>6.50</td>
<td>2.00</td>
<td>1.05</td>
<td>0.63</td>
<td>9.00*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence

\( M_1 \) = Mean of post-test scores of different EGs
\( M_2 \) = Mean of post-test scores of control group

### Table 8.2.6

Mean Differentials between Pre- and Post-test scores of all treatment groups with regard to Free Writing

<table>
<thead>
<tr>
<th>Groups</th>
<th>( M_1 ) (n=24)</th>
<th>( M_2 ) (n=24)</th>
<th>( SD_1 )</th>
<th>( SD_2 )</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All EGs</td>
<td>2.04</td>
<td>5.08</td>
<td>0.81</td>
<td>1.44</td>
<td>5.06*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence

\( M_1 \) = Mean of pre-test scores of different EGs
\( M_2 \) = Mean of post-test scores of different EGs
Figure 8.2.5

Mean Differentials of Post-test Scores between different EGs and CG with regard to Free Writing

EG1-CG: 5.33
EG2-CG: 3.67
EG3-CG: 4.83
EG4-CG: 6.5

Mean Scores

Post test of EG  Post test of CG

EGs = Experimental Groups, CG = Control Group
Figure 8.2.6

Mean Differentials between Post-test Scores of all treatment groups with regard to Free Writing
remedial strategies discussed earlier in chapter IV had gained significantly but those who did not receive any training, did not show improvement in spelling and writing. These findings support the findings of Enfield and Greene, 1983; Traub, 1982; and Wilson, 1988. Multisensory Alphabetic Phonetic Approach appear to have enabled subjects to promote improvement in reading, spelling and applying the words and rules when writing. (Guyer and Sabatino, 1989). It can be inferred from these findings that due to reduction in reading problems there was a noticeable improvement in spellings and written language. However, some evidence has been generated which supports the use of MSL method. It has been found that when students are taught reading, through MSL method, spelling and writing also improve. (Brightman, 1986; Enfield, 1976,1988; Frankiewicz, 1984; Guyer and Sabatino, 1989; Hutcheson, Selig, and Young, 1990; Vickery, Reynolds and Cochran, 1987; White, 1986).

It is clear from the above discussion that with the reduction in reading problems, children appeared to spell and write with more confidence and needed less assistance than they did prior to the study. Thus, the second hypothesis, namely "Reduction in reading difficulties may improve spelling and writing expression of dyslexiastic children" stands verified.

To sum up the discussion of results of both hypotheses it can be safely concluded that some
neuropsychological abilities such as visual discrimination, sound discrimination, visual sequential memory, auditory sequential memory, and sound blending may be the necessary condition for normal reading acquisition. The present study demonstrates that reduction in reading difficulties may result in improvement of some neuropsychological abilities. On the other hand, the present data also show that children who had reading difficulties also had writing and spelling difficulties. So different remedial strategies significantly facilitated reading acquisition. All the children who were given training improved in reading skills. Also, as the reading difficulties decreased, improved performance was found in spelling and writing of the subjects. These results are supported by the findings of Karen et al. (1987).