SUMMARY
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Inspite of having average and above average intelligence many children are not able to perform good in academics. These children may face difficulties in one or several areas such as reading, writing, spelling and arithmetic. Such children can be named as slow learners, learning disabled etc. Learning disability is not limited to only neurological or biological disturbances. Daily life pathology is also one major cause of such problems. Similarly learning disability may not be limited to a particular age or group or sex. It is life long and must be dealt accordingly (Mercer, 1991; Smith and Luckasson, 1995). For enhancing the basic skills in learning disabled special strategies are required. A variety of strategies are used to deal with learning disabilities. For example, reading and writing problems are dealt with by using the techniques TREE, PLEASE etc. that need very indepth understanding and related skills or expertise. This is the limitation of these specialized techniques. So there is a need to look for some such technique which require no much effort and are easy to administer. Perhaps one such strategy could be negative ion therapy.

Ions are small particles of $O_2$ and $O_3$ etc. which are also present in the air surrounding us. Environment contains two types of ions i.e. positive and negative. In polluted air positive ions are found in abundance. But in the fresh air negative air ions are more prevalent. Their concentration or ratio changes time to time and place to place. The ions inhaled by human beings and animals have marked effects on the biology and behavior. Air abundant with positive ions increases body pain, sickness, headache, dizziness, fatigue, increase reaction time and so on (Slote, 1961; Halcomb and Kirk, 1965). The negative air ions have opposite effects. There are studies showing the positive effects of negative air ions. On the physical side negative ions have calming effects, benefiting like meditation and enhance concentration. Ions give relax feeling (Bucakalew and Rizzuto, 1982), enhance psychomotor performance (Batra and Kumar, 2005), improve cognitive performance (Batra, 2005), memory (Baron et.al, 1985; Batra and Rashmi, 1997), enhance physical and mental well-being (Batra, 2008) and so on. Negative air ions promote alpha brain waves (Assaels et.al, 1967). All these studies are showing the physiological and psychological impact of air ions and most of the
studies are done on healthy population. But there are some special areas which need attention e.g. special population of learning disabled and mentally retarded. There are only three studies done by Morton and Kershner (1980, 1984, and 1990) in this area. These studies are showing positive impact of negative air ion exposure on special population.

So keeping in mind these limited studies on special sect of population and its relevance and implication in the present scenario, this investigation was designed to study the effect of negative air ions on he learning and memory of the learning disabled.

Objectives:
1) To find out whether the negative ion exposure helps in enhancing acquisition amongst normal and learning disabled subjects.
2) To find out whether the negative ion exposure helps in enhancing retrieval amongst normal and learning disabled subjects.
3) To compare the degree of enhancement in learning disabled and normal population due to negative ion exposure.
4) To find out the residual effect of negative air ions.

Hypotheses:
1) The acquisition would be better amongst subjects exposed with negative ions.
2) The retention would be better amongst subjects exposed with negative ions.
3) The degree of enhancement would be more amongst the normal population.

Design: To investigate these predicted results a 2×2×3 factorial repeated measure design was employed

<table>
<thead>
<tr>
<th>Groups</th>
<th>Dosages (ions/cm^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No exposure</td>
<td>1000-1200 ions/cm^3</td>
</tr>
<tr>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>Learning disabled</td>
<td></td>
</tr>
<tr>
<td>Exposure of negative ions</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>Learning disabled</td>
<td></td>
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</tbody>
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n=15
Tools:
(i) Learning Disability Evaluation Scale (LDES-renormed)
(ii) Air Ion Counter
(iii) Negative Ion Generator

Tasks:
(i) Digit Span i.e. FDS and BDS
(ii) Serial Learning Task
(iii) 30 Word Recall Test

Procedure:

First of all a pilot work was conducted to decide about the setting of air ions and ionizers to maintain the doses for various exposure conditions. Now in different in different settings subjects were tested on FDS, BDS, serial learning and 30 word recall before and after daily one hour exposure for 10,20 and 30 days. The D scores were obtained, monotonic transformations were made and after adding constant values, the new means were analysed by employing 3 way ANOVA and DRTs.

The results of FDS indicated that the exposure of ions enhanced the FDS after 10, 20 amongst both normal and LD subjects only. The normal subjects were able to gain after 30 days. Regarding doses, the only observation was that the normals had a dose dependent benefit after 30 days, the moderate dose being most beneficial.

To summarise the impact of negative air ions on BDS, 10 days exposure was not enough to improve the performance. After 20 and 30 days, the exposure improved the performance amongst both the normal and the LD subjects. However, this effect did not differ amongst normals and the LD subjects indicating that both groups were equally benefited. There was no any significant effect of dose, at any duration. These results indicated that both the acquisition and retention enhanced in STM.

Regarding serial learning task, exposure led to a saving in trials required to master the task upto 100% after 10, 20 and 30 days. 10 and 20 days exposure benefited the LD subjects more than the normal subjects whereas after 30 days normals also gained due to exposure. Dose dependent effect was observed only after 10 days, amongst LD subjects
low and high dose were more effective in improving acquisition than moderate dose. So negative air ions exposure led to an enhanced acquisition of LTM also.

The same subjects were tested for the number of NSS they could recall after 24 hours of complete learning. The results of all the three ANOVAs calculated for different durations, it indicated that 10 days exposure duration did not differ from pre level retention of NSS. But as the duration increased, exposure effect was clearly visible. So exposure of at least 20 days is required in order to see the effect of exposure of negative air ions in recalling of NSS after 24 hours. However, neither the normals differed significantly from the LDs nor there was any dose dependent effect. So the retention in LTM also enhanced due to negative air ion exposure. The last task was 30 word recall task. The results on this task also indicated an improved performance after exposure of negative air ions and the effect was more pronounced amongst LDs. Thus first two hypotheses proved true by the results of each task.

The third hypothesis predicted that normal subjects would be benefited more than the LDs. However, this hypothesis did not prove and the LDs were more benefited more. However, for complex task like serial learning even the normal subjects were able to gain.

The last objective of the study was to investigate the residual effect. Nothing much could be established clearly except that for some doses the effect did not last although not for very long durations.