SUMMARY

IMPACT OF NEGATIVE AIR ION EXPOSURE ON ATTENTIONAL PROCESSES

Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience and the senses. Cognition refers to mental activities such as seeing, attending, remembering and solving problems. Attending to an object is to bring that object to consciousness. To perceive an object, to think about it, to solve some problem about it, to remember it and the like is not possible without attending to it. By attending to anything one brings it within the realm of consciousness. Attention is the heart of the conscious process and is basic to all mental activity and behaviour. Attention in a way precedes all mental activity. Without attention, perceiving, thinking, learning, deciding and acting is not possible as it is the gateway to all these processes.

Attention refers to an active processing of specific information present in the environment by an individual. It allows to ‘tune out’ information, sensations, and perceptions that are not relevant at the moment and instead focus energy on the information that is important. Attention is the means by which one actively processes a limited amount of information from the enormous amount of information available through one’s senses, stored memories and other cognitive processes (De Weerd, 2003; Duncan, 1999; Motter, 1999; Posner and Fernandez-Duque, 1999; Rao, 2003). Attention is the study of the capabilities and limitations of the individual to select and process sensory information from the environment (Jahnke and Nowaczyk, 1998).

Attention is necessary to keep one from becoming overloaded with information. Working on living best and happiest lives, and making greatest possible contributions to the world, are intimately bound up with a simple habit: focusing one’s attention on those things that are most important.

But, this era of high technological advances and stress has deteriorated attention a lot as it is full of frequent and unplanned interruptions, coupled with growing expectations for immediate responses which challenges one’s cognitive control system at its very core. People are continuously working under excessive pressure to make their place in this competitive world which is somehow affecting their performances. While many people say multitasking
makes them more productive, but multitaskers actually have more trouble focusing and shutting out irrelevant information, and experience more stress which often leads to forgetfulness, depression and poor judgment (Matthews and Desmond, 1995; Wickens, Strokes, Barnett and Hyman, 1991). Multitasking and dependency on electronic gadgets are reducing the thinking skills. So, in this world of hush rush, in order to lead a better and successful life, one needs to be careful about the influence of unending streams of interference and has to be more focused. Thus, it is the need of the hour today to look for the ways through which attentional skills can be enhanced.

A lot of research has been done on enhancing the memory, learning etc among normal individuals and various techniques are also available for improving these but the techniques that can be used to enhance attention are a few and yield poor results. Techniques such as ‘Getting things done’, ‘Time trial’, ‘Limit the internet’, ‘Using observational skills’, ‘Limit the T.V and Video games’, ‘incidental learning’, ‘creative arts’ and biofeedback training are available for increasing attention but they require a lot of time and energy. Besides this, meditation, and relaxation both reduce the level of arousal and thus calm the individual (Jha, Krompinger and Baine, 2007; Tang et al, 2007). This helps in holding attention. But sometimes using some of these techniques can create difficulties, as today one cannot imagine their life without T.V or Internet and restricting them can create hindrance in child’s growth. Children learn as well as get a lot of information from these sources.

However, behaviour modification is not an easy task as well as mental exercises to improve attention is not easy. A lot of training, experience, long time efforts on the part of both the modifier and the subject, and a sincere cooperation with high motivation and involvement on the part of learner is required. This could be reason for the fact that these methods though well researched could not be popularised for improving the attentional processes, which are basic to all types of learning, memory, educational activities. Therefore it is most important to focus on attention from this point of view. It would be highly beneficial if some technique could be looked for, that does not need any training, is easy and economic in terms of money and efforts, and requires no much patience to handle the students. To the view of researcher, perhaps one such technique could be negative air ion therapy.

An ion is an atom or molecule where the total number of electrons is not equal to the total number of protons, giving it a net positive or negative electrical charge. If there are more electrons than protons, the atom or molecule will be negatively charged. This is called an anion means ‘up’ and if there are more protons than electrons, the atom or molecule will be
positively charged. This is called a cation taken from Greek word ‘kata’ meaning ‘down’. Experimental researches available earlier indicates that exposure to negative air ions is linked to reduced depression severity (Flory, Ametepe and Bowers, 2010; Goel and Etwaroo, 2006; Terman and Terman, 1995; Terman and Terman, 1998; Terman and Terman, 2006.), lower psychological stress (Malik, Singh and Singh, 2010), less anxiety (Nakane, Asami, Yamada and Ohira, 2002), and enhanced well-being (Assael, Pfeifer and Sulman, 1974; Buckalew and Rizzuto, 1982; Lips, Salawu, Kember and Probert, 1987; Misiaszek, Gray and Yates, 1987). Others suggest that exposure to positive air ions may be associated with feelings of unpleasantness, irritability, and heightened anxiety (Charry and Hawkins, 1981; Giannini, Jones and Loiselle, 1986; McGurk, 1959). Studies have proved that negative ions in the atmosphere are very beneficial for enhancing learning and memory. Numbers of researches are available on learning and memory which proves that negative air ion exposure enhances learning (Batra, 2005; Morton and Kershner, 1987, 1990; Olivereau and Lambert, 1981; Savita and Batra, 2009), memory (Batra and Rashmi, 1997; Baron, Russells, and Arms, 1985; Baron 1987; Morton and Kershner, 1984; Olivereau and Lambert, 1981) and psychomotor performances (Baron and Dreher, 1964; Buckalew, and Rizzuto, 1984; Hawkins and Barker, 1978; Vinay and Batra, 2010) indicating an improved cognitive performance.

Since attention is considered to be a gateway to all other cognitive tasks, enhancement in learning and memory indicates that attention also must be getting affected by negative air ion exposure. But this needs to be tested and past literature indicates that this preposition has not been tested elsewhere whereas its implications are very wide. So, the following problem was formulated.

**Problem:**

“To study the impact of negative air ions exposure on attentional process.”

**Objectives:**

1) To study the effect of negative air ions on attentional processes.

2) To compare the effect of various doses of negative air ions on attentional processes.

3) To compare the effect of various duration of exposure of negative air ions on attentional processes.

4) To compare the effect of various doses of negative air ions on various types of attention.
5) To compare the effect of various durations of exposure of ions on various types of attention.

6) To study the residual effects of negative air ions on attentional processes.

**Hypotheses:**

1) Negative air ions would enhance the attentional processes.

2) Higher the dose of negative air ions more would be the improvement.

3) More the duration of exposure of ions, more would be the improvement in attentional processes.

4) The effect of various doses of negative air ions would not differ significantly across various types of attention.

5) The effect of various durations of exposure would not differ significantly across various types of attention.

6) The residual effects of negative air ions would be observed amongst the students at least for two months.

For testing these hypotheses, A 3x4 factorial design was employed. A sample of total 180 students (n=15) studying in class 9th and 10th were selected on the basis of span of attention, belonging to an age range of 14 to 16 years, having 15 subjects in each of the 12 groups. Three varied levels of negative air ions were administered for three varying durations. Subjects with moderate attention span were exposed to ion levels of 1000-1200 ions/cm$^3$, 2500-3000 ions/cm$^3$ and 4500-5000 ions/cm$^3$ for 10, 20 and 30 days. Control subjects were given no ionic exposure although were made to sit in the same room in the same way as the study group. Four types of attentional processes i.e. Selective, Sustained, Alternating, and Divided attention were assessed. Pre-post measures on various tasks were taken before and after the administration of the treatment for different durations. Besides this, in order to study the residual effect, the post tests were conducted after 15 days, 30 days and 60 days. The results were analyzed for statistical significance using Two way and One way ANOVA followed by DRT.

The first hypothesis of the study predicted that, “Negative air ions would enhance the attentional processes.” The results of two way ANOVA indicated that F-value on Sustained
attention was found to be significant for between dosages; on Alternating attention both between dosage and duration F values were significant; on Divided attention between duration was significant and none of the F values was significant for selective attention. However, the individual group means analysis is indicative of improvement even in the Selective attention due to air ion exposure. Thus, negative air ion exposure has been found to positively influence the attentional processes studied in this research work.

Secondly, it was hypothesized that, “higher the dose of negative air ions more would be the improvement”. The lowest dose was found to be most effective on Selective, Sustained and Divided attention but for Alternating attention highest dose was found to be most effective. Thus, the second hypothesis has not been verified.

The third hypothesis of the study predicted that “more the duration of exposure of ions, more would be the improvement in attentional processes”. The duration dependent effect was significant for Alternating and Divided attention but not for Selective and Sustained attentional processes. Thus, the third hypothesis has also not been verified.

The next hypothesis i.e. the fourth hypothesis predicted that “the effect of various doses of negative air ions would not differ significantly across various types of attention”. In case of 1000-1200 ions/cm$^3$ this positive effect did not differ across various tasks at all the durations and 2500-3000 ions/cm$^3$ dosage levels, this positive effect did not differ when given at 10 and 20 days but was observed only after 30 days. The effect of the highest dose varied across different types of attention at all the duration’s i.e.10, 20 and 30 days. Thus, the dosage effects varied across the difficulty level of attention tasks. The difficult tasks required the higher doses to be given for longer durations. For simple tasks the lower doses seem to be better. Thus, in the light of these findings, this hypothesis has been partially verified.

The next hypothesis stated that “the effect of various durations of negative air ions would not differ significantly across various types of attention”. Similar to dosage effect, even the duration effects varied across the difficulty level of attention tasks i.e. most difficult tasks required longer durations even when given for higher doses while for simple tasks shorter durations were effective. Thus, the fifth hypothesis has also not been verified.

Last hypothesis of the study was related to residual effects. Results indicated that effect of negative air ions last quite long as residual effects were observed for all the tasks i.e Selective, Sustained, Alternating and Divided. The effect lasted till 60 days on all the tasks
for all the doses at all the durations except on Selective and Alternating attention for lowest
dose at moderate duration, on Sustained and Alternating attention for highest dose at highest
duration.

Concludingly, it can be said that negative air ions had a positive effect on all the attentional
processes in the study. The effect however, was found to be task dependent.