Psychoneuroimmuno modulation by controlled vestibular stimulation

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DOI: 10.5455/jcer.201335

ABSTRACT

Acute stressors (lasting minutes) were associated with potentially adaptive up regulation of some parameters of natural immunity and down regulation of some functions of specific immunity. Brief naturalistic stressors (such as exams) tended to suppress cellular immunity while preserving humoral immunity. Chronic stressors were associated with suppression of both cellular and humoral measures. Vestibular system is connected with hypothalamus and hypothalamus regulates immune reactions. Stress responsiveness is primarily regulated by two neuroendocrine axes: the hypothalamic-pituitary-adrenocortical (HPA) and sympathetic adrenomedullary (SAM) systems. A thorough review of literature revealed that vestibular stimulation inhibits both HPA axis and SAM axis and decreases cortisol level and heart rate and blood pressure within normal limits and brings to stress- less condition and prevents immune suppression. It is the need of time to identify the importance of vestibular stimulation and to start translational research for the well being and peak performance of human being and also for patient care and treatment.

Key words: Controlled vestibular stimulation, immunity, stress

INTRODUCTION

Psycho-neuro-immunology is the study of how the mind can affect immune system functioning.\(^1\) The immune system, once thought to be autonomous, is now known to respond to signals from many other systems in the body, particularly the nervous system and the endocrine system. Stress is generally considered to suppress the immune system which leads to an increase in disease occurrence in the face of a pathogen.\(^2\) The immune system serves as a primary defense against bacterial and viral challenges and can be brought back to baseline levels after a challenge to homeostasis that involves the hypothalamic-pituitary-axis. Often, findings reported from various studies investigating the effects of stress on the immune system are conflicting and difficult to interpret. These discrepancies may be partly explained by the types and durations of the stressors and whether researchers measured innate or adaptive aspects of the immune system. Acute stressors (lasting minutes) were associated with potentially adaptive upregulation of some parameters of natural immunity and downregulation of some functions of specific immunity. Brief naturalistic stressors (such as exams) tended to suppress cellular immunity while preserving humoral immunity.

Chronic stressors were associated with suppression of both cellular and humoral measures.\(^3\) Stress hormones released in response to hypothalamic-pituitary-axis activation such as CRF, ACTH, and cortisol have all been shown to have an effect on immune function.

It has been shown that incubation of cattle and porcine immune cells with cortisol suppresses lymphocyte proliferation, IL-2 production, and neutrophil function.\(^4\) There are many interacting
factors influencing the immunological response of an animal to stress, these include stressor type (psychological vs. physiological vs. physical), duration of stressor, (chronic vs. acute), genetics, age, and social status. Stress responsiveness is primarily regulated by two neuroendocrine axes: the hypothalamic-pituitary-adrenocortical (HPA) and sympathetic adrenomedullary (SAM) systems. A thorough review of literature revealed that vestibular stimulation inhibits both HPA axis and SAM axis and decreases cortisol level and heart rate and blood pressure within normal limits and brings to stressless condition.[6] Recent studies show that several audiovestibular pathologies in the paediatric population may be immune-mediated.[7]

The purpose of this article is to review research reports related to vestibular stimulation and its role on balance of stress and immunity, with the intent of clarifying the present knowledge base in this area, and suggesting future research needs.

**MATERIALS AND METHODS**

Searches of the review study register articles from google.com, pubmed.com, British medical journal.com, Medline, ERIC, frontiersin.org and online standardized journals.

**How could stress “get inside the body” to affect the immune response?**

First, sympathetic fibers descend from the brain into both primary (bone marrow and thymus) and secondary (spleen and lymph nodes) lymphoid tissues.[8] These fibres can release a wide variety of substances that influence immune responses by binding to receptors on white blood cells.[9]

Second, the hypothalamic–pituitary–adrenal axis, the sympathetic–adrenal–medullary axis, and the hypothalamic–pituitary–ovarian axis secrete the adrenal hormones epinephrine, norepinephrine, and cortisol; the pituitary hormones prolactin and growth hormone; and the brain peptides melatonin, β-endorphin, and enkephalin. These substances bind to specific receptors on white blood cells and have diverse regulatory effects on their distribution and function.[10]

Third, people’s efforts to manage the demands of stressful experience sometimes lead them to engage in behaviours such as alcohol use or changes in sleeping patterns that also could modify immune system processes.[10]

**Balance of stress and immunity by controlled vestibular stimulation**

Our vestibular system does more than just allow us to stand upright and balance our bodies and give us a sense of direction. The Vestibular system coordinates information for our whole body and affects such things as muscles, our organs, limbs, vision and immune system.[11] It is widely believed that stress suppresses immune function and increases susceptibility to infections and cancer.[12] Stress responsiveness is primarily regulated by two neuroendocrine axes, namely the HPA and SAM systems. Controlled vestibular stimulation directly inhibits the HPA axis.[13-14] Vestibular stimulation is performed twice a day for ten days by using infant water bed in infants, decreased urinary cortisol levels significantly when compared with control group.[15] Controlled vestibular stimulation inhibits HPA axis by increasing GABA release.[16-17] Controlled vestibular stimulation may inhibit HPA axis by influencing hippocampal formation.[18]

Controlled vestibular stimulation inhibits SAM axis; controlled vestibular stimulation reduces heart rate and blood pressure.[19] Salivary Ig A levels decreases by negative emotions and anxiety.[20]

Retrograde viral tracing in the rat brain has demonstrated the presence of a direct vestibuloparaventricular projection[21] and similarly a paraventricular–vestibular pathway has also been described.[22] It was observed that hypothalamus regulates immune reactions.[23]

**CONCLUSION**

From the above discussion we conclude that controlled vestibular stimulation modulates in psycho neuro-immunological responses. It is the need of time to identify the importance of vestibular stimulation and to start translational research for the well being and peak performance of human being and also for patient care and treatment.
REFERENCES


Source of Support: Nil, Conflicts of Interest: None declared.