I have a theory... that during our long trek up the evolutionary ladder, a defacto presumption of a great deal of physical activity and movement throughout our waking day was deeply incorporated into the regulation of our autonomic nervous system. The movement created by that activity was detected by the sensitive rotational and linear acceleration sensors of our brain's vestibular system.

As we know, we evolved out in the open prairies of sub-Saharan South Africa, under the ever present live giving radiation of the sun. Because calories were precious and the sun's radiation was ever present, our biochemistry took an energy-saving shortcut, using a small but energetic slice of that radiation spectrum (UVB) to power the conversion of cutaneous cholesterol into a hormone which became crucial to our health. It was misnamed “Vitamin D.”

It was only when we stopped living under the sun that the dire consequences of chronic vitamin D deficiency became known. So this dependence upon the sun’s UVB radiation is not a failure of our biochemistry, it’s a consequence of the fact that the changes our evolving intelligence allowed us to make to our environment radically outpaced the rate of evolutionary change.

As I have been studying and discovering the startlingly underappreciated influence the vestibular system – located in our inner ears – exerts across our autonomic nervous and endocrine systems, the only way its role makes sense is when it is put into the same sort of evolutionary context as our dependence upon the sun:

*We evolved spending our days in motion.* We were hunting, gathering, walking, running, playing – moving. And during all of this, our vestibular system was there providing subconscious autonomic sub-sensory data about the instantaneous orientation and angular acceleration of our head in real time with surprising fidelity and speed. We are utterly dependent upon that silent system for virtually all aspects of locomotion, and it is only when it develops problems that we become aware of our dependence upon something we so casually take for granted.

As I have been researching this sensory system with the goal of understanding its role (because it has become clear that it is intimately associated with some aspects of the neural stimulation I’ve been studying), I have learned that a great many of the problems of modern Western life – high blood pressure, type-2 diabetes, stress, anxiety, insomnia, weight gain, gastric acid over production, migraine, low thyroid, senile dementia, Alzheimer's and more, can be significantly improved, or relieved, simply through the natural stimulation of our vestibular system.

*Simply swinging on a swing is enough to make a difference.*

I have inserted (the next two pages) a short paper detailing a case study of one female 18 year old student whose many metabolic metrics were monitored closely for six months… while she used a swing-set briefly every day. It will serve to give you a good sense for how surprisingly deeply connected our sense of “position” is to the autonomic regulation of our health:
INTRODUCTION
Stress is the generalized, non specific response of the body to any factor that overpowers or threatens to overwhelm, the body’s compensatory abilities to maintain homeostasis. High levels of stress in college students is hazardous as it not only effect their academic performance but also affect their health conditions. For many young adults, college is the best time of life. These critical years of adjustment can also be undermined by depression, anxiety, substance abuse and eating disorders. Researchers are finding that many mental illnesses are traced to trauma, whose damage surfaces in times of stress and change, such as the college years [1]. March is the year’s most dreaded month for Indian students: it’s exam time and the pressure to excel can be destructive. In recent years, it happens sometimes that college students suffer from physical or mental illness, which even leads to temporary absence from school or even suicide [2]. According to the National Crime Records Bureau, 5,857 Indian students attempted suicide due to exam stress in 2006 [3]. Physiological studies have shown that stress from any source can influence endocrine, haemopoietic and immune systems [4]. High level of stress may have adverse effect on academic achievement. Stress in students is also due to lack of guidance [5]. Adapting coping strategies that are beneficial during stressful experiences have to be encouraged. Coping is defined as the process of managing stressful demands and challenges that are appraised as exceeding the resources of the person [6]. Preventive measures can be aimed at preventing the consequences.

The vestibular system remains enigmatic among the human senses. It responds to the position of the head in relation to vestibular motion, specifically, gravity and accelerated or decelerated motion. Research has shown many benefits from vestibular stimulation including decreased self stimulation, decreased hypersensitivity, increased postural security, increased concentration and attentiveness, increased balance, increased body awareness, calming effects, reduction of abnormal muscle tone at slow speeds and increased alertness at high speeds [7]. Stimulating vestibular system by controlling direction, duration, frequency and intensity. Ideal direction, duration, frequency and intensity are yet to be determined. Hammam E et al., suggested that low frequency stimulation is beneficial. [8] Winter et al., reported that they have observed decrease in salivary cortisol in volunteers who subjected to front to back motion on a hexapod [9]. Vestibular under stimulation, does not have any effect or mild effect and over stimulation causes nausea, vomiting and radical fluctuations in pulse and respiration [7]. It was reported that controlled vestibular stimulation provides more soothing effects [10]. In the present case we have applied controlled vestibular stimulation for the first time to reduce stress in college student.

CASE REPORT
While screening the students to select for our research work at Little Flower Medical Research Centre, Angamaly, we have found Miss B, a 18 years old college student with Height 157cms, Weight-46kg BMI = 18.66 kg/m² (Healthy weight) having abnormal pulse rate (130±2.10) and BP (159±5.06/93.5±2.35) at rest. On advice she underwent haematological, salivary cortisol and random blood glucose estimations and was found abnormal values [Table/Fig-1]. Salivary samples were collected at 1 pm following the guidelines provided by salimetrics lab. Her ECG indicates sinus tachycardia and she reported that she is under stress all the time and her menstrual cycle was irregular from past 8 months. No family history of hypertension is present. We advised her to start vestibular stimulation on a swing back to front direction. She was advised to adjust frequency, duration and intensity, depending on her level of comfort. We have installed two swings at our physiological garden to give vestibular stimulation [11]. She started to swing for 4 minutes duration with frequency of 24 cycles/min and intensity 46kg BMI = 18.66 kg/m² (Healthy weight) havin...
both the stress axes (hypothalamic-pituitary-adrenocortical (HPA) and sympathetic adrenomedullary (SAM) )and decreases cortisol level and heart rate and blood pressure within normal limits. Swaying appears to decrease salivary cortisol levels in African elephants [13]. Infants who received auditory, tactile, visual and vestibular interventions showed a significant steady decline in cortisol [14-16]. Poor or inadequate sleep can cause irritability and stress [17]. Vestibular stimulation relieves pain and promotes sleep and balance stress [18,19]. Vestibular stimulation also improves cognition [20]. Rocking is soothing and may be due to involvement of brainstem inhibitory mechanisms [9]. In the present case we have observed steady and significant decrease in salivary cortisol, Blood pressure and blood cell counts followed by controlled vestibular stimulation.

CONCLUSION

The present case shows that controlled vestibular stimulation reduces stress and can be of use in similar cases. Hence we recommend further detailed study in this area.

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**REFERENCES**

10. Pederson DR. The soothing effects of vestibular stimulation as determined by frequency and direction of rocking. ERIC – educational resources information centre. ED084017.
Of course I know that a single case study proves nothing, but an abundance of well conducted research also exists employing all the standard protocols and methodologies of modern “proof-generating” medicine – placebo controls, crossover with washout, blinding where feasible, and so forth.

The only way this profound level of unseen autonomic control makes sense...

… is if it is similar to the mechanism by which we unwittingly became dependent upon the vitamin D generating energy of the sun: Something that was a constant factor in our lives as we evolved was deeply incorporated into our biology because our evolution had no way of anticipating that we would not always be spending our days on the move, hunting, gathering, walking, running, and playing. So our deep nervous and hormonal regulation systems blindly incorporated the assumption that this would never change into the regulation of our bodily processes for our health.

But just as our evolved intellect allowed us to move indoors behind UVB-blocking glass – thus depriving ourselves of a crucial component of the sun's life giving rays – that same intellect allowed us to figure out how to spend almost none of our day physically working – and moving – to survive. It has become common knowledge that a “sedentary lifestyle” is hazardous to our health. This is probably why.

And it has long been observed that “exercise” appears to be a crucial component of health. In the absence of this understanding, it seems a bit odd that even walking helps a very great deal. We know it does. Now we may know why: since walking directly and rhythmically stimulates our vestibular system. And it seems likely that a very large component of the benefit conferred by exercise is due to the fact that any exercise – even light exercise – actively drives vestibular stimulation, allowing our body's autonomic systems to function as they designed themselves to.

An early reader of this paper noted John J. Ratey’s book “Spark.” In it, Ratey observes that while exercise in general produces cognitive benefits (improved memory, learning, recall, etc.), exercise involving more complex movement (such as choreographed dancing or martial arts) appears to provide even greater cognitive benefits. That would appear to support this theory since the greater degree of vestibular stimulation provided by movement involving balance and rapid and continual repositioning (e.g. dancing and martial arts) would be expected to confer a multitude of additional health benefits.