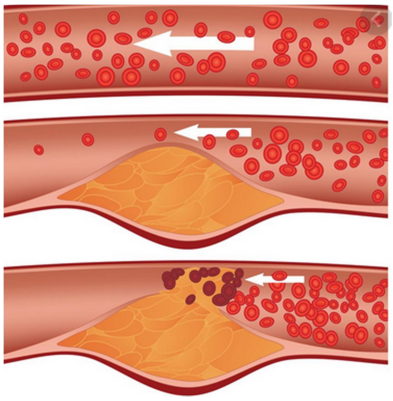
CARDIOLOGÍA EN OSTEOPATÍA Y SU RELACIÓN CON EL SNA Parte 5

La estimulación del vago reduce y retrasa los procesos aterogénicos cardiacos.



Atherosclerosis. 2007 Dec;195(2):e1-9. Epub 2006 Nov 13.

Vagus-brain communication in atherosclerosis-related inflammation: a neuroimmunomodulation perspective of CAD.

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Author information

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Abstract

The current understanding of the pathophysiology of atherosclerosis leading to coronary artery disease (CAD) emphasizes the role of inflammatory mediators. Given the bidirectional communication between the immune and central nervous systems, an important question is whether the brain can be "informed" about and modulate CAD-related inflammation. A candidate communicator and modulator is the vagus nerve. Until now, the vagus nerve has received attention in cardiology mainly due to its role in the parasympathetic cardiovascular response. However, the vagus nerve can also "inform" the brain about peripheral inflammation since its paraganglia have receptors for interleukin-1. Furthermore, its efferent branch has a local anti-inflammatory effect. These effects have not been considered in research on the vagus nerve in CAD or in vagus nerve stimulation trials in CAD. In addition, various behavioural interventions, including relaxation, may influence CAD prognosis by affecting vagal activity. Based on this converging evidence, we propose a neuroimmunomodulation approach to atherogenesis. In this model, the vagus nerve "informs" the brain about CAD-related cytokines; in turn, activation of the vagus (via vagus nerve stimulation, vagomimetic drugs or relaxation) induces an anti-inflammatory response that can slow down the chronic process of atherogenesis.

PMID: 17101139 DOI: 10.1016/j.atherosclerosis.2006.10.009

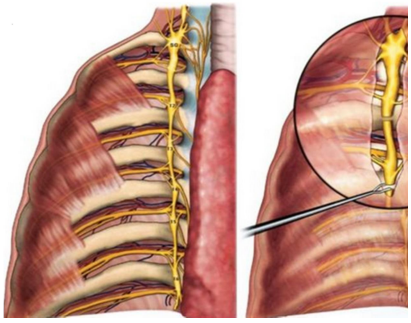
DOLOR CARDIACO:

- El dolor cardiaco se considera estar mediado por aferentes viscerales vertebrales con sus cuerpos celulares en los ganglios de la raíz dorsal C8 A T9 (PRINCIPALMENTE T2-T6).





- De cualquier manera, los intentos por aliviar el dolor asociado con angina de pecho mediante manipulación quirúrgica (simpatectomía, rizotomía dorsal o inyección de alcohol en la cadena simpática) muestra consistentemente que solo alivi un 50% de los pacientes, el resto obtienen Alivio parcial o ningún Alivio.



Neuroscience. 1992;48(3):501-24.

A critical review of the afferent pathways and the potential chemical mediators involved in cardiac pain.

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Author information

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Abstract

There is considerable evidence that on the anterior surface of the heart (which is usually supplied by the left anterior descending and the proximal part of the left circumflex coronary arteries), sympathetic efferent reflexes characterized by tachycardia and/or hypertension predominate following experimental or pathological perturbations. These cardiovascular reflexes are accompanied by an increase in presumed nociceptive afferent traffic and, in pathological condition, by pain. In these experiments, there is generally no effect of vagotomy on afferent nerve traffic, and lower cervical and upper thoracic sympathectomies help provide relief from angina. On the other hand, experimental or pathological perturbations involving the inferior-posterior surface of the heart (supplied by the right and distal parts of the left circumflex coronary arteries), are characterized by vagal efferent reflexes, resulting in bradycardia and/or hypotension. These reflexes are accompanied by an increase in vagal afferent nerve traffic and, in pathological conditions, by pain. In these experiments, vagotomy generally abolishes such cardiovascular reflexes, and lower cervical and upper thoracic sympathectomies are not effective in the relief from angina. Although cardiac sympathetic afferents are unquestionably involved in the central transmission of nociceptive information from the heart, it is also likely that there is a contributing role from the vagus in cardiac pain. It is important experimentally to understand the natural stimulus that gives rise to angina. In the clinical situation, a decrease in coronary blood flow or an increase in the metabolic demands of the myocardium due to increased work are obvious precipitating factors which lead to myocardial ischemia. In the experimental situation, occlusion of the coronary arteries is often used as a stimulus which mimics myocardial ischemia. As people who frequently experience angina have varying degrees of coronary artery disease, it is difficult to accept that the state of the coronary arteries of the normal experimental animal bear any resemblance to the state of the coronary arteries under pathological conditions. That is, the gain of homeostatic reflexes, the basal concentrations of neuroactive substances in the plasma, the myocardium and the afferent terminals, the excitability of the afferents, access of chemical mediators (e.g. bradykinin, 5-HT, adenosine, histamine, prostaglandins, potassium, lactate), to afferents, and the overall function of the animal are all significantly different. We have no idea how control mechanisms have been altered in the person with severe coronary artery disease compared to the normal patient or the "normal" experimental animal.(ABSTRACT TRUNCATED AT 400 WORDS).

Hay evidencia considerable de que en la superficie anterior del corazón (que suele ser suministrada por la descendente anterior izquierda y la parte proximal de las arterias coronarias circunflejas izquierdas), los reflejos eferentes simpáticos caracterizados por taquicardia y/o hipertensión predominan tras perturbaciones experimentales o patológicas.
Estos reflejos cardiovasculares se acompañan de un aumento del presunto tráfico aferente nociceptivo y, en condición patológica, de dolor.
En estos experimentos, generalmente no hay efecto de la vagotomía en el tráfico del nervio aferente, y las simpatectomías cervical inferior y torácica superior ayudan a proporcionar alivio de la angina.
Por otra parte, las perturbaciones experimentales o patológicas que afectan a la superficie inferior-posterior del corazón (suministradas por las partes derecha y distal de las arterias coronarias circunflejas izquierdas), se caracterizan por reflejos eferentes vagales, dando lugar a bradicardia y/o hipotensión.

ESTO CORRESPONDE AL ARTÍCULO ANTERIOR

Estos reflejos se acompañan de un aumento del tráfico nervioso aferente vagal y, en condiciones patológicas, de dolor. En estos experimentos, la vagotomía generalmente suprime tales reflejos cardiovasculares, y las simpatectomías cervicales inferiores y torácicas superiores no son efectivas en el alivio de la angina.
Aunque los aferentes simpáticos cardíacos están incuestionablemente involucrados en la transmisión central de información nociceptiva desde el corazón, también es probable que haya un papel contribuyente del vago en el dolor cardíaco. Es importante comprender experimentalmente el estímulo natural que da lugar a la angina.

ESTO CORRESPONDE AL ARTÍCULO ANTERIOR
SI HACIENDO CAMINAR UN POCO AL PACIENTE SE PONE AZUL, ES QUE VASOCONSTRIÑE, POR TANTO VA A RESPONDER MAL A LA OSTEOPATÍA ESTRUCTURAL (TRABAJA CON FASCIAS, AFERENCIAS VAGALES Y FRÉNICAS ETC, PERO NO MANIPULES)
SI HACIENDO CAMINAR UN POCO AL PACIENTE SE PONE ROJO, TIPO MÁS CONGESTIONADO, ES QUE VASODILATA, POR TANTO VA A RESPONDER BIEN A LA OSTEOPATÍA ESTRUCTURAL (TRABAJA CON TODO: FASCIAS, AFERENCIAS VAGALES Y FRÉNICAS ETC, Y MANIPULACIONES)

Se ha de advertir que algunos de los fracasos a la hora de aliviar el dolor cardiaco deben considerar que la parte posteroinferior del corazón está inervada por aferentes vagales y puede mediar dolor cardiaco también.
Esta conclusion se apoya en investigaciones neurofisiológicas que muestran que algunas neuronas del tracto espinotalámico a nivel de c1-c2-c3 pueden ser activadas mediante la estimulación eléctrica de las aferentes vertebrales y vagales o inyectando sustancias algógenas en el saco pericárdico

DOLOR REFERIDO CARDIACO Y AFERENTES VAGALES:

La activación de las neuronas del tracto espinotalámico mediante aferentes vagales es transmitido por el núcleo del tracto solitario.
Estas neuronas pueden ser activadas sinápticamente mediante estimulación mecánica de los campos de receptor somáticos en los segmentos correspondientes de la cabeza , mandíbula, cuello y hombro (dermatomas y miotomas), en línea con las observaciones del dolor referido visceral cardíaco.

FRÉNICO-CERVICALES Y DOLOR CARDIACO:

J Neurophysiol. 2002 Mar;87(3):1290-302.

Spinal inhibitory effects of cardiopulmonary afferent inputs in monkeys: neuronal processing in high cervical segments.

Chandler MJ[1], Zhang J, Qin C, Foreman RD.

Author information

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Abstract

Noxious stimulation of spinal afferents inhibits primate spinothalamic tract (STT) neurons in segments distant from the region of afferent entry. Inhibitory effects of cardiopulmonary sympathetic afferent (CPSA) stimulation remain after C(1) transection but disappear with spinal transection between C(3) and C(7). We hypothesized that spinal inhibitory effects produced by CPSA stimulation are processed by neurons in C(1)-C(3) segments. One purpose of this study in anesthetized monkeys was to determine whether chemical activation of high cervical neurons reduced sacral STT cell responses to colorectal distension (CRD) and urinary bladder distension (UBD). First, effects and interactions of pelvic and cardiopulmonary visceral afferent inputs were determined in 10 monkeys on extracellular activity of sacral STT neurons recorded in deep dorsal horn. CRD and UBD increased activity in 95 and 91% of sacral STT neurons, respectively. CPSA and cardiopulmonary vagal stimulation decreased activity in 84 and 56% of STT neurons, respectively. CPSA stimulation decreased CRD-evoked activity in six of eight sacral STT neurons and decreased UBD-evoked activity in five of eight STT neurons tested. Excitatory amino acid application at C2 segment decreased CRD-evoked responses in 7 of 10 sacral STT neurons and decreased UBD-evoked responses in 9 of 12 STT neurons. The second purpose of this study was to examine responses of C(1)-C(3) descending propriospinal neurons to stimulation of cardiopulmonary afferent fibers. If C(1)-C(3) neurons process CPSA input to suppress STT transmission, then CPSA stimulation should excite C(1)-C(3) neurons with descending projections. Effects of thoracic vagus nerve stimulation also were examined. Vagal stimulation inhibits STT neurons in segments below C(3) but excites C(1)-C(3) STT neurons; we theorized that vagal inhibition of sensory transmission might relay in high cervical segments and, therefore, excite C(1)-C(3) descending propriospinal neurons. Extracellular discharge rate was recorded for C(1)-C(3) neurons antidromically activated from thoracic or lumbar spinal cord in 24 monkeys. CPSA stimulation increased activity of 16 of 45 neurons and inhibited one cell. Thoracic vagus stimulation increased activity of 20 of 43 neurons and inhibited one cell; stimulation of abdominal vagus fibers did not affect activity of six of six cells that were excited by thoracic vagal input. Mechanical stimulation of somatic fields excited 30 of 41 neurons tested. All neurons activated by visceral input received convergent somatic input from noxious pinch of somatic receptive fields that generally included the neck and upper body; 11 C(1)-C(3) propriospinal neurons did not respond to any afferent input examined. Results of these studies were consistent with the idea that modulation of spinal nociceptive transmission might involve neuronal connections in high cervical segments.

EL FRÉNICO JUEGA UN PAPEL IMP EN EL DOLOR CARDÍACO

Debe ser considerado que algunos aferentes del frénico inervan el pericardio, son independientes de los aferentes vagales y se proyectan a los segmentos cervicales de c3-c5.
Estos segmentos cervicales de c3-c5 contienen neuronas con aferencias sinápticas convergentes de aferentes vagales, viscerales espinales y somáticas que se proyectan a segmentos vertebrales más caudales torácicos, lumbares y sacros. Estas neuronas están implicadas en el control inhibitorio de la transmision nerviosa nociceptiva.

SI QUIERO TRATAR EL CORZAON TENGO QUE TRATAR TODO!!!!!!!! CONCEPTO HOLÍSTICO

RUTAS PARASIMPÁTICAS CARDIACAS:

- Una vía está implicada en la regulación de la frecuencia de los latidos cardíacos, actuando sobre las células marcapasos del nodo sinoauricular y en el nodo atrioventricular, y en la regulación de la fuerza de contracción de la aurícula.
- Los axones de la mayoría de las neuronas preganglionares de esta vía son mielinizados
- Los cuerpos celulares de las neuronas preganglionares están situados en la formación externa del núcleo ambiguo y los cuerpos celulares de las neuronas postganglionares

- están en los ganglios cardíacos parasimpáticos asociados con la aurícula derecha. Algunas neuronas de esta vía cardiomotora muestran actividad espontánea.
- Las neuronas son excitadas por la estimulación de los baroreceptores arteriales y exhiben ritmos cardíacos en su actividad.
- La actividad en la mayoría de las neuronas cardiomotoras de esta vía tiene ritmicidad respiratoria.

UNA BUENA RESPIRACIÓN ES IMP EN LA COHERENCIA CARDÍACA (NEX)

ARRITMIA SINUSAL RESPIRATORIA:

Existe un acoplamiento del latido cardiaco a la red respiratoria central que es la base de la arritmia sinusal respiratoria del latido del corazón.
La estimulación de quimiorreceptores arteriales, receptores nasofaríngeos u otros receptores excita estas neuronas cardiomotoras, llevando a la bradicardia.
La estimulación química de los cuerpos celulares de las neuronas cardiomotoras en el núcleo ambiguo conduce a la disminución de la frecuencia cardíaca.

CORAZÓN: IMPORTANCIA DEL TRABAJO DE DIAFRAGMA, RESPIRACIÓN DIAFRAGMÁTICA Y TRABAJO MEDIASTINO-PULMÓN-CILINDROS-METÁMERAS

J Comp Neurol. 2000 Sep 4;424(4):588-606.

Nucleus ambiguus projections to cardiac ganglia of rat atria: an anterograde tracing study.

Cheng Z[1], Powley TL.

Author information

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Abstract

We injected the anterograde fluorescent tracer 1,1;-dioleyl-3,3,3;, 3;-tetramethylindocarbocyanine methanesulfonate (DiI) into the nucleus ambiguus (NA) and used confocal microscopy to inventory NA fibers and axon terminals in whole-mounts of rat atrial tissues. Both the axons projecting to cardiac ganglia and the innervated principal neurons (PNs) were counted. Rats were injected unilaterally in the NA with DiI, either at four sites (between 600 microm rostral and 600 microm caudal to the obex) or at nine sites (1,600 microm rostral to 1,600 microm caudal). Fluoro-Gold was administered intraperitoneally to retrogradely label neurons of the dorsal motor nucleus of the vagus (DmnX), NA, and cardiac ganglia. To verify that the DiI-labeled fibers examined in the atria originated exclusively from the NA, neurons of the DmnX and the nodose ganglia were surveyed for DiI labeling. Our observations established that (1) NA fibers in the cardiac branches of the vagus numbered in the range of 82-151, left; or 60-122, right. (2) Both left and right NA supplied substantial numbers of fibers to each of the three major cardiac ganglionic plexuses. (3) NA axons terminated in dense basket, or calyx, endings around individual PNs. (4) By issuing divergent collaterals, individual NA fibers supplied numerous PNs with these calyx endings. (5) Labeled axons innervated 2,248 (left vagus) and 1,784 (right), or at least 56% and 45%, of the cardiac PNs. (6) Divergence (i.e., NA axons:PNs innervated) averaged between 1:27 (left vagus) and 1:30 (right vagus). Several features of these NA projections to cardiac ganglia contrasted sharply with those of DmnX projections that we have recently characterized with the same tracing protocol: (1) NA fibers did not innervate small intensely fluorescent cell clusters in cardiac ganglia, whereas DmnX axons did. (2) NA efferent fascicles contained more large fibers (presumably B-type), whereas the DmnX issued more fine caliber fibers (presumably C-type). (3) NA fibers diverged about three times as extensively as did DmnX axons. Taken together, our data strongly suggest that vagal control of the heart involves the convergence and integration of distinct NA and DmnX projections within the cardiac plexuses.

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CORAZÓN: IMPORTANCIA DEL TRABAJO DE DIAFRAGMA, RESPIRACIÓN DIAFRAGMÁTICA Y TRABAJO MEDIASTINO-PULMÓN-CILINDROS-METÁMERAS

De hecho la excitación de una única neurona cardiomotora preganglionica parasimpática ya disminuye la frecuencia cardíaca, mostrando lo poderoso que esta vía parasimpática es para generar bradicardia cardíaca.

J Physiol. 1978 Sep; 282: 353–364.
doi: 10.1113/jphysiol.1978.sp012468

PMCID: PMC1282744
PMID: 722537

Two types of vagal preganglionic motoneurones projecting to the heart and lungs

R. M. McAllen and K. M. Spyer

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This article has been cited by other articles in PMC.

Abstract

1. A study has been made of eighty-four cells in the cat's nucleus ambiguus whose axons projected to the cardiac (seventy-four) and pulmonary (ten) branches of the right vagus. Their axonal conduction velocities were all in the range of B fibres (2·8-15·5 m/sec).

2. Pulmonary branch projecting neurones were usually spontaneously active (nine out of ten) and fired in phase with inspiration. Their activity showed no pulse modulation.

3. Ten cardiac branch projecting neurones had properties indistinguishable from those of pulmonary branch projecting neurones. Inspiratory-firing cells projecting to either branch are believed to be bronchoconstrictor in function.

4. The remaining sixty-four cells that projected to the cardiac branch had properties expected of cardioinhibitory neurones. Most (fifty-four) were silent until activated by ionophoresis of excitant amino acids. All showed an expiratory discharge when active, and of twenty-seven tested twenty-three showed a cardiac modulation of their discharge. When the aortic baroreceptors were denervated, the cardiac rhythm was always abolished reversibly by carotid occlusion.

5. Ionophoretic activation of expiratory firing (presumed cardioinhibitory) cells slowed the heart (fifteen out of eighteen neurones tested). Excited inspiratory-firing cells never had this effect (eleven tested).

Research

Open Access

Osteopathic manipulative treatment and its relationship to autonomic nervous system activity as demonstrated by heart rate variability: a repeated measures study

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EL TTO OSTEOPÁTICO MEJORA LA VARIABILIDAD CARDÍACA

Abstract

Background: The relationship between osteopathic manipulative treatment (OMT) and the autonomic nervous system has long been acknowledged, but is poorly understood. In an effort to define this relationship, cervical myofascial release was used as the OMT technique with heart rate variability (HRV) as a surrogate for autonomic activity. This study quantifies that relationship and demonstrates a cause and effect.

Methods: Seventeen healthy subjects, nine males and eight females aged 19–50 years from the faculty, staff, and students at Oklahoma State University Center for Health Sciences College of Osteopathic Medicine, acted as their own controls and received interventions, administered in separate sessions at least 24 hours apart, of cervical myofascial OMT, touch-only sham OMT, and no-touch control while at a 50-degree head-up tilt. Each group was dichotomized into extremes of autonomic activity using a tilt table. Comparisons were made between measurements taken at tilt and those taken at pre- and post-intervention in the horizontal.

The variance of the spectral components of HRV, expressed as frequencies, measured the response to change in position of the subjects. Normalized low frequency (LF) and high frequency (HF) values, including LF/HF ratio, were calculated and used to determine the effect of position change on HRV.

Results: Predominantly parasympathetic responses were observed with subjects in the horizontal position, while a 50-degree tilt provided a significantly different measure of maximum sympathetic tone ($p < 0.001$). Heart rate changed in all subjects with change in position; respirations remained constant. When OMT was performed in a sympathetic environment (tilt), a vagal response was produced that was strong enough to overcome the sympathetic tone. There was no HRV difference between sham and control in either the horizontal or tilt positions.

Conclusion: The vagal response produced by the myofascial release procedure in the maximally stimulated sympathetic environment could only have come from the application of the OMT. This demonstrates the association between OMT and the autonomic nervous system. The lack of significance between control and sham in all positions indicates that HRV may be a useful method of developing sham controls in future studies of OMT.

Trial registration: clinicaltrials.gov NCT00516984.

Breath of Life: The Respiratory Vagal Stimulation Model of Contemplative Activity

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Contemplative practices, such as meditation and yoga, are increasingly popular among the general public and as topics of research. Beneficial effects associated with these practices have been found on physical health, mental health and cognitive performance. However, studies and theories that clarify the underlying mechanisms are lacking or scarce. This theoretical review aims to address and compensate this scarcity. We will show that various contemplative activities have in common that breathing is regulated or attentively guided. This respiratory discipline in turn could parsimoniously explain the physical and mental benefits of contemplative activities through changes in autonomic balance. We propose a neurophysiological model that explains how these specific respiration styles could operate, by phasically and tonically stimulating the vagal nerve: respiratory vagal nerve stimulation (rVNS). The vagal nerve, as a proponent of the parasympathetic nervous system (PNS), is the prime candidate in explaining the effects of contemplative practices on health, mental health and cognition. We will discuss implications and limitations of our model.

Keywords: meditation, mind-body exercises, mindfulness, respiration, vagus nerve, heart rate variability, cognition, stress

How Breath-Control Can Change Your Life: A Systematic Review on Psycho-Physiological Correlates of Slow Breathing

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Background: The psycho-physiological changes in brain-body interaction observed in most of meditative and relaxing practices rely on voluntary slowing down of breath frequency. However, the identification of mechanisms linking breath control to its psychophysiological effects is still under debate. This systematic review is aimed at unveiling psychophysiological mechanisms underlying slow breathing techniques (<10 breaths/minute) and their effects on healthy subjects.

Methods: A systematic search of MEDLINE and SCOPUS databases, using keywords related to both breathing techniques and to their psychophysiological outcomes, focusing on cardio-respiratory and central nervous system, has been conducted. From a pool of 2,461 abstracts only 15 articles met eligibility criteria and were included in the review. The present systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Results: The main effects of slow breathing techniques cover autonomic and central nervous systems activities as well as the psychological status. Slow breathing techniques promote autonomic changes increasing Heart Rate Variability and Respiratory Sinus Arrhythmia paralleled by Central Nervous System (CNS) activity modifications. EEG studies show an increase in alpha and a decrease in theta power. Anatomically, the only available fMRI study highlights increased activity in cortical (e.g., prefrontal, motor, and parietal cortices) and subcortical (e.g., pons, thalamus, sub-parabrachial nucleus, periaqueductal gray, and hypothalamus) structures. Psychological/behavioral outputs related to the abovementioned changes are increased comfort, relaxation, pleasantness, vigor and alertness, and reduced symptoms of arousal, anxiety, depression, anger, and confusion.

Conclusions: Slow breathing techniques act enhancing autonomic, cerebral and psychological flexibility in a scenario of mutual interactions: we found evidence of links between parasympathetic activity (increased HRV and LF power), CNS activities (increased EEG alpha power and decreased EEG theta power) related to emotional

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Psychophysiological Effects of Slow Breathing control and psychological well-being in healthy subjects. Our hypothesis considers two different mechanisms for explaining psychophysiological changes induced by voluntary control of slow breathing: one is related to a voluntary regulation of internal bodily states (enteroception), the other is associated to the role of mechanoceptors within the nasal vault in translating slow breathing in a modulation of olfactory bulb activity, which in turn tunes the activity of the entire cortical mantle.

Keywords: slow breathing, breath-control, pranayama, paced breathing, EEG, fMRI, HRV, psychophysiology

Journal of *Clinical Medicine*

MDPI

Article

Influence of a 30-Day Slow-Paced Breathing Intervention Compared to Social Media Use on Subjective Sleep Quality and Cardiac Vagal Activity

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Abstract: Breathing techniques are part of traditional relaxation methods; however, their influence on psychophysiological variables related to sleep is still unclear. Consequently, the aim of this paper was to investigate the influence of a 30-day slow-paced breathing intervention compared to social media use on subjective sleep quality and cardiac vagal activity (CVA, operationalized via high-frequency heart rate variability). Healthy participants (n = 64, 33 male, 31 female, M = 22.11, SD = 3.12) were randomly allocated to an experimental or control group. In the experimental group, they had to perform slow-paced breathing for 15 min each evening across a 30-day period. This was administered through a smartphone application. The control group used social media (e.g., Facebook, Instagram, Whatsapp) for the same duration. The night before and after the intervention, their CVA was assessed via a light portable Electrocardiogram (ECG) device, and they had to fill out the Pittsburgh Sleep Quality Index questionnaire. Results showed that in comparison to the use of social media, the slow-paced breathing technique improved subjective sleep quality and increased overnight CVA, while a tendency was observed for morning awakening CVA. Slow-paced breathing appears a promising cost-effective technique to improve subjective sleep quality and cardiovascular

Physiology of long pranayamic breathing: Neural respiratory elements may provide a mechanism that explains how slow deep breathing shifts the autonomic nervous system

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Summary Pranayamic breathing, defined as a manipulation of breath movement, has been shown to contribute to a physiologic response characterized by the presence of decreased oxygen consumption, decreased heart rate, and decreased blood pressure, as well as increased theta wave amplitude in EEG recordings, increased parasympathetic activity accompanied by the experience of alertness and reinvigoration. The mechanism of how pranayamic breathing interacts with the nervous system affecting metabolism and autonomic functions remains to be clearly understood. It is our hypothesis that voluntary slow deep breathing functionally resets the autonomic nervous system through stretch-induced inhibitory signals and hyperpolarization currents propagated through both neural and non-neural tissue which synchronizes neural elements in the heart, lungs, limbic system and cortex. During inspiration, stretching of lung tissue produces inhibitory signals by action of slowly adapting stretch receptors (SARs) and hyperpolarization current by action of fibroblasts. Both inhibitory impulses and hyperpolarization current are known to synchronize neural elements leading to the modulation of the nervous system and decreased metabolic activity indicative of the parasympathetic state. In this paper we propose pranayama's physiologic mechanism through a cellular and systems level perspective, involving both neural and non-neural elements. This theoretical description describes a common physiological mechanism underlying pranayama and elucidate the role of the respiratory and cardiovascular system on modulating the autonomic nervous system. Along with facilitating the design of clinical breathing techniques for the treatment of autonomic nervous system and other disorders, this model will also validate pranayama as a topic requiring more research.
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The Impact of Cervical Manipulation on Heart Rate Variability

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INTERRELACIONES DE LOS SISTEMAS NIE

Abstract – Heart Rate variability (HRV) is the inter-beat variability in heart rate and is moderated by the balance of sympathetic and parasympathetic divisions of the autonomic nervous system. Electrocardiography (ECG) can be utilized to obtain Low frequency (LF) to high frequency (HF) ratios that represent sympathetic to parasympathetic response, respectively and these ratios may be increased in people with chronic pain. Spinal manipulation is often used to manage musculoskeletal disorders such as neck pain. This study assesses the influence of cervical manipulation on HRV using LF/HF ratio. Ten subjects without neck pain formed the control condition and passive head movement (PHM) condition during which their head was flexed, extended and rotated. Ten subjects with subclinical neck pain underwent the same conditions. A separate session was performed for an actual manipulation. LabChart™ software was utilized to collect and analyze five minute pre and post R-R intervals. Repeated measures of ANOVA demonstrated significant interaction effect on HRV (F (1, 18) = 6.841, p = 0.018) following manipulation vs. PHM. Subsequent analysis showed a significant decrease in the ratio during manipulation condition (p = 0.0316), that was not seen in any other conditions, suggesting a significant autonomic nervous system alteration. This study may lead to new techniques to assess the effectiveness of various treatment interventions.

POSIBLE CONSECUENCIA DE UN FENÓMENO DE REGULACIÓN A LA BAJA DE RECEPTORES

Sympathetic nerve activity in stress-induced cardiomyopathy

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Abstract
Purpose To evaluate directly recorded efferent sympathetic nerve traffic in patients with stress-induced cardiomyopathy (SIC).
Background SIC is a syndrome affecting mostly postmenopausal women following severe emotional stress. Though the precise pathophysiology is not well understood, a catecholamine overstimulation of the myocardium is thought to underlie the pathogenesis.
Methods Direct recordings of multiunit efferent postganglionic muscle sympathetic nerve activity (MSNA) were obtained from 12 female patients, 5 in the acute (24–48 h) and 7 in the recovery phase (1–6 months), with apical ballooning pattern and 12 healthy matched controls. MSNA was expressed as burst frequency (BF), burst incidence (BI) and relative median burst amplitude (RMBA %). One of the twelve patients in this study was on beta blockade treatment due to a different illness, at time of onset of SIC. All patients were investigated with ongoing medication.
Results MSNA was lower in patients with SIC as compared to matched controls, but did not differ between the acute and recovery phase of SIC. RMBA %, blood pressure and heart rate did not differ between the groups.
Conclusion MSNA is shown to be lower in patients with SIC compared to healthy controls, suggesting that sympathetic neuronal outflow is rapidly reduced following the initial phase of SIC. A distension of the ventricular myocardium, due to excessive catecholamine release over the heart in the acute phase, may increase the firing rate of unmyelinated cardiac c-fibre afferents resulting in widespread sympathetic inhibition. Such a mechanism may underlie the lower MSNA reported in our patients.

Keywords Sympathetic nervous system · Cardiomyopathy · Stress · Women

¿Qué fenómeno puede explicar el artículo?

Lo que hacemos con nuestro cuerpo, lo que pensamos, cómo comemos, hace que nuestras células regulen el número de receptors al alza o a la baja .

Tenemos dos mecanismos de regulación:

1.-Regulación a la baja: se produce en caso de estimulación excesiva , lo que provoca la reducción del número de receptores .

2.-Regulación al alza : cuando existe una concentración plasmática baja de neurotransmisores, el tejido diana puede incrementar el número de receptores y aumentar el efecto .

