

HEART RATE VARIABILITY, BRAIN, AND SPIRITUALITY

Ana Carolina Previtali Nascimento¹

RESUMO

Trabalho científico que apresenta as interferências do coração no cérebro, a partir de revisão de estudos sobre a variabilidade da frequência cardíaca, conforme pesquisas do HeartMath Institute dos Estados Unidos da América², correlacionando seus reflexos com a dimensão espiritual individual. Apresenta as interferências dos ritmos dos batimentos cardíacos no funcionamento cerebral, com reflexos físicos, mentais e emocionais, discutindo de que maneira a ingerência consciente dos indivíduos quanto ao ritmo de seus corações pode trazer o aprofundamento de suas experiências espirituais. Aborda o reconhecimento científico da importância da espiritualidade na vida moderna, suas relações com os aspectos emocional, mental e físico, relacionando-as com os ritmos cardíacos. A espiritualidade será tratada no que tange à relação do indivíduo com si mesmo, sua conexão com os demais e com o que entender haver além e acima de si, assim como busca de sentido e propósito da vida, independentemente de suas crenças religiosas e do comparecimento a templos ou cultos.

ABSTRACT

Scientific work that presents the interference of the heart in the brain, based on a review of studies on heart rate variability, according to researches conducted by the HeartMath Institute of the United States of America, correlating their reflexes with the individual spiritual dimension. It presents the interferences of the heartbeat rhythms in brain functioning, with physical, mental, and emotional reflexes, discussing in which ways the conscious meddling of individuals, concerning the rhythm of their hearts, can bring the deepening of their spiritual experiences. It addresses the scientific recognition of the importance of spirituality in modern life, its relationships with the emotional, mental, and physical aspects, relating them to heart rhythms. Spirituality will be discussed concerning the individual's relationship with themselves, their connections with others and with what they understand to be beyond and above themselves, as well as the search for meaning and purpose in life, regardless of their religious beliefs and attendance to temples or services.

¹ Bachelor's degree in Law from the University of São Paulo; graduate degree in Neurosciences from the Pontifical Catholic University of Rio Grande do Sul, member of the Federal Prosecution Office since 2003; Certified Trainer of the HeartMath Institute, which is based in the United States

² <https://www.heartmath.org/>

INTRODUCTION

The advancement of Neurosciences has brought progress in the scientific area of extreme relevance to society, with the cure of diseases and technological advances. At the same time, there is a greater interest among the common public about the subject, given the difficulties in dealing with the challenges of modern life and related physical and psychological diseases, according to published statistical data³. In fact, the relations between stress and management of thoughts and emotions, and their implications over brain areas, have been increasingly studied by neuroscientists, also seeking to use language accessible to the common public for application in everyday life.

Interest in the brain functioning is increasingly frequent, even among people who are not from the scientific field, concerned with aspects of longevity, mental and physical health. However, the aspects of heart's interference in brain functioning and how we can, based on the heartbeat, consciously interfere with physical, mental, emotional, as well as spiritual states, are not still widely discussed in Brazil.

It was from 1991 onwards that the HeartMath Institute in the USA began to dedicate itself to studying the interference of the heart in the brain, evaluating the influences of heart rhythms on people's physical, mental, and emotional health.⁴. In laboratory tests, the reflexes of the heartbeat in different areas of the brain were and still are monitored, analyzing their hormonal consequences, interference with blood pressure, the immune system, and other physical and emotional aspects.

At the same time, there is a growing scientific interest in spiritual aspects, notably in the face of studies that demonstrate the importance of spiritual practices (linked or not to religions) in the treatment of various diseases, especially those arising from the stress of modern life, enabling individuals to live in more balanced emotional and social states, as well as giving them confidence and courage to move forward, despite the difficulties faced.

This study seeks to discuss the relations between heart rhythms, their interference in the brain, and spiritual practices, with the aim of addressing the extent to which we can, voluntarily and independently of religious ties or attendance at rituals or temples,

³ The World Health Organization announced in June 2022 that almost 1 billion people lived with a mental disorder in 2019, 14% of whom were adolescents. Available at: <https://bvsmms.saude.gov.br/oms-divulga-informe-mundial-de-saude-mental-transformar-a-saude-mental-para-todos/>. Furthermore, a survey released by the National Association of Occupational Health identified that more than 260 million people suffer from anxiety; in Brazil, 9.3% of the population is anxious, 86% of Brazilians suffer from some mental disorder such as anxiety or depression, with 37% of Brazilians experiencing extremely severe stress, while 59% are in an extremely severe state of depression. Extremely severe anxiety reaches levels of 63%. Available at: <https://www.anamt.org.br/portal/2019/08/01/pesquisa-mostra-que-86-dos-brasileiros-tem-algum-transtorno-mental/#:~:text=Al%C3%AAs%2C%20o%20Brasil%20C%C3%A9%20o.mental%2C%20como%20ansiedade%20e%20depress%C3%A3o>.

⁴ HeartMath Institute, a non-profit organization, was created in 1991 by Doc Childre, aiming to provide tools that connect us with the "heart of who we truly are". Today, HeartMath serves people of all ages and lifestyles around the world in their homes, classrooms, and communities, so that they can live healthier, happier, and more fulfilling lives. Available at: <https://www.heartmath.org/about-us/hmi-mission/>

manage, from the heart, mental, physical and emotional aspects, deepening spiritual practices and experiences.

HEART, HEART RATE VARIABILITY, AND BRAIN

Long-standing religious and philosophical texts recognize the importance of the heart not only as the organ responsible for physical existence, but also for the search for the meaning of life and guidance on the best paths. There are several citations in the Catholic Bible regarding the importance of the heart as a center of wisdom and feelings, recognizing its importance in spiritual life⁵, as well as in the integral conduct of human existence⁶, management of feelings, and good health⁷. In “The Book of Spirits”, by Allan Kardek, the heart is also mentioned as the seat of feelings⁸, as in several other religions⁹, recognizing the importance of the organ for spiritual evolution, enabling direction and contact of the individual with “God”, the “Sacred” or whatever they understand to be above and beyond themselves¹⁰. On the other hand, the heart is seen by ancestral cultures as the center of consciousness, spirituality, energy, care, compassion, and love, inspiring ancient practices in different cultures, aiming at healing and spiritual elevation (EDWARDS, Steve, 2017).

Modern citations about the heart in poems, novels, and films, always as the center of feelings, inspiration, and guidance, confirm the ancestral intuitive wisdom regarding the importance of the organ in such aspects. However, the current dissemination of scientific knowledge about the importance of the heart, at least in our country, has been restricted to its notorious vital importance, given the pumping and circulation of blood, as well as, with regard to the mirroring of emotions, the fact that heartbeats tend to accelerate in situations of physical exertion, fear, or anger, at the same time that they tend to slow down when the individual is resting or relaxing.

The HeartMath Institute has made important advances in the study of the heart’s interference in the brain, proving that the connections between the two organs are much broader and deeper than the average speed of the heartbeat, as well as that the heart is

⁵ “But the Lord said to him: Do not look on his appearance or on the height of his stature, because I have rejected him. For the Lord sees not as man sees: man looks on the outward appearance, but the Lord looks on the heart” (Samuel 16:7). “Create in me a pure heart, oh God, and renew a steadfast spirit within me” (Psalm 51:10).

⁶ “Above all else, guard your heart, for everything you do flows from it.” (Proverbs 4:23).

⁷ “A heart at peace gives life to the body, but envy rots the bones” (Proverbs 14:30).

⁸ “Man of Heart, Chapter 20, question 938 commented: “The man with a heart blessed by the purest feelings has already received his reward. Even if he is involved in the ingratitude of the antagonists, his faith isolates him from this corrosive magnetism of darkness, and the light that arises from his heart, through the exercise of love, makes him happy, in the happiness of Jesus”. O Livro dos Espíritos, comentado pelo Espírito Miramez. Homem de Coração, Capítulo 20, questão 938 comentada.

⁹ “There is a sanctuary in every heart on Earth, so you must open its doors. However, they fill this divine temple with debris, raising walls of incomprehension between what they are, trapped in illusions, and what they must be to “see” the kingdom of God. Under these circumstances, they look for him in vain.” (PEIXOTO, 2020, p 102).

¹⁰ “Blessed are the pure in heart, for they will see God.” (Matthew 5.8).

more than a vital organ responsible for pumping blood, and its rhythms - and not just the average speed of the beats - directly influence cognitive functioning, emotional and physical states¹¹.

The influences and communications between brain and heart are complex, continuous, and two-way, occurring neurologically (through the transmission of nerve impulses), biochemically (through hormones and neurotransmitters, including hormones produced directly by the heart¹²), biophysically (through blood pressure), and energetically (through the interactions of the heart's magnetic field, formed with cardiac pulses)¹³.

The frequency of the heartbeat reflects the continuous and two-way interaction between the brain and the heart, being controlled by the autonomic nervous system (ANS), which also regulates several other internal bodily functions, always related to each other, such as digestion, breathing, and the functioning of glands of the hormonal system.

Branch of the ANS, the sympathetic nervous system is mainly responsible for physiological reactions in situations of danger or defense, with the acceleration of heartbeat, increased blood pressure, and triggering of hormones necessary for defenses and reactions, while the parasympathetic branch must rebalance the body into states of rest, regeneration, and digestion, with a decrease in heartbeat and other related physiological reactions. Communications between the heart and the brain through the sympathetic and parasympathetic branches occur both through efferent (descending) signals, coming from the brain to the heart, and through afferent (ascending) signals, directed from the heart to the brain, being reflected in heart rate variability (HRV) patterns, which mirror heart rhythms.

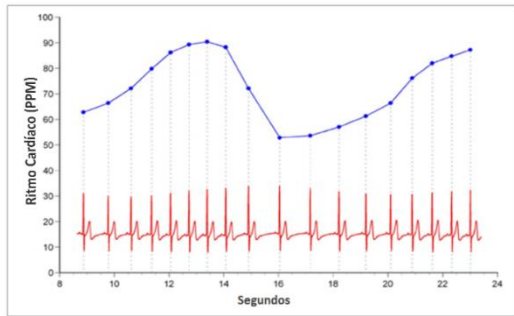
The constant accelerations and decelerations of the heartbeat are readily noticeable when heart rate variability (HRV) is examined beat-to-beat, but overlooked when analyzes consider average values over time. Records of heartbeat accelerations and decelerations represent the heart's rhythms, bringing the concept of "heart rate variability" (HRV): "a measure of the changes, beat-to-beat, that normally occur in the heart rate"¹⁴. HRV is, therefore, considered a measure of function that reflects heart-brain interactions, given the flow of neural signals through efferent and afferent pathways, thus reflecting the dynamics of the autonomic nervous system, as can be seen below.

¹¹ Aspects that have been studied in detail by the recent branch of Neurocardiology, which investigates the interaction between brain and heart with a view to developing new treatment possibilities for diseases arising from stress. (JUNQUEIRA; PINA, 2017).

¹² MCCRATY, 2015, p. 7

¹³ MCCRATY, 2015, p. 3

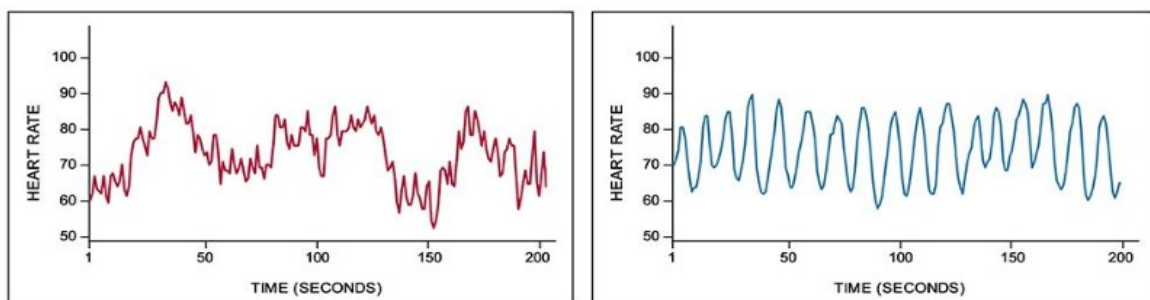
¹⁴ MCCRATY, 2015, p.13



The figure to the side indicates an electrocardiogram exam, with heart pulses. Heart accelerations and decelerations are reflected by the blue line, which indicates heart rate variability, showing the pattern of monitored heart rhythms.¹⁵

Heart rate variability represents a huge impact on communication between brain and heart, given the signals sent to the brain by cardiovascular afferent signals, encoded by the rhythmic pattern of the heart, over time. Studies demonstrate that cardiovascular signals transmitted by afferent nerves first reach the nucleus of the sympathetic tract, heading to the parabrachial complex, periaqueductal gray region, thalamus, hypothalamus, and amygdala. From these areas, signals are sent to the cerebral cortex. There is also evidence to suggest the existence of afferent pathways from the medulla directly to the prefrontal cortex.¹⁶ Therefore, afferent signals coming from the heart are received by brain areas directly related to the processing of emotions, as well as cognitive ones.

Based on this knowledge, researches were conducted on the consequences of heart rate patterns, and analyzes of acceleration and deceleration curves indicated that heart rate variability patterns can result in chaotic and disordered curves, or, on the contrary, harmonious and sinuous curves, in the latter case with accelerations and decelerations that reflect the synchronicity between the sympathetic and parasympathetic nervous systems. Such patterns of variability are proven to be associated with emotional states, making them an important physiological indicator of emotional experience, as shown in the following tables:¹⁷



The first graph above, with the red outline, reflects disorganized heart rhythm in accelerations and decelerations, typically identified in people who are feeling anger,

¹⁵ Figure taken from MCCRATY, 2015, p. 13

¹⁶ MCCRATY, *et al*, 2009, p. 45

¹⁷ Figure taken from MCCRATY, *et al*, 2009, p.22.

fear, impatience, or frustration (as well as other so-called “negative” feelings). The second graph, with a blue outline, reflects synchronized cardiac accelerations and decelerations, with a rhythmic pattern typically associated with feelings such as love, care, gratitude, and joy (and other so-called “positive” ones). Rhythmic patterns are independent of the average speed of the heartbeat, and an individual may be in a situation of physical rest, but with quite disordered rhythms, as in the case of incessant mental activities that cause worry, or with thoughts that generate feelings of sorrow, sadness, or resentment.

Studies on the reflections of cardiac rhythmic patterns in the body, with the analysis of heart rate variability curves, allowed the development of the concept of “cardiac coherence”, which starts from the meaning of the word “coherence”, namely, “integration”, “harmony”, “logical and ordered integration between different parts”¹⁸. Cardiac coherence primarily refers to the harmony between the sympathetic and parasympathetic nervous systems, generating “harmonic” and, therefore, “coherent” acceleration and deceleration curves, as shown in the table above with blue line. From then on, the rhythms in “cardiac coherence” will positively influence the functioning of the body’s other systems, especially blood pressure, breathing, and the endocrine system, thus generating “coherent” - harmonious and integrated - functioning of the entire physical organism, including with regard to cognitive, emotional, and behavioral aspects¹⁹.

Scientific works on heart rate variability have made it possible to identify a physiological state associated with good cognitive functioning, emotional stability, and positive impacts on physical health, called “psychophysiological coherence”, which develops the individual’s ability to adapt to complex environments, with constant changes and demands.²⁰. Therefore, based on scientific investigations already developed, we intend to discuss to what extent heart rate variability is associated with the spiritual dimension of individuals and how this knowledge can be used voluntarily and consciously to deepen spiritual practices.

SPIRITUALITY, HEART, AND BRAIN

The World Health Organization (WHO) defines Health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”.²¹ This definition recognizes the importance of balance and well-being in the broadest sense of the human being, regardless of the specific manifestation of

¹⁸ MCCRATY *et al*, 2009, p. 17

¹⁹ STEPHAN, David. 2018.

²⁰ MCCRATY, JOINA “HeartMath approach to self-regulation and psychosocial well-being”

²¹ Constitution of The World Health Organization. Available at: [couv.arabe.indd\(who.int\)](http://couv.arabe.indd(who.int))

imbalances in the form of diseases. Given strong evidence that spiritual practices bring benefits to the general well-being of individuals, helping them in social contexts and improving diseases related to the modern lifestyle and related to risk factors, such as poor diet, physical inactivity, use of alcohol, cigarettes, stress, anxiety, among others, studies focused on the topic are increasingly frequent, which has allowed the understanding of spirituality as the “fourth dimension of human health”.²²

Diseases arising from modern habits and lifestyle derive from behaviors and attitudes related to respective belief systems and cultural values, associated with high levels of material and mental aspirations. In this context, the adoption of values arising from spiritual practices, connecting the individual with their emotions, their aspirations, and the search for better relationships, can bring profound behavioral, affective, and cognitive transformations, influencing habits and facilitating the management of emotions and thoughts, with improvements in general well-being.

A study that focused on developing criteria for a “spiritual health” scale, defined it as “a state of being where an individual is able to deal with everyday life in a way that leads to the realization of their full potential; meaning and purpose of life; and inner happiness”. The analyzes carried out in this study recognized the importance, for spiritual health, of the cognitive (thoughts), affective (feelings), and behavioral (actions) aspects, always related and interdependent.²³

Professor Jaderson Costa da Costa teaches that, despite being related, religiosity and spirituality are not synonymous, since religiosity involves a system of worship and doctrine shared by a group, with specific characteristics, while “spirituality is related to the “transcendent”, with “definitive questions about the purpose of life” and “human values”, as well as “linked to an emotional response and, often, also involves a cognitive process: a set of beliefs about oneself and the world”²⁴. He adds that spirituality has two dimensions, namely: the vertical dimension, characterized by the relationship between the person and God, the Sacred, and the transcendent, as well as the horizontal dimension, which is the interaction through beliefs, values, lifestyle, relationships with oneself, with others, and with nature²⁵. This division of spirituality into two dimensions, due to its didactic value, will accompany the analyzes of this study.

The vertical dimension of spirituality relates to the perception and connection with what the individual understands to exist above and beyond physical existence. This expansion of personal perceptions (we can say “broadening or expansion of consciousness”) is connected to the “ability to transcend”, transposing perceptions

²² DHAR, CHATURVEDI, NANDAN, 2013

²³ DHAR, CHATURVEDI, NANDAN, 2011

²⁴ Neurociência e Espiritualidade, book of the subject, Graduate Studies in Neuroscience and behavior”

²⁵ “Spirituality is innate to the human being, it is part of the human being, but it must be exercised”, “Religion is a form of expression of spirituality, but it is not the only one” (Neurociência e Espiritualidade, book of the subject, Graduate Studies in Neuroscience and behavior”

beyond individual physical boundaries, making the individual perceiving what is outside and beyond themselves, including connecting to what they understand as God, Sacred, or Divine²⁶. In turn, the ability to expand personal perceptions is directly related to the thoughts and feelings arising from daily experiences and the meaning – and new meaning – of these experiences.

The definition of “spirituality” is quite variable among authors, because as MENDES (2006, p.2) analyzes, “spirituality is an abstract concept that involves many aspects”. It relates to experience that involves perceptions of each person’s relationships with a supreme being or great power (such as God), as well as relations with others and the environment. And, in this context, it involves feelings, meanings, and purposes for earthly existence.

It turns out that feeling, the choices of values that guide individual paths, the understanding of oneself, and social relationships, are aspects of extreme complexity and are sometimes hampered by life’s challenges. They are related to cognitive and emotional processes (thoughts and emotions), which are directly reflected in social behavior (“horizontal dimension” of spirituality). This behavior can be dominated by impulsive actions, governed by intense and challenging emotions, or it can be driven by peaceful and balanced actions, in line with the values and beliefs of each individual, based on their self-knowledge and ability to self-manage.

In modern life, accelerated and disordered thoughts, tied to the materiality and concreteness of daily concerns dominate individuals, imprisoning them in the search for the satisfaction of material desires and feelings related to fear, frustration, impatience, and anger. Living in a constant state of alert, the individual faces difficulties in connecting with themselves and others, to act in a balanced way based on their self-management, to identify the values that govern their path, as well as to experience states of love, gratitude, and peace.

In this context, many people find, when going to temples and religious services, moments that free them from the materiality of life, where they obtain direction and guidance to connect with values brought by specific doctrines or religions, relate in harmony with a social group and connect with what they believe there is beyond physical existence and “Sacred”²⁷. However, outside of such moments and places, this connection is often lost, giving way to daily concerns, returning to a constant state of

²⁶ “The transcendent function leaves the limits of the body, it ceases to be a purely internal function and is exercised in its fullness, in an extracorporeal dimension.” (Neurociência e Espiritualidade, book of the subject, Graduate Studies in Neurosciences and behavior, class of Professor Jaderson Costa da Costa)

²⁷ ELIADE (1957, P. 17) explains the term “hierophany”, namely, “manifestation of the sacred”, which can occur through different manifestations, as follows: “From the most elementary hierophany – for example, the manifestation of the sacred in any object, a stone, or a tree – to the supreme hierophany, which is, for a Christian, the incarnation of God in Jesus Christ, there is no solution of continuity. We find ourselves faced with the same mysterious act: the manifestation of something “of a different order” – of a reality that does not belong to our world – in objects that form an integral part of our “natural, profane” world.

alert and the practice of selfish, angry, and judging acts. Even though individuals long to live in another way, they simply cannot do it, finding themselves trapped by urgency, with the disordered activation of the sympathetic autonomic nervous system, experiencing physical, emotional, and mental health problems that make connection difficult – or even impossible – with their spiritual aspects.

Next, we will evaluate to what extent scientific studies allow the conclusion that the voluntary and conscious connection with the heart, through the management of heart rate variability, can assist these processes and enable the exercise of spirituality in complete freedom, from self-knowledge, self-management, and expansion of perceptions to what is outside, above, and beyond oneself,²⁸ regardless of any system of beliefs, worships, dogmas, or religious doctrines.

LITERATURE REVIEW

The heart is equipped with highly complex structures, made up of ganglia, neurotransmitters, proteins, and nerve cells that enable it to function independently of the brain. Its characteristics make it an important center of intelligence and memory, according to extensive research by PEARSALL (2005), who analyzed hundreds of cases in which heart transplant patients began to remember the donors' lives, well as to have their habits. His studies bring an understanding to the expression “knowing by heart”, common in several other languages, confirming the heart's ability to store memories of individual experiences, to be accessed for direction, wisdom, and choices in life.

Initial scientific researches on the heart and heart rate variability began at the HeartMath Institute in 1991. Initially, the relations between breathing patterns, blood pressure, heart rhythms, hormonal variation, and the immune system were analyzed, as well as their variations depending on emotional states. Physiological effects related to positive emotions such as appreciation, love, and compassion were measured, as well as negative emotions such as frustration or anger, and their relations with heart rhythms and brain patterns, based on data provided by electrocardiograms, electroencephalograms, electromyography, and electrodermal activities (among others). It was observed that the results of the electrocardiograms varied at different time intervals, depending on the emotional state, and such variations were due not to the average number of beats per minute, but to the variation in heart rhythms. It was possible to conclude that heart rate variability patterns reflected emotional states, and that changes in these emotional states caused immediate changes in heart rate variability, as well as in other physiological aspects (MCCRATY, 2022).

²⁸However, belonging to religious communities is also considered a positive factor, bringing a sense of belonging to the individual (GADIT, 2007)

It has also been demonstrated that positive emotions tend to alter heart rate variability patterns, positively influencing blood pressure, respiratory rhythms, and low frequencies of brain rhythms. From this knowledge, there was the begin of the defense of the thesis that rhythmic patterns of the heart are responsible for synchronizing other body systems, generating harmony and coherence between the psychological, cognitive, and emotional systems, necessary for maintaining health, emotional and mental stability, establishing the term “cardiac coherence” (MCCRATY, 2009). At the same time, the organic consequences generated by the chaotic patterns of acceleration and deceleration of the heart were evaluated, a state called “cardiac incoherence”, typical of people under the effect of chronic stress.

JORINA and MCCRATY (2020) emphasize that, despite the two-way communication between brain and heart, texts on physiology are full of diagrams that illustrate the transmissions of the nervous system from the brain, directed to the other organs. However, many of these illustrations do not show the complete two-way communication circuit, omitting the transmission systems from the afferent fibers, which carry signals from the heart to the brain. However, in some visceral nerves, such as the abdominal vagus nerve, up to 90% of the fibers are afferent, concluding that, due to the important and extensive network of afferent nerves, the heart sends more neural signals to the brain than vice versa, and these signals are received by important brain centers, including the thalamus, hypothalamus, and the limbic system, thus explaining the important effects of the signals sent by the heart, according to heart rhythms, in modulating the cognitive process and emotional experience.

Given this knowledge, the HeartMath Institute began to dedicate itself to developing, improving, and teaching techniques so that people, consciously and voluntarily, can manage their heart rhythms, achieving harmonic and sinuous curves of rate variability. The practices begin with synchronized breathing, with similar inhalation and exhalation times, with direct action on the sympathetic and parasympathetic branches of the ANS. Then there is the voluntary induction of positive feelings such as love, appreciation, compassion, calm, or gratitude. At the same time, researches are carried out in the laboratory, measuring the results obtained with practices in various studies and interventions.

A study carried out with forty-five healthy adults proved that the use of techniques aimed at cardiac coherence, for a month, allows significant increases in the positive affect scales of affection and vigor and significant decreases in the negative affect scales of guilt, hostility, exhaustion, anxiety, and effects linked to stress. There was an average reduction of 23% in cortisol and a 100% increase in DHEA/DHEAS in the experimental group. DHEA was significantly and positively related to the affective state of human warmth, while cortisol was significantly and positively related to the effects of stress. Increased coherence in heart rate variability patterns was identified in

80% of the experimental group during the use of the techniques (MCCRATY *et al.*, 1988).

The practice of cardiac coherence demonstrated benefits in the non-pharmacological treatment of diseases in hypertensive patients, in an intervention with sixty-two patients, concluding that the cultivation of positive emotions, based on the training received by participants, results in harmonious heart rhythms that provide better emotional stability, physiological efficiency, and reduction of high blood pressure (ALABDULGADOR 2012). The improvement of physical and emotional states associated with diseases, such as anxiety, stress reduction, and psychological improvement, as well as increased physical vitality, was also identified in a study with thirty-eight individuals seropositive for the human immunodeficiency virus, most of them diagnosed with AIDS, subjected to an intervention program based on the practice of cardiac coherence, being oriented towards cultivating positive emotional states, minimizing negative emotional states (ROZMAN *et al.*, 1996).

Regarding cognitive aspects, intervention for four weeks in students subjected to a high load of exhaustion (“*school burnout*”), evaluated the effect of applying the techniques, noting the reduction of typical symptoms of stress, including the reduction of blood pressure and significant improvement in cognitive performance (MAY *et al.*, 2018). The benefits were also proven in professions under high levels of demand and stress, according to an intervention in a police department in the United States of America, verifying a reduction and improvement in psychophysiological responses to stress, including a reduction in the risk of cardiovascular diseases. The intervention consisted of training professionals in the ability to prepare for stressful situations, deal better with challenges during their occurrence, as well as recover after them, through practices that reestablish cardiac coherence, with impacts on the physical, cognitive, and emotional systems (RAMEY *et al.*, 2016).

The benefits of voluntary management of heart rate variability were identified in an intervention with cardiac coherence practices for at least five consecutive sessions, bringing significant changes in psychophysiological coherence, negative and positive feeling states, with a decrease in the feeling of sadness and an increase in feeling of peace (EDWARDS, Steve, 2016).

The studies mentioned above, combined with hundreds of others already carried out on heart rate variability²⁹, demonstrate the relations between positive and negative feelings, heart rate variability, and their effects at physical, cognitive, and emotional levels. On the other hand, studies on spiritual practices and their impact on health are equally associated with the transition from negative to positive feelings, helping the individual’s relationships with themselves, their self-knowledge, identification of

²⁹ <https://www.heartmath.org/research/research-library/>

purpose and meaning of life, better social relationships and experiences of perceptions with transcendental aspects (associated with what the individual believes to exist beyond physical existence). Therefore, our hypothesis is that spiritual practices tend to favorably interfere with heart rate variability and bring states of psychophysiological coherence, as they are associated with positive emotions.

In this sense, intervention with cancer patients concluded that spirituality is a strategy for coping with the illness process, enabling the creation of strategies to reduce suffering, with people tending to react in a more positive way, such as feelings of hope, calm, and acceptance. Stimulation in the hospital environment to provide conditions for religious or spiritual expression showed good results, as people were able to engage in experiences rich in meaning (ARAUJO, *et al.*, 2022).

In another study, carried out with oncologists and palliative care physicians accustomed to dealing with the finitude of their patients and high levels of anxiety and pressure, it was identified that spiritual or religious practices are associated with better strategies for coping with difficulties, as well as positive feelings identified as “positive aspects of faith”. Spirituality was understood as a set of convictions related to the meaning and purpose of life, without being limited to specific beliefs or religious practices. It was found that spiritual practices lead people to seek love and protection from God or connection with transcendental forces, comfort in religious literature, praying for the well-being of others, forgiving and being forgiven. They thus tend to “redefine the stressor as beneficial”, which directs them towards positive feelings (PLAUTO *et al.*, 2022).

We can conclude that the aforementioned “redefinition of the stressor as beneficial”, facing life’s challenges as a possibility for evolution and learning, based on the “positive aspects of faith”, is directly related to cardiac coherence practices, which enable individuals to manage their thoughts and emotional actions so that, based on physical, cognitive, and psychological balance, they can give new meaning to their experiences and develop new action strategies. This is an ability directly related to a “personal power” associated with the heart, as developed by CHILDRE (1994).

The associations between heart rate variability and feelings that constitute central values in many religions and spiritual practices, such as love, compassion, peace, and gratitude, are part of the studies indicated above. In the same sense, an intervention that monitored cardiac and brain activities during the induction of states of self-compassion, a feeling described as “treating oneself with kindness and self-concern when experiencing adversity in life, similar to compassion towards others, which involves perceiving suffering, generating the desire to alleviate suffering with understanding³⁰.

³⁰ Compassion is a feeling encouraged in several religious practices. In Buddhism, Venerable Master Hsing Yun says: “knowing yourself is knowing everyone. When we understand the complexity and beauty of human needs, we naturally sympathize with all forms of life, wherever they are.” (p.159)

The results indicate that experiencing states of compassion provides positive effects on both the heart and the brain, contributing to better patterns of heart rate variability, as well as decreased activity in the prefrontal cortex. On the other hand, remembering stressful memories causes greater activation of the prefrontal cortex and disorganization of heart rhythms. (SANTOS *et al.*, 2022).

Heart rate variability is related to aspects of horizontal spirituality, in terms of relationships and expansion of social perceptions, not only from the self-management of thoughts and feelings, which influence personal actions towards others, but also from social influences generated from electromagnetic waves formed by heart rhythms, which will compose information through the electromagnetic field of each individual.

In fact, studies have shown that groups of people in a state of cardiac coherence can change the heart rhythms of people nearby, previously with incoherent patterns, to coherent patterns. In this sense, the intervention identified that groups of three people trained in achieving cardiac coherence cause positive interference in the heart rhythms of a fourth untrained individual, all in the same environment, with an increase in the untrained person's coherence indices, also verifying the trend and synchronization of the participants' heart rhythms (MORRIS, 2010). It is explained, therefore, why people tend to feel good in temples or religious services where there is a collective direction towards feelings of love, peace, compassion, and others, since heart rhythms relate collectively, especially between people at close physical distances from each other.

As demonstrated by MCCRATY in 2004, the heart generates the largest electromagnetic field in the body, with the electric field measured in the electrocardiogram being approximately 60 times greater than the amplitude of the brain waves recorded in electroencephalograms. The magnetic component generated by the heart is around five thousand (5000) times stronger than that produced by the brain and can be measured at least one meter away from each individual's body, which has allowed the identification of patterns of waves generated by the electromagnetic field in different emotional states, verifying individual responses to magnetic field signals produced by other people's hearts, with interference in the degree of cardiac coherence and rhythm synchronization. This is effective energetic communication, called "cardiac electromagnetic communication", which constitutes a human skill with important aspects of empathy and sensitivity between individuals.³¹

The aforementioned cardiac electromagnetic communication, which is reflected in the capacity for empathy and sensitivity to the needs of others, also implies the improvement of intuitive capabilities, with the receipt of information that can be accessed and understood in states of cardiac coherence, highlighting that, according to studies carried out specifically on intuition, the heart is the first organ to receive such

³¹ MCCRATY, 2004. *The Energetic Heart: Bioelectromagnetic Communication Within and Between People*

information, sending, therefore, communications to the brain³². The researches being carried out in this sense are extremely interesting regarding the receipt of information regardless of time and location, relating directly to aspects of transcendence, since the receipt of information exceeds individual bodily physical limits.

Finally, with regard specifically to heart rhythms and transcendent spirituality, i.e., spiritual experiences and perceptions that overcome individual physical and corporeal barriers, allowing connection and a feeling of unity with the collective, intuitive experiences, as well as connection with what the individual believes to exist beyond and above themselves and the earthly existence (vertical spirituality), studies have identified that, in states of cardiac coherence, people reduce internal dialogue and achieve a deep state of peace, harmony, and balance. In a state of high cardiac coherence (as can be measured using *feedback* technologies), the individual's perceptions of what is outside of themselves, the connection with the environment and the forces of nature, are expanded and enriched, allowing them to experience deep states of relaxation and peace that connects them "to a greater whole, perhaps to God, or to a higher aspect of themselves". Such experiences - called "transcendental" - are often cited by people in moments of deep love, joy, kindness, internal and social connection, which are associated with coherent heart rate variability.³³

The importance of managing thoughts, reducing internal dialogue, so that spirituality can be more easily accessed, is clear. As demonstrated by studies that relate positive feelings to spiritual experiences, these are associated with the senses and not the intellect. They involve belief and connection with something greater than corporeal and concrete limits and, therefore, require the individual to connect with their feelings, removing mental control.

In this sense, experiences that transcend individual borders depend on the expansion of our perceptions and, for this purpose, it is necessary to remove the conflicts brought by past judgments and psychological experiences, as FINLAY Brockett explains: "Transcendence can only come to a mind that is free from its own psychological and emotional activities, struggles, and conflicts". And he adds: "Consciousness is pure observation. Pure observation and alert passivity, which means being without the interference of the past through judgments, comparisons, and conclusions"³⁴.

In fact, stillness of the mind is part of very ancient spiritual practices, as well as training for managing heart rate variability, enabling connection with the heart,

³² MCCRATY, 2004. Electrophysiological Evidence Of Intuition, Parts 1 and 2

³³ "Your creativity flows freely. In this state of inner harmony and deep fulfillment, you experience a sense of greater connectedness – to other people, to a larger whole, perhaps to God, or to a higher aspect of yourself", Psychophysiological Correlates of Spiritual Experience, (CHILDRE MCCRATY, 2002)

³⁴ FINLAY Brockett – Transcendence, Enlightenment and The Mystical Mind – Kindle Edition, cit. in 74% and 82%.

providing self-knowledge that guides and directs, as well as more compassionate expression with the others. Therefore, there is a scientifically proven way to be able to experience life with our heart as a “guide”, being able, from it, to self-organize, balance, and progress in all aspects of our being, including the spiritual aspect.

RESULTS AND FINAL CONSIDERATIONS

Whether by religions or ancient cultural traditions, the heart is traditionally considered the seat of the highest feelings, such as gratitude, love, compassion, forgiveness, and tolerance, as well as a physical place of connection with spirituality. Heart-centered breathing practices are traditional for indigenous healing people in Africa, India, China, and many other areas of the planet, associated not only with healing but also with transcendent experiences (EDWARDS, Steve, 2017). In fact, science has proven ancient knowledge: from the heart, we can obtain better direction in life, better relationships with others, and expand our perceptions with what we believe to exist beyond earthly existence.

Regarding the benefits of the spiritual dimension, GADIT (2007) notes: better self-control, self-esteem, and confidence, enabling easier recovery from grief situations, maximization of personal potential, improvement in relationships, and a new meaning and purpose, resulting in “the awakening of hope and peace of mind, enabling people to accept and live with problems that have not yet been resolved”.

This study reviews the relations between heart rate variability and the spiritual dimension of individuals, based on the interference that heart rhythms generate in the brain through afferent pathways. On the other hand, it correlates the benefits brought with voluntary cardiac coherence, allowing the management of thoughts and feelings with the benefits brought by spiritual practices, which, equally, are associated with the encouragement of feelings considered positive and “elevated” by spiritual traditions.

It turns out that, in moments of great disappointment and pressure, especially in modern life, it is sometimes quite difficult to manage anger, frustration, and impatience. The disordered and constant activation of the sympathetic nervous system in such situations can dominate human actions, making them incompatible with feelings encouraged by spiritual practices, such as love, compassion, tolerance, and empathy. In such circumstances, knowing that we can voluntarily interfere with our heart rate variability to manage our emotional states is extremely important.

The techniques developed by the HeartMath Institute are very didactic and allow individuals to learn how to manage their heart rhythms for physical, emotional, and spiritual balance, with gains in their overall health. They also allow the experimentation of transcendent states, with the expansion of perceptions beyond individual physical

borders, providing broad connections with the collective and with “Sacred” and “Divine” aspects, depending on what is understood to be above and beyond earthly existence.

The training covers the practice of focusing attention on the heart, balance of the sympathetic and parasympathetic nervous systems through synchronized breathing, and induction of positive emotions to achieve, maintain, and sustain heart rate variability in coherence. Knowledge is disseminated in extensive scientific bibliography, guided practices, and *biofeedback* technologies, with pulse sensors for measurement, which monitor the quality of the curves formed by heart rhythms^{35, 36}. The practice allows individuals to easily recognize states of frustration, anxiety, worry (among others), and manage their emotional states, becoming less judgmental, experiencing more tolerance, understanding, compassion, among other positive emotions, reacquiring the innate “power of the heart”, so strengthened in spiritual traditions and ancient cultures and unfortunately forgotten by modern society.

These techniques and technologies are accessible, free of charge, as part of the HeartMath Institute’s mission to contribute to humanity’s connection with the heart³⁷, in line with the teachings of BIASE and ROCHA. “If we combine our scientific technology, ancient traditional practices of change in consciousness, such as prayer, meditation, archetypal rituals and dances, visualization, among others, we will be able to accomplish feats”³⁸.

RELEVANCE AND SOCIAL IMPACT

This study intended to bring greater awareness to the importance of heart interference in brain functioning, as well as its physiological and emotional consequences, given that, despite the topic being publicized in the United States of America for three decades, in the Brazilian Academy of Neurosciences nothing, or very little, is said.

³⁵The more sinusoidal and broader the wave pattern formed from heart rate variability, the higher the cardiac coherence measure reflected in biofeedback tools, enabling the conscious and voluntary improvement of rhythmic patterns.

³⁶Ideally, the rhythmic patterns that generate the best results are those that reflect ordered rhythms and sinuous waves at frequencies around 0.1 Hertz, i.e., one cycle every 10 seconds (JOINA, MCCRATY, 2020)

³⁷ For free learning about heart rate variability, visit the website <https://www.heartmath.com/experience/> . To access the free technology, access the Global Coherence app, which features guided meditations and a sensor for monitoring heart rate variability - <https://www.heartmath.org/gci/global-coherence-app/> . The website <https://www.heartmath.org/> presents a wide variety of studies and learning materials, with scientific researches already carried out, being constantly updated.

³⁸ BIASE; ROCHA, 2005. *Ciência Espiritualidade e Cura: Psicologia Transpessoal e Ciências Holísticas*. Capítulo 1 Retornando ao Sagrado por Meio da Ciência, posição 651):

It also intended to review the scientific studies already available to demonstrate that the heart is a “sacred space” that we can all access, regardless of religions and attendance at specific religious services. It is in the heart that we find the connection with our highest feelings, direction for our social relationships, and the possibility of transcending the boundaries of selfish and materialistic perceptions, to connect with others, as well as with what we may believe to exist above and beyond earthly existence, bringing meaning and purpose to life.

In view of the current high incidence of diseases resulting from individuals’ disconnection from their innate ability to self-manage emotionally, mentally, physically, and spiritually, we hope to contribute to the dissemination of an ancestral wisdom, scientifically proven, non-pharmacological, and accessible to all.

BIBLIOGRAPHY

ALABDULGADOR, Abdullah A. Coherence. A Novel Nonpharmacological Modality for Lowering Blood Pressure in Hypertensive Patients. **Global Advances In Health and Medicine**, 2012. Available at: <https://www.heartmath.org/assets/uploads/2015/01/coherence-nonpharmacological-modality-for-lowering-blood-pressure.pdf>. Accessed on: May 4, 2023.

- ANDERSON, Micheline R. *The Spiritual Heart*. Spirituality Mind Body Institute, Teacher College, Columbia University, New York, 2020. Available at <https://www.heartmath.org/assets/uploads/2020/11/spiritual-heart.pdf>. Accessed on: May 4, 2023.
- ARAÚJO, Lucivaldo da Silva. *et al.* Religiosidade, Espiritualidade e a vivência do câncer: um estudo fenomenológico. *Cadernos Brasileiros de Terapia Ocupacional*, 2022. <https://doi.org/10.1590/2526-8910.ctoAO244832031>. Available at: <https://www.scielo.br/j/cadbto/a/FyCHYqdJPz9PKhBNRSkzhMM/?lang=pt>. Accessed on: May 4, 2023.
- BIASE, Franciso Di; ROCHA, Mario Sérgio. **Ciência, Espiritualidade e Cura - Psicologia Transpessoal e Ciências Holísticas**. 1st ed: Qualitymark, 2005
- CHILDRE, Doc Lew. **Do Caos à Coerência**. 1st ed. Lisbon: Cultrix, 1997
- CHILDRE, Doc; MCCRATY, Rollin. Psychophysiological Correlates of Spiritual Experience. Feature Article, Boulder Creek, California, 2002. Available at: <https://www.heartmath.org/assets/uploads/2015/01/spiritual-article.pdf>. Accessed on: May 4, 2023.
- DHAR, Neera, CHATURVEDI S. K., NANDAN Deoki. Spiritual health scale 2011: Defining and Measuring 4th Dimension of Health. *Indian Journal of Community Medicine*, Oct-Dec; 36(4): 275–282, 2011. DOI: 10.4103/0970-0218.91329 Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3263147/>. Accessed on: May 4, 2023.
- DHAR, Neera, CHATURVEDI S. K., NANDAN Deoki. Spiritual health, the fourth dimension: a public health perspective. *South-East Asia Journal of Public Health*, January-March, 2013. DOI: 10.4103/2224-3151.115826. Available at:

https://apps.who.int/iris/bitstream/handle/10665/329763/seajphv2n1_p3.pdf?sequence=1&isAllowed=y. Accessed on: May 4, 2023.

- EDWARDS, Stephen David. A Wisdom Way of Being to Transform The Heart Of Humanity. IFAC – Papers Online, Volu 51, issue 30, p. 739-743, 2018. DOI: [10.1016/j.ifacol.2018.11.204](https://doi.org/10.1016/j.ifacol.2018.11.204). Available at:
<https://www.sciencedirect.com/science/article/pii/S2405896318328696?via%3Dihub>. Accessed on: May 4, 2023.
- EDWARDS, Stephen David. Overview of HeartMath Coherence Model in Advancing Health and Medical Science. Proceedings of Academics World 158th International Conference, Cape Town, South Africa, 2020. Available at: <https://www.heartmath.org/assets/uploads/2020/10/overview-of-heartmath-coherence-model-in-advancing-health-and-medical-science.pdf>. Accessed on: May 4, 2023.
- EDWARDS, Steve. Influence of HeartMath quick coherence technique on psychophysiological coherence and feeling states. African Journal for Physical Activity and Health Sciences, Vol 22 (4:1), p. 1006-1018, 2016. Available at: <https://www.heartmath.org/assets/uploads/2018/03/influence-of-heartmath-quick-coherence-technique.pdf>. Accessed on: May 4, 2023.
- EDWARDS, Steve. Radiating Love: Reflections on The Role of The Heart in Indigenous and Global Healing University of Zululand, South Africa, 2017. Available at: <https://www.heartmath.org/assets/uploads/2017/09/radiating-love.pdf>. Accessed on: May 4, 2023.
- ELIADE, Mircea. **O Sagrado e o Profano, A experiência das Religiões**. Rowohlt Taschenbuchverlag GmbH, 1957. Translation 4th ed. WMF Martins Fontes LTDA, 2018
- FINLAY, Brockett. **Transcendence, Enlightenment and The Mystical Mind**. Available in Kindle Edition, 2019
- GADIT, Amit A. Muhammad. Spiritual dimension of mental health: do we have adequate insight? Discipline of Psychiatry, Memorial University of Newfoundland, 300 Prince Philip Dr, St Johns, Canada, 2007. Available at: https://www.researchgate.net/profile/Amin-Gadit/publication/5857118_Spiritual_dimension_of_mental_health_Do_we_have_adequate_insight/links/00b7d528611ae775ee000000/Spiritual-dimension-of-mental-health-Do-we-have-adequate-insight.pdf. Accessed on: May 4, 2023.
- GOLEMAN, Daniel. **Inteligência Emocional – A Teoria Revolucionária que Redefine o que é ser Inteligente**. 1995. Translation 2nd ed. Rio de Janeiro: Schwarcz, 2012
- JOINA, Elbers; MCCRATY, Rollin. HeartMath approach to self-regulation and psychosocial well-being. HeartMath Research Center, Bolder Creek, 2020. DOI: <https://doi.org/10.1080/14330237.2020.1712797>. Available at: <https://www.heartmath.org/research/research-library/basic/heartmath-approach-to-self-regulation-and-psychosocial-well-being/>. Accessed on May 4, 2023.
- JUNQUEIRA, Luis; PINA Marta. A Psicologia Cardíaca e a Interação Mente-Coração, Novos Paradigmas

para a Prevenção das Enfermidades Cardíacas e o Tratamento Psicológico de Pacientes Cardíacos. *Psychiatry on line Brasil*, Volume 22, 2017. Available at: <https://www.polbr.med.br/ano17/art0317.php>. Accessed on: May 4, 2023.

- MAY Ross W, *et al.* Self-regulatory biofeedback training: an intervention to reduce school burnout and improve cardiac functioning in college students. *The International Journal on The Biology of Stress*, 2018. <https://doi.org/10.1080/10253890.2018.1501021>. Available at: <https://www.heartmath.org/assets/uploads/2018/11/self-regulatory-biofeedback-training-school-burnout-cardiac-functioning-in-college-students.pdf>. Accessed on: May 4, 2023.
- MCCRATY, Rollin. *et al.* The Impact of a Ney Emotional Self-Management Program on Stress, Emotions, Heart Rate Variability, DHAЕ and Cortisol. Institute of HeartMath, California, 1988. Available at: <https://www.heartmath.org/assets/uploads/2015/01/dhea-cortisol-study.pdf>. Accessed on: May 4, 2023.
- MCCRATY, Rollin. The Energetic Heart: Bioelectromagnetic Communication Within and Between People. *Clinical Applications of Bioelectromagnetic Medicine*, New York, p. 541-562, 2004. Available at <https://www.heartmath.org/research/research-library/energetics/energetic-heart-bioelectromagnetic-communication-within-and-between-people/>. Accessed on: May 4, 2023.
- MCCRATY, Rollin. *et al.* Electrophysiological Evidence of Intuition: Part 1. The surprising Role of the Heart. *The Journal of Alternative and Complementary Medicine*, vol 10, n 1, p. 133-143, 2004. Available at <https://www.heartmath.org/assets/uploads/2015/01/intuition-part1.pdf>, and Part 2. A System Wide Process. *The Journal of Alternative and Complementary Medicine*, vol 10, n1, p. 325-336, 2004. Available at: <https://www.heartmath.org/assets/uploads/2015/01/intuition-part2.pdf>. Accessed on: May 4, 2023.
- MCCRATY, Rollin. *et al.* The Coherent Heart – Heart-Brain Interactions, Psychophysiological Coherence, and the Emergence of System – Wide Order. HeartMath Research Center, Bolder Creek, 2009. Available at: <https://www.heartmath.org/assets/uploads/2016/04/coherent-heart-integral-review-2009.pdf>. Accessed on: May 4, 2023.
- MCCRATY, Rollin. Science of The Heart, Exploring the Role of the Heart in Human Performance, Vol 2. HeartMath Institute, Bolder Creek, CA, 2015. Available at: <https://www.heartmath.org/research/science-of-the-heart/>. Accessed on: May 4, 2023.
- MCCRATY, Rollin. Following the Rhythm of the Heart: HeartMath Institute-s Path to HRV Biofeedback Springer Science Business Media, LLC, part of Springer Nature, 2022. DOI: <https://doi.org/10.1007/s10484-022-09554-2>. Available at: <https://www.heartmath.org/research/research-library/basic/following-the-rhythm-of-the-heart/>. Accessed on: May 4, 2023.
- MENDES, João Manuel Galhanas Mendes. Como Inserir a Espiritualidade no Processo Terapêutico. *Revista Servir*, Vol 54 n. 4. Lisbon, 2006. <http://hdl.handle.net/10174/3190> Available at: <https://www.rdp.uevora.pt/handle/10174/3190?locale=en>. Accessed on May 4, 2023.
- MIRAMEZ, Espírito de. “O Livro dos Espíritos, comentado pelo Espírito de Miramez”. Chap. 20, question 938. Available at: <http://www.olivrodosespiritoscomentado.com/fev19q938c.html>. Accessed on May 4, 2023.

- MORRIS, Steven. Achieving Collective Coherence: Group Effects on Heart Rate Variability Coherence and Heart Rhythm Synchronization. *Alternative Therapies in Health, Medicine, A Peer-Reviewed Journal*, 16 (4):62-72, 2010. Available at: <https://www.heartmath.org/assets/uploads/2015/01/achieving-collective-coherence.pdf>. Accessed on May 4, 2023.
- PEARSALL, Paul; SCHWARTZ, Gary E.; RUSSEK Linda G. Organ Transplants and Cellular Memories. *Nexus Magazine*, vol. 12, n. 3, 2005. Available at: <https://www.paulpearsall.com/info/press/3.html>. Accessed on: May 4, 2023.
- PEIXOTO, Norberto. **Mediunidade de Terreiro, Ramatis**, 2nd ed.: Triângulo, 2020
- PLAUTO, Monique Sá e Benevides de Carvalho. *et al.* Espiritualidade e qualidade de vida em médicos que convivem com a finitude da vida”. *Revista Brasileira de Educação Médica* 46 (01), 2022. Available at: <https://www.scielo.br/j/rbem/a/KhxQCKhmQkj6xzF7JvwQCxH/>. Accessed on May 4, 2023.
- Neurociência e Espiritualidade. Livro da disciplina. Graduate Program in Neurosciences and behavior from the Pontifical Catholic University of RS.
- RAMEY, Sandra L. *et al.* Building Resilience in an Urban Police Department. *American College of Occupational and Environmental Medicine*, 2016. Available at: <https://www.heartmath.org/research/research-library/organizational/building-resilience-in-an-urban-police-department/>. Accessed on: May 4, 2023.
- ROZMAN Deborah. *et al.* A pilot intervention program that reduces psychological symptomatology in individuals with human immunodeficiency virus. *Complementary Therapies in Medicine*, 4(4): 226-232, 1996. Available at: <https://www.heartmath.org/assets/uploads/2015/01/heartmath-aids-study.pdf>. Accessed on: May 4, 2023.
- SANTOS, Fábio R. M dos. *et al.* Changes in Prefrontal FNIRS Activation and Heart Rate Variability During Self-Compassionate Thinking Related to Stressful Memories. *Mindfulness* **13**, 1354–1355, 2022. <https://doi.org/10.1007/s12671-022-01871-1> Available at: <https://link.springer.com/article/10.1007/s12671-021-01789-0>. Accessed on: May 4, 2023.
- YUN Hsing. Venerable Master. **Cultivando o Bem**, ed. Cultura, 2001