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# OVERVIEW OF HEARTMATH COHERENCE MODEL IN ADVANCING HEALTH AND MEDICAL SCIENCE

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**Abstract** - The HeartMath system is based on a coherence model. The aim of this study is to overview the function of this model in its focus on advancing health and medical science. This integral theme, which includes historical, alternative, complementary and contemporary perspectives, is unpacked at various levels; physiological, social and global. Special attention is given to the coherent heart, artificial intelligence, environmental and public health. In addition to many medical and health implications, HeartMath research and praxis facilitate heart intelligence, health promotion, moral consciousness and related behaviour. Conceptual and practical implications of this initiative can be found on the websites: [www.Heartmath.org](http://www.Heartmath.org) and [www.glcoherence.org](http://www.glcoherence.org).

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**Keywords** – HeartMath, Coherence, Health, Medical Science, Artificial Intelligence, Environmental Research.

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## I. INTRODUCTION

Contemporary health sciences typically understand health in terms of diverse patterns of physical energy, which reflect dynamic, organ systems, human social behavioural patterns and correlated, environmental resonant frequencies (Childre, Martin, Rozman & McCraty, 2016). Coherent consciousness is required for meaningful interpretation and communication of these energetic patterns. This occurred in Einstein's (1926) recognition of space-time, Bohm's (1993) notion of an implicate order and Shelldrake's (2009) morphogenetic fields. Integral healing intentionality is needed to transform such energetic consciousness into significant advances in health and medical sciences. Such intentionality, especially centred on the heart, in all its psychophysiological associations of love, care, compassion and appreciation provided motivation for this article. Such coherent heart intentionality led stress researcher, Doc Childre, to create the HeartMath system in 1991 (Childre, et al, 2016). This system pursues a central vision and mission of promoting personal, social and global coherence research, education and health. Major findings include heart communication of energetic, electromagnetic, neurochemical, biophysical and hormonal information (McCraty, 2016, 2017). Pribram's (2011) holonomic research provided scientific theory for much early HeartMath research. From a practical perspective, heart rate variability (HRV) is crucial in communication, adaptation, resilience and general health. This is because HRV dynamics inclusively reveal autonomic nervous system (ANS) functioning, heart-brain interactions, psychophysiology as well as interconnectedness with broader energetic environment, geomagnetic field, Schumann resonances, solar activity and cosmic rays, all of which have significant energetic potential to

impact consciousness, health and behaviour (McCraty, 2016, 2017).

## II. THE HEARTMATH SYSTEM IS FOUNDED ON A RIGOROUS SCIENTIFIC EVIDENCE BASE

The HeartMath research library houses an extensive collection freely downloadable from <http://www.Heartmath.org>. Google Scholar research citations exceed 8000 by HeartMath researchers. Publications are classified into the following categories: (a) basic research, psychophysiology, heart-brain interactions and coherence (b) clinical and health research, (c) educational research, (d) organizational research, (e) global coherence research, (f) intuition research, (g) energetics research, (f) scientific monographs and e-books, (g) relevant publications, (h) abstracts and (i) dissertations. Google scholar lists over 400 independent studies conducted by researchers not employed by or attached to the HeartMath Institute, which provide consistent evidence for the natural, human and social scientific value, validity and effectiveness of the HeartMath system, tools and techniques. See <https://www.heartmath.org/research/research-library>.

The evidence bases includes established physical, biological, psychophysiological, and environmental evidence related to: (a) the physical law of resonance, (b) electromagnetic and cardiorespiratory activity, (c) the vagus nerve, with its mainly afferent, heart to brain neural communication system including systemic brainstem, limbic, amygdala and prefrontal neural communication networks, (d) respiratory sinus arrhythmia (RSA), the naturally occurring physiological mechanism whereby heart rate increase

during inhalation and decreases during exhalation, mechanism, (e) heart rate variability and related adaptive function of varying intervals between heart beats as well as coherent and incoherent heart rhythms and their correlations with negative emotions and positive emotion respectively, with the latter heart rhythms resembling coherent sine wave type activity, (f) biofeedback principles, (g) this heart rhythm mathematics applies in various domains, physical through social to global.

**Goal of the study** - The general aim of the study is to introduce the HeartMath coherence model. The specific aim is to overview the function of this model in advancing health and medical science.

### III. HEARTMATH COHERENCE MODEL

The HeartMath system is founded on a coherence model. An integral concept, coherence is used in both general terms, as in logical argumentation, or systemically related parts, as well as specific meanings, as in phase relationships in the physical sciences. Coherence implies harmony, interconnectedness and consistency. It typically includes a global order where the whole is greater than the sum of the parts (McCraty, 2017). At the natural scientific level, auto-coherence or auto-correlation implies stability in a single wave form as in the sine-wave. Cross-coherence, phase locking and resonance reflect harmony in various rhythmic activities. At the psychophysiological level, coherence typically occurs among positive emotions, cardiovascular, respiratory, immune, and nervous and other systems (McCraty et al., 2009). At the human, interpersonal, team and social levels, coherence refers to dyads, couples, groups, organizations and communities. Here harmonious relationships promote efficient energy flow, communication, synchronization and collective action, as in a rowing team, collective skydiving, or any group working towards shared goals. At the global level, groups, nations and countries working co-operatively could promote optimal ecological and planetary peace and harmony. This is one goal of the HeartMath Global Coherence Initiative (GCI). Unpacking of this integral theme follows:

#### Psychophysiological coherence

The heart has become recognized as a sophisticated information processing centre, with an intrinsic nervous system, capable of making autonomous, functional decisions (McCraty, 2017). Through its transmission of dynamic patterns of information to the brain and throughout the body, the heart possesses a more extensive communication system with the brain than other organs (McCraty et al., 2009). The HeartMath coherence model is supported by three complementary HRV related psychophysiological theories. Firstly, resonance theory, based on

collaborative heart rate variability biofeedback (HRVB) research, has indicated that maximal increases in amplitude of heart rate oscillation are produced when the cardiovascular system is rhythmically stimulated by paced respiration at a frequency of about 0.1 Hz. Secondly, polyvagal theory postulates the vital role of the tenth cranial nerve in mammalian social evolution and high amplitudes of HRV for optimal health and well-being. Thirdly, the neurovisceral integration model, which describes a central autonomic network (CAN), extends polyvagal theory as to the importance of the “vagal brake” operating in relation to higher level social, emotional regulation (Edwards, 2018).

#### Social coherence

HeartMath studies consistently indicate that the heart transmits various, dynamic, energetic patterns through moment to moment, beat-to-beat HRV communications. For example, signal averaging research techniques have provided evidence of one person’s electrocardiogram (ECG) signals registered in another person’s electroencephalogram (EEG) and electrocardiogram (ECG), in both physical contact and non-contact situations (McCraty, 2017). A bioenergetics communication system apparently also exists in highly coherent group contexts. Laboratory studies have provided evidence that people trained in achieving high states of heart coherence can facilitate coherence in other people (Morris, 2010, McCraty, 2017). McCraty (2017) summarized HRV and social coherence research with special reference to physiological synchronization in social interactions and as measure of interaction synchrony. Endorsing the importance of early mother-child relationships, Feldman’s (2009) findings suggest that mother heart rate and HRV synchrony form the foundation of socialization processes. Findings consistently point to the magnetic field of the heart as most likely physical mechanism that can continuously provide information exchange between living systems and the larger ecosystem. In recent study (McCraty (2017), twelve participants, including six preassigned pairs, were respectively asked to close their eyes, use the Heart Lock-In technique for five minutes and radiate feelings of appreciation to their partner only. Findings revealed significant HRV synchronization between pairs only, indicating the power of intentionality when coherently focused.

#### Global coherence

Several independent lines of evidence have provided support for the existence of an interconnecting global information network facilitated through the earth’s magnetic field (László, 2007; McCraty, 2017; Nelson, 2011). The Institute of HeartMath, Global Coherence Initiative (GCI) has conducted pioneering researching into interconnectedness in order to promote heart-focused social and global coherence, consciousness, care and health (Childre et al, 2016).

A global network of ultrasensitive magnetic field detectors are installed strategically around the planet to provide data on relationships involving physical, animal, human, planetary and cosmic ecologies. At present six sites are operational in California, Saudi Arabia, Lithuania, Canada, New Zealand and South Africa. Information on live data can be found at [www.heartmath.org/research/global-coherence/gcms-live-data](http://www.heartmath.org/research/global-coherence/gcms-live-data). The global coherence initiative resonates with findings from the Global Consciousness Project (Nelson 2011) and other emerging interdisciplinary fields, for example, bio-field physiology research linking life science, neuroscience and cosmology (Kreitzer, M., & Saper, R. (2015).

### **The Coherent Heart in Alternative, Complementary and Contemporary Medicine**

The heart plays an integral role in life, let alone healing. Thus holistic, integral, healing inevitably implies more than any sum of, or interaction among, healing variables in diverse contexts. Reflections illuminate an ancient tree of healing, rooted in an undivided world of plants, animals and indigenous healers whose holistic, therapeutic knowledge and intuitions was recognized and sanctioned by their local communities. Branches such as yoga, chi-gung, kabbalah, meditation, prayer, contemporary medicine and HeartMath, many of which use holistic heart focussed techniques, reflect original meanings of healing involving transformations from illness to states of integrated wholeness, health and integrity. Heart-centred practices for global healing occur in ancestral reverence, Hinduism, Judaism, Buddhism, Taoism, Christianity and Islam. For example, as mentioned above, Christian traditions have long practised the prayer of the heart as in the Hesychast method of the Jesus prayer, where recitation is associated with the physical rhythm of breathing and the heartbeat (Edwards, 2016).

Contemporary, natural scientifically orientated biomedical as well as alternative and complementary medical (ACM) branches are alrooted in a field inhabited by human healers whose holistic, therapeutic knowledge and intuitions are recognized and sanctioned by their respective communities. For example global psychology is premised on the fact that holistic, integral healing inevitably implies more than any sum of, or interaction among, healing variables in diverse contexts. Core healing variables typically included diverse forms of spirituality, energy, coherence, consciousness, care and/or compassion (Edwards, 2016; Nidich et al., 2000). HeartMath Institute research has considerably extended knowledge as to the intrinsic nervous system of the heart, with regard to the neuropsychological, electromagnet, energetic, metaphorical and other multifaceted roles of the heart. For example, a dramatic example of the power of the electromagnetic field of the coherent human heart was demonstrated at the USA 2017 Burning

Man festival. Field artists Pablo Gonzalez Vargas and Gabriella Vargas, created Ilumina, a 40 foot high interactive light and sound sculpture powered by eight participant's collective heart coherence. Each participant was hooked up to an emWave Pro and as their heart rhythms synchronized together, it lit up the light sculpture. See <https://www.heartmath.com/articles/heartmath-tech-lights-up-at-burning-man/>

### **Heart Intelligence and Artificial Intelligence in Medical Systems**

Intelligence may be variously viewed as concept, gift, art and science. Artificial intelligence implies human creation, e.g. robots, which were developed to simulate human behavior. Heart intelligence refers to physical, emotional and spiritual forms of intelligence, known to many cultures through the ages and recognized anew through interdisciplinary research pioneered by the HeartMath Institute. Heart intelligence is a specific form of intelligence, including and transcending other psychometrically measured forms of intelligence such as the intelligence quotient (IQ), emotional quotient (EQ) and other multiple forms such as Platonic and Taoist tripartite (tantien) divisions, and correlated biological oscillators in the head, heart and gut (Edwards, 2018).

In their facility to promote heart intelligence, through optimal heart rate variability derived psychophysiological coherence, HeartMath tools such as Inner Balance and emWavePro certainly qualify as forms of AI as humanly designed intelligence tools or techniques. Similar issues arise in the case of heart transplants, particularly in the case of artificial hearts. Here further issues arise in the following more specific questions: What types of heart intelligence will an artificial heart be able to simulate? What types of heart intelligence and associated behaviours will robots be able to simulate? How can robots be programmed to improve various types of coherence, psychophysiological, social, global and, if so, in what contexts? How will heart holograms improve cardiac care? How will meditation be advanced by AI and vice versa in that AI may not have the ego, desires or fears of humans. At more subtle levels, research continues on the neuroscience of meditation as promoted by Buddhist, Hindu, Christian, Islamic and other wisdom traditions (Edwards, 2018). What implications does this have for that tautological term, holistic health?

Heart intelligence is associated with coherent brain behaviour relationships. Moral actions inevitably involve issues of determinism, free will and related ethical issues involving vocation, volition, agency and decision making processes (Edwards, 2018). Brain imaging techniques such as functional MRI have facilitated objective measurement of introspective data. For example, building on an

earlier what, when, and whether (WWW) model of intentional action or decisions, Brass et al (2013) have postulated an anterior-posterior gradient within the medial frontal cortex (mPFC), whereby (mPFC) based intuitions become funnelled into more specific behaviours associated with the rostral cingulate zone (RCZ), and pre-supplementary motor areas (SMA/preSMA) respectively. These specific behaviours include intentional suspension of volitional control, with regard to which humans seemingly have the ability to veto movements preceded by early brain signals up to 200 microseconds before movement onset (Schultze-Kraft et al. 2016). At least, such research provides some physical basis of hope for accurate differential diagnosis, responsible decisions and effective treatment by medical practitioners.

#### **Environmental, Bio-field and Public Health**

The HeartMath Global Coherence Initiative supports and extends many beliefs and practices that have typically been promoted over millennia by intuitions, insights, meditations and life experiences of the sages, indigenous healers, doctors, diviners, prophets, priests and counsellors (Edwards, 2016). HeartMath's general coherence postulate is of dynamic, information processing exchanges involving the earth's energetic/magnetic field, facilitating non-local and global communication at all levels of consciousness (Brizhik, Del Giudice, Jorgensen, Marchettini, & Tiezzi, 2009; Childre, et al., 2016; Meijer 2019; Gaiseanu 2019). In this context, the exponential growth of interdisciplinary fields such as bio-electromagnetic and subtle energy medicine (Rosch, 2009) and bio-field sciences (Kreitzer, & Saper, (2015) predict various further distinctions under a broad umbrella paradigm such as energy science.

Various environmental research and public health studies support vast, energetic, interconnectivity at human, planetary and solar systemic levels. McCraty, et al. (2017) found significant HRV correlations with solar and geomagnetic activity as well as geomagnetic field-line and Schumann resonances over a longitudinal 31-day period in a group of participants in separate locations. Timofejeva et al. (2017) found synchronization between slow HRV wave rhythms and changes in local magnetic field data, with the degree of synchronization being associated with the quality of interpersonal relationships. Extending earlier studies, Alabdulgader, et al., (2018) as well as McCraty et al., (2018) again indicated that energetic environmental phenomena impact psychophysical processes in people in different ways depending on their sensitivity, health status and capacity for self-regulation. In addition to empirical outcomes, HeartMath research findings support many earlier evidence based studies with regard to propensity to

facilitate consciousness, particularly moral consciousness and behaviour, creativity and health promotion (Alexander, 2005). This implies promoting optimal moral and ethical behaviour to encourage and advance such contexts as love, peace and harmony and such related relationship variables as empathy, respect, coherent communication and coherent therapy (Edwards, 2016, 2018)

#### **IV. CONCLUSION**

It seems that HeartMath offers marvellous opportunities for explorations and advances in contemporary bio-field scientific medicine, environmental and public health. The supreme challenge seems to be further realization, and planetary advancement of the greatest good, moral qualities and general excellence, as well as ensuring survival and flourishing for all sentient beings, through furthering heart intelligence and optimizing interconnectedness. The HeartMath Coherence model provides theory and praxis in this regard. Such initiatives need energetic promotion, as for example, the Moments for Mass Meditation (MOMM), which took place on 11 and 12 May 2019, was measured using the HeartMath Global Coherence application. At present there are many thousands of HeartMath practitioners and GCI ambassadors from over 150 countries practicing heart focussed care, compassion and love towards improving global coherence. From a global perspective any individual, group, community or nation motivated to promote planetary health and welfare can become global coherence ambassadors at no financial cost. Many more such advances in medicine and health are needed in collaboration between all caring planetary stakeholder individuals, communities and countries.

#### **ACKNOWLEDGEMENTS**

1. This work is based on research supported by the University of Zululand and the South African National Research Foundation (NRF). Any opinion, finding and conclusion or recommendation expressed in this material is that of the author(s) and the NRF does not accept any liability in regard thereto.
2. Special thanks to Dr Rollin McCraty for research collaboration.

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