African Journal for Physical Activity and Health Sciences (AJPHES) Volume 22(4:1), December 2016, pp. 1006-1018.

Influence of HeartMath quick coherence technique on psychophysiological coherence and feeling states

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(Received: 14 March 2016; Revision Accepted: 17 October 2016)

Abstract

This small scale study used mixed, quantitative and qualitative methods to investigate whether HeartMath practice of at least five consecutive sessions would be associated with higher psychophysiological coherence levels, decreases in negative feeling state, and increases in positive feeling state, ratings and experiences. A convenience sample of six participants, four women and two men, with a mean age of 38.3 years, recorded low, medium and high psychophysiological coherence scores achieved after each HeartMath practice session. Before and after each session, participants also rated negative feeling states involving anger, anxiety, boredom and sadness, as well as positive feeling states of contentment, peacefulness, happiness and excitement. After all five sessions, participants provided written descriptions of their experiences of the HeartMath practice. Quantitative data were analysed using non-parametric Spearman rank order correlations, Wilcoxon *Z* and Friedman's X^2 statistics for collective changes, as well as parametric Analysis of Variance with repeated measures for longitudinal, individual, dependent variable changes over time. Qualitative data in the form of participants' phenomenological descriptions were analysed into individual, experiential summaries and then synthesized into a group profile. Integral findings converged in consistently supporting the research hypothesis of significant changes in psychophysiological coherence, negative feeling states and positive feeling state clusters. There were also significant changes in specific, dependent variables such as increased percentages of high psychophysiological coherence, decreased feelings of sadness and increased feelings of peacefulness. Psychophysiological and emotional state findings are discussed in relation to health and sport psychology, theory and practice.

Keywords: Biofeedback, physiological coherence, Quick Coherence Technique, feeling states.

How to cite this article:
Edwards, S.D. (2016**).** Influence of HeartMath Quick Coherence Technique on psychophysiological coherence and feeling states. *African Journal for Physical Activity and Health Sciences*, 22(4:1), 1006-1018.

Introduction

The HeartMath Institute refers to an international scientific research and educational organization, with central vision and mission of promoting personal, social and global coherence (Institute of HeartMath, 2014). The HeartMath system refers to self-regulation techniques that can be used in the moment to relieve stress, improve resilience and health and well-being, as well as sport performance, while promoting what athletes describe as zone experiences. These techniques are informed by a large body of scientific research indicating that neural signals from the heart affect the brain centres involved in emotional self-regulation (McCraty & Shaffer, 2015). Skill acquisition of HeartMath techniques is facilitated through the use of heart rate variability (HRV) and heart rhythm coherence feedback training, heart focussed breathing and intentional generation of associated positive emotional feelings, emotional imagery, and remembered wellness (McCraty & Zayas, 2014). Based on Pribram's (2011) pattern recognition theory of emotion, it is hypothesized that HeartMath techniques use the heart as point of entry to facilitate neural identification of changes in the pattern of afferent cardiac signals sent to the brain and its associated cortical electrophysiological activity respectively. Related research has revealed associated dynamic, systemic activity at various levels; neurochemical, bio-electromagnetic, hormonal and cognitive (McCraty, Atkinson, Tomasino & Bradley, 2009).

A practical energetics approach underlies the techniques. Emphasis is on awareness of energy depletion, renewal and resilience in preparing for challenges, as well as shifting and resetting feelings after challenges, through sustained, regular HeartMath practice. Although research has revealed that positive emotions are associated with psychophysiological coherence independently of respiration, heart focussed breathing at about 5-7 breath cycles per minute and/or 10 second cardio-respiratory rhythm remains a practical, first step in most tools. This conscious step facilitates respiratory sinus arrhythmia (RSA), a dynamic, naturally occurring, physiological mechanism, whereby heart rate increases during inhalation and decreases during exhalation. In addition to modulating the heart's rhythmic activity, slower breathing facilitates identification and focus on a particular positive emotion (McCraty & Zayas, 2014). For example, the Quick Coherence technique chosen for the present study essentially involves heart focused, breathing and feeling. The technique can be practised in relation to a visualized graph of the autonomic nervous system along the vertical axis and hormonal system along the horizontal axis. On the vertical, breath axis, sympathetic activation yields high heart rates and parasympathetic relaxation rate yields low heart rates, while along the horizontal, feeling axis, depleting, negative emotions are associated with stress hormone, cortisol, and renewing positive emotions with growth hormone, dehydroepiandrosterone or DHEA (Childre & Martin, 1999; Institute of HeartMath, 2014; McCraty & Zayas, 2014). For example, HeartMath biofeedback tools, such as Inner Balance and emWave2, were specifically developed to facilitate emotional insight, shift consciousness and transform negative angry, anxious, bored and sad feelings into excited, happy, peaceful and/or contented feelings respectively.

Various studies have indicated that HeartMath practice is associated with improved positive emotional states (McCraty et al., 2009; McCraty, Barrios-Choplin, Rozman, Atkinson & Watkins, 1998; Rein, Atkinson, & McCraty, 1995). However, studies typically measured changes after single sessions, conducted mostly in controlled conditions in laboratory settings. Further research is needed to investigate the nature and process of such emotional changes on a longitudinal and session to session basis. This provided the motivation for the present study. Findings from the abovementioned studies, indicating typical findings of emotional state improvements, led to the postulation of the general research hypothesis that HeartMath practice of at least five sessions would be associated with higher psychophysiological coherence levels, decreases in negative feeling states and increases in positive feeling states.

Methodology

Design

This small scale study required a pre- and post-test, mixed methods, correlational, within subjects, outcome evaluative design (Cresswell & Plano-Clark, 2007; Terre Blanche, Durrheim & Painter, 2006).

Participants

The participants were a small, convenience sample of 6 volunteer adults, four women and two men, with a mean age of 38.3 years, standard deviation 14.6, and age range of 26 to 63 years. Three participants already owned and practised HeartMath tools, Inner Balance and emWave2, the other three were encouraged, lent and taught the practice of these tools. All participants were selected for their commitment to participate in the research and willingness to explore, describe, explicate and articulate their experience. While such qualitative research selection criteria have certain advantages in pilot type, evaluative research as the present study, they do present methodological limitations including social desirability, Hawthorn and experimenter effects. These limitations can be addressed through further randomized, controlled studies with larger samples.

Procedure

The study was introduced to participants with the abovementioned rationale of heart focus, heart breathing and heart feeling. All were informed that research on heart rhythm coherence feedback training had indicated various physiological and psychological benefits, such as blood pressure reduction and improved positive emotions. Specific instructions were as follows: “Please complete and record psychophysiological coherence levels for at least five sessions. Before each session give each feelings state a score and after each session give each a score. The feeling states are: Angry, Anxious, Bored, Sad, Contented, Peaceful, Happy and Excited. What you specifically need to do is explore your feelings and to score a 1, 2, 3 or 4 or under each type before and after each session indicating the degree to which you 1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree with the feeling type." All understood that, as participants, they would be assisting with quantitative evaluations of the effect of a HeartMath biofeedback apparatus on physiological coherence, and perceptions of feeling states. After pre-testing on all quantitative measures, participants completed at least five Inner Balance or emWave2 biofeedback sessions. At post-testing, all participants provided written descriptions of their experiences of the HeartMath practice.

Ethics

Institutional approval was obtained from HeartMath and respective university research committee. All participants were fully informed of HeartMath research, the nature and purpose of the investigation and provided written consent with regard to the use of the information for publication purposes. Participants were guaranteed nominal confidentiality and advised as to their right to withdraw from the research at any stage.

Measures

HeartMath practice was viewed as independent variable. One set of dependent variables consisted of high, medium and low psychophysiological coherence levels as measured on HeartMath tools such as Inner Balance and emWave2. When attached to a laptop computer, these give readings of heart rate variability, time elapsed, as well as low, medium and high levels of physiological coherence. Feedback consisted of red, blue and green coloured bars with percentage indications and accompanying tones for low, medium and high coherence levels respectively. Further feedback was provided by a cumulative coherence graph with a demarcated area for coherence indicating the zone of optimal autonomic nervous system functioning. The other set of dependent variables consisted of an excel sheet in which, after each session, participants rated negative feeling states involving anger, anxiety, boredom and sadness, as well as positive feeling states of contentment, peacefulness, happiness and excitement.

Data analysis

The small sample indicated Statistical Package for the Social Sciences (SPSS) non-parametric analysis involving Spearman Rank order correlations coefficients to assess the level of correlation between all variables and Wilcoxon Z statistics for psychometric comparisons between pre-test and post-test scores for all five measures, collectively, on the respective feeling state ratings. This was followed by Friedman's test, the non-parametric equivalent of Analysis of Variance (ANOVA) with repeated measures, which yielded Chi-Square statistics for psychophysiological coherence percentages, as well as negative and positive feeling state clusters respectively. It should be noted that whereas non-parametrical statistical techniques are actually based on ranking procedures, only mean score ratings are tabulated for illustrative purposes. Friedman's test was complemented by repeat measures ANOVA, a sufficiently robust technique for small samples with various measures, to measure the specific variables of interest, i.e., high psychophysiological coherence percentages, as well as each individual feeling state over each of the five sessions and thus longitudinally assess any HeartMath influence over time. The conventional probability level of $p < 0.05$ was set for all significant statistical comparisons, which are indicated below by an asterisk (*). Qualitative data in the form of participants' phenomenological descriptions were analysed into experiential summaries and synthesized into a group profile (Bryman & Cramer, 2008; Terre Blanche, et al., 2006).

Results and discussion

Quantitative findings

Table 1: Spearman correlation coefficients indicating degree of relationship between all dependent variables

	Low	Medium	High	Angry	Anxious	Bored	Sad	Content	Peace	Happy	Excited
Low	1										
Medium	.73*	1									
High	-.93*	-.87*	1								
Angry	-.09	-.09	-.09	1							
Anxious	.02	-.06	-.01	.24	1						
Bored	-.20	-.04	-.06	.36	.46*	1					
Sad	.00	-.00	-.03	.47*	.47*	.44*	1				
Content	-.24	-.34	.34	.16	-.36	-.15	-.36	1			
Peaceful	-.20	-.30	.30	-.07*	-.50*	-.44	-.25	.75*	1		
Happy	-.38*	-.48*	.49*	-.03*	-.38*	-.21	-.43*	.85*	.72*	1	
Excited	-.37*	-.48*	.41*	-.03	-.33	-.21	-.45*	.78*	.67*	.84*	1

Spearman Rank order correlation coefficients in Table 1 indicated expected correlated dependent variable clusters among psychophysiological coherence levels, as well as negative and positive feeling ratings respectively. These were low, medium and high psychophysiological coherence percentage levels: negative angry, anxious, bored and sad feelings; and positive contented, peaceful, happy and excited feelings respectively. For example, high psychophysiological coherence levels were negatively correlated with low and medium psychophysiological coherence levels (-.93* and -.87*, respectively). Anxious feelings correlated positively with bored and sad feelings (.46* and .47*, respectively) and correlated negatively with peaceful and happy feelings (-

.50* and -.38*, respectively). Cross-cluster correlations were also in the expected direction. For example, peaceful and excited feelings respectively correlated positively with high coherence levels (.49* and .41*, respectively) and negatively with low coherence levels (.38* and .37*), respectively.

Table 2: Wilcoxon *Z* statistics and associated probability levels for comparisons between pre-test and post-test coherence levels and feeling state ratings

Measure	Pre-test	SD	Post-test	SD	Wilcoxon *Z*	Probability
Low PC	48.17	23.07	4.83	6.97	2.20*	.028
Medium PC	13.83	11.00	9.00	13.05	1.08	.279
High PC	32.83	28.48	86.17	19.81	2.20*	.028
Angry	1.23	.45	1.07	.25	2.50	.014
Anxious	2.20	.71	1.53	.63	4.26	.000
Bored	1.87	.63	1.37	.56	3.27	.001
Sad	1.73	.87	1.33	.55	3.00	.003
Content	2.63	.76	3.03	.81	2.82	.005
Peaceful	2.63	.72	3.10	.80	3.12	.002
Happy	2.50	.73	3.10	.84	3.07	.000
Excted	2.13	.63	2.60	.86	2.20	.002

Table 2 refers to pre-test and post-test means and standard deviations (SD) for measures of physiological coherence levels and feeling states. Means and standard deviations for all measures of: low, medium and high psychophysiological coherence (PC); angry, anxious, bored, sad, as well as contented, peaceful, happy and excited feeling states respectively, are followed by Wilcoxon *Z* statistics and associated probability levels. As indicated in Table 2 there were significant decreases in low physiological coherence: Z = 2.20*, p = .028; and significant increases in high physiological coherence: Z = 2.20*, p = .028. This was associated with significant decreases in feeling: angry, Z = 2.50*, p = .014; anxious, Z = 4.26*, p = .000; bored, Z = 3.27*, p = .001; and sad, Z = 3.00*, p = .003; as well as significant increases in feeling: content, Z = 2.82*, p = .005; peaceful, Z = 3.12*, p = .002; happy, Z = 3.07*, p = .000; and excited, Z = 2.20*, p = .002. Although this is a very small sample and no great value can be attached to these findings, psychophysiological coherence and feeling state measures all provided consistent support for the research hypothesis that the HeartMath practice was significantly influential in decreasing low physiological coherence and negative emotional states, while increasing high physiological coherence and positive emotional states. The hypothetical effectiveness of practice was apparent in the high coherence percentage score of 86.17 attained by the group at post-test, easily exceeding the HeartMath conventional indication of successful practice and/or training of a high coherence score of 80. The insignificant medium coherence level, in itself, is simply a ratio between low and high coherence percentages without any real value. Table 3 refers to mean base-line or pre-test measures followed by consecutive individual session measures for all levels of psychophysiological coherence and all feeling states as indicated by the numbers 1 to 5. For reasons of parsimony and space, only the post-test feeling state means are reported. Friedman non-parametric statistics assessed within subjects' comparisons over the five sessions.

Table 3: Mean scores for coherence levels and feeling state ratings, over baseline pretesting and folloing five sessions.

Measure	Coherence			Negative feeling states				Positive feeling states			
Session	Low	Med	High	Angry	Anxious	Bored	Sad	Content	Peace	Happy	Excited
Baseline	48	15	33	1.3	2.7	1.7	2.5	2.2	2.3	2.2	1.8
1	11	12	74	1.2	1.7	1.3	1.7	3.0	3.0	2.8	2.3
2	12	24	64	1.0	1.5	1.3	1.0	2.8	2.8	2.7	2.3
3	14	16	77	1.0	1.5	1.5	1.2	3.2	3.0	3.5	2.5
4	7	14	79	1.2	1.3	1.3	1.3	3.2	3.3	3.3	3.2
5	4	6	90	1.0	1.6	1.2	1.4	3.2	3.6	3.4	2.8
Chi Square	24.88*			17.10*				25.01*			
Probability	p = .000			p = .001				p = .000			

Observation of means in Table 3 collectively indicated increases in low, medium and high psychophysiological coherence, decreases in angry, anxious, bored and sad negative feeling state ratings and increases in contented, peaceful, happy and excited positive feeling state ratings over time. Friedman Chi Square (X^2) findings indicated significant changes for all three clusters, i.e. psychophysiological coherence: X^2 = 24.88*, p = .000; negative feeling states, X^2 = 17.10*, p = .001; and positive feeling states, X^2 = 25.01*, p = .000 respectively.

Table 4: Analysis of variance repeated measures of consecutive changes over five HeartMath sessions

Measure	S1	S2	S3	S4	S5
High PC *F(p)*	56.25*(.000)	15.86*(.011)	51.98*(.001)	23.56 *(.005)	37.58*(.002)
Angry *F(p)*	2.46 (.178)	1.07 (.348)	5.85 (.060)	2.05 (.212)	1.50 (.276)
Anxious *F(p)*	0.69 (.441)	7.66* (.040)	0.14 (.726)	000 (1.00)	3.81 (.108)
Bored *F(p)*	12.78* (.016)	0.99 (.366)	7.29* (.043)	3.83 (.108)	5.29 (.070)
Sad *F(p)*	21.13* (.006)	15.74 (.011)	13.99* (.013)	80.00* (.000)	59.02* (.001)
Content *F(p)*	21.56* (.006)	2.52 (.173)	.026 (.879)	33.80* (.002)	8.31* (.034)
Peaceful *F(p)*	29.98* (.003)	150.1* (000)	7.70* (.039)	15.63* (.011)	24.15* (.004)
Happy *F(p)*	18.91* (.007)	3.97 (.106)	59.51* (.001)	22.73* (.005)	12.21* (.017)
Excited *F(p)*	6.49* (.051)	15.2* (.011)	13.47* (.014)	3.86 (.107)	.81 (.411)

Table 4 refers to ANOVA findings of consecutive within-subjects comparisons from baseline over five HeartMath sessions for the specific, individual variables of study interest, i.e., high psychophysiological coherence percentages and post-test ratings of feeling states. Repeated measures ANOVA provided consistent evidence in support of the research hypothesis and Friedman Chi Square collective statistical findings of the general influence of HeartMath practice on psychophysiological coherence and emotional states over five consecutive sessions. Table 4 specifically indicated that significant *F* ratios for high psychophysiological coherence percentages were respectively maintained over each of the five sessions; S1 (56.25*), S2 (15.86*), S3 (51.98*), S4 (23.56*) and S5 (37.58*). Table 4 also indicated relatively less significant changes (six out a possible 20 changes) for the negative feelings cluster and relatively more significant changes (15 out of a possible 20 changes) for the positive feelings cluster. No great value can be attached to these statistics owing to the very small sample, and not even speculative inferences can be made as there was no between subjects control group. However, some evidence appeared that the HeartMath programme appeared to have had the most influence on the negative feeling state of sadness, where there were four out of a possible five significant changes over time: S1 (21.213*), S3 (13.99*), S4 (80.00*) and S5 (59.02*). In addition, the HeartMath programme appeared to have had the most influence on the positive feeling state of peacefulness, with all five changes were significant: S1 (29.98*), S2 (150.1*), S3 (7.70*), S4 (15.63*) and S5 (24.15*).

Qualitative findings

In addition to these quantitative findings the research hypothesis received unanimous qualitative support from all six participants' positively phrased experiential descriptions, numbered A to F, as follows. Improvements in both negative and positive feeling states are expressed in the following individual and group profiles.

Participant A. HeartMath practice is one of the quickest and most effective ways to regulate unwanted feelings and enhance desired feelings. If I am in the upper left hand quadrant (anger, frustration and anxiety) or lower left hand quadrant (burnout, withdrawal and resentment), where there is an increase in cortisol, during and after HeartMath practice, based on the internal and external environment, and desired effect, I can feel myself move into the upper right hand quadrant (excitement, courage and passion) or lower right (contentment, fulfilment and ease), which results in a decrease in cortisol and an increase in DHEA. *Participant A describes the self-regulating experience and related physiology of transforming unwanted feelings into desired feelings.*

Participant B. I feel that HeartMath practice encourages one to search for a deeper sense of inner peace and tranquillity. It opens the mind and opens the heart encouraging a flow of stillness throughout the mind. This in turn allows one to have a truer sense of one's feelings. After HeartMath practice, the feelings that I sense are rejuvenation, tranquillity and mindfulness, allowing me to have a more positive focus on my daily tasks. *Participant B describes how HeartMath practice encourages a deeper, truer feeling sense and search.*

Participant C. Doing HeartMath makes me aware of my breathing and helps me to slow it down and breathe more deeply. It also helps me to focus and still my

mind from fleeting thoughts and worries. When I am feeling anxious, irritable or experiencing other negative feelings it enables me to get things into perspective and change to a more positive frame of mind. *Participant C describes breath awareness and control as related to changes in negative and positive feelings.*
Participant D. I found myself wanting to do HeartMath whenever I was a little overwhelmed by a feeling or situation. In general, there was one dominant emotion going into the practice - and I felt better about that emotion after the practice. Being plugged into the Inner Balance monitor, I also felt motivated to deal with the emotion, breathe through it, and manage it in this way. In general, I felt much calmer after a session - it gave me a 'break' from everything. The more I do it, the more I want to do it. *Participant D describes greater emotional management, calmness and encouragement in improving dominant and/or overwhelming feelings or situations.*

Participant E. I feel that my personal experience with the HeartMath training was not as successful as it should have been. I found that due to multiple other factors within the timeframe I was struggling to maintain my usual focus. This does not however mean that I felt no results from it. The most significant difference for me before and after each session was a noticeable sense of calm and patience. I have no doubt that continued practice will yield greater and longer lasting control over my emotional state and therefore my overall well-being. Along with feeling calmer, there was of course a sense of happiness that was creeping in, and considering it is at an unusually stressful time of my life this only further proves the possibilities that continued practice can bring about. With regard to feeling bored or excited, I can't say that I felt much of a difference in that I am generally more inclined to put less focus on either of those feelings and rather take a more rational and thought out approach. This is often more of a self-trained habit to avoid disappointment but it also makes me more prepared for the situations of everyday life. I would like to believe that with greater control I could let that habit fade a bit in order to get more enjoyment out of the happy situations and less concern about the details. *Although Participant E was undergoing unusual stress, which perceivably prevented greater, practice effectiveness, a definite degree of emotional insight, management, calm, belief and hope was experienced.*

Participant F. I started the HeartMath training as a way to help cope with severe anxiety and hyperventilating caused by anxiety. I found the first time I used the HeartMath training technique a bit difficult as I battled to calm my breathing and focus on a 'happy and calm' feeling. After a few attempts I managed to acquire a sense of calm more easily. I found the HeartMath training a huge help in clearing my mind and calming myself and I have used the breathing technique successfully in calming myself during panic attacks and I also use it to clear my mind before I sleep. It has helped me feel more in control of my mind, as anxiety often makes me feel like I'm losing control. I will definitely keep using this technique. *After initial breathing and feeling struggles, Participant F describes significant improvements in severe anxiety, hyperventilation, panic attacks, emotional calmness, mental clarity and sleep.*

Group Profile. All participants describe breathing and feeling experiences related to changes in negative and positive emotional states. Negative state transformations relate to feelings, perceptions and contexts of stress, anger, irritability, frustration, anxiety, panic, hyperventilation, overwhelm, burnout, withdrawal, disappointment, resentment, hyperventilation, cortisol and sleep. Positive state transformations include feelings, conditions and environments of excitement, courage, passion, contentment, fulfilment, ease, peace, tranquillity, flow, stillness, rejuvenation, tranquillity, mindfulness, focus, motivation, enjoyment, positivity, happiness, patience and well-being. This transformation process is described as one of breathing, feeling, opening, clearing, deepening, slowing, sensing, calming, relaxing, focussing, moving, controlling, regulating, managing and encouraging and appears to have been an intrinsically rewarding experience.

Integrative Evaluation

Integral evidence from quantitative and qualitative findings converged in supporting the research hypothesis that HeartMath practice of at least five consecutive sessions would be associated with increased psychophysiological coherence, decreased negative feeling states and increased positive feeling states. There were also significant changes in specific, dependent variables such as increased percentages of high psychophysiological coherence, decreased feelings of sadness and increased feelings of peacefulness. In addition to enhanced breath control, insight and awareness of emotional extremes such as violence, panic, ennui, depression, equanimity, bliss, ecstasy and mania, participants' experiential descriptions provided evidence of increasingly subtle, energetic heart consciousness transformations with practised focus on everyday occurring feelings states of anger, anxiety, boredom, sadness, content, peacefulness, happiness and excitement.

The study confirmed and extended findings from various other studies indicating associations between HeartMath practice, respiration and improved positive emotional states (MacKinnon, Gevirtz, McCraty & Brown, 2013; McCraty, 2003; McCraty et al., 1998; McCraty & Rees, 2009; McCraty & Shaffer, 2015; Rein et al., 1995; Tiller, McCraty & Atkinson, 1996). These studies measured changes after single sessions, conducted mostly in controlled conditions in laboratory settings. HeartMath practice in the present research took place over at least five consecutive sessions as conducted and assessed by participants in their places of choice. Despite the pilot, exploratory nature of the study, there appears no reason to doubt the integrity and authenticity of the quantitative or qualitative findings. However, there are obvious theoretical, practical and methodological limitations to the present study. These include small sample size, social desirability, Hawthorn and experimenter effects, correlational nature and consequent preclusion of causal speculations or theoretical inferences. Further large scale randomized controlled studies, with larger samples, as well further in depth investigations are needed to address quantitative criteria such as reliability and validity as well as qualitative criteria such as dependability and transferability.

Research has indicated that positive emotions and RSA, independently or jointly, facilitate coherence, with cardiorespiratory activity typically viewed as being primarily responsible for transformations in resonance and/or coherence levels, and positive emotions associated with secondary, higher order associations and feedback loops that maintain coherence, provide direction and bring meaning (McCraty, 2003; McCraty & Shaffer, 2015; Lehrer & Gevirtz, 2014; Lehrer, Vaschillo & Vaschillo, 2000; Vaschillo, Vaschillo & Lehrer, 2006). Findings point towards the need for further research exploring relationships between multi-contributory components, psychological, cardio-respiratory, bio-electromagnetic, neurochemical and other. For example, the intimately interrelated nature of emotional consciousness and cardio-respiratory activity require specific, ongoing, theoretical and practical investigations into their neuropsychological interconnectedness. Such studies, by HeartMath research staff as well as independent researchers, appear continually on the HeartMath website and elsewhere.

In conclusion, the HeartMath system offers vast opportunities to research integral and diverse, dynamic and systemic, qualitative and quantitative, correlational and causative, factors and mechanisms operating in health and physical activity contexts. In everyday, practical terms, the present findings of high coherence levels being associated with positive emotions, specifically indicates the health and sport psychological value of athletes' positive feelings and transcendent experiences in physical activity contexts, endorsing successful, elite sportspersons reports of "feel good" factors, as well as those of sports coaches' who encourage their protégés with such messages as: "express yourself with integrity," "enjoy yourself" and "have fun out there."

Acknowledgements

The research assistance of all participants and editorial assistance of Dr David Edwards is gratefully acknowledged.

Declaration of conflicting interests

Any opinion, finding, and conclusion or recommendation expressed in this material is that of the author, and the National Research Foundation (NRF) does not accept any liability in regard thereto.

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