

Impact of a Sudarshan Kriya-based Occupational Stress Management Intervention on Physiological and Psychological Outcomes

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Abstract

In a field experiment with 72 participants, we study the impact of Sudarshan Kriya¹ on participants' physiological and psychological variables. The intervention significantly reduced participants' stress levels and blood cortisol levels and increased their life satisfaction, emotional intelligence and emotional stability. The results of the field experiment were triangulated with an open-ended survey of participants, and we found that the effects of the programme were sustainable after a year, especially for those who continued to practise the technique learned in the programme.

Keywords

Sudarshan Kriya, stress, emotional intelligence, life satisfaction, cortisol

In the last 20 years, the growth in Indian economy has been unprecedented. Economic liberalization in 1990 provided numerous opportunities to the established sectors in manufacturing as well as newer sectors such as software and services. While Indian companies struggled to keep pace with the high growth rate, they continued to face challenges in terms of trained managers. One outcome of this demand–supply gap was the huge pay increases of the order of 10–12 per cent year on year enjoyed by managers (*Economic Times*, 2012). Another outcome of the economic growth was the high stress levels imposed on Indian managers as they strived to cope with the new and turbulent environment, which calls for increased ownership and involvement at work (Business Standard, 2009). As organizations drive employees to take higher initiative in their work, an increased amount of stress and burnout becomes inevitable (Bolino and Turnley, 2005).

In response to rising stress, organizations have adopted numerous methods. One of these is the use of yoga and meditation classes for managers. Various organizations such as Art of Living, Isha

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Foundation, Prasanna Trust and Brahma Kumaris are offering corporate programmes to help managers deal with stress at work (Singh, 2011; Verma, 2011). In this study, we measure the impact of one such stress management intervention (SMI); that is, Art of Living's Achieving Personal Excellence (APEX) programme on the physiological and psychological outcomes of Indian managers.

Job Stress

Despite the overwhelming importance of stress to organizations, there is considerable disagreement amongst researchers as to its meaning with some researchers considering it as a stimulus, while others consider it as a response, and yet others consider it as a stimulus–response relationship (Jex et al., 1992). For the purpose of this article, we follow Newman and Beehr's (1979) definition of job stress as 'a situation wherein job-related factors interact with the worker to change his or her psychological and/or physiological conditions such that the person is forced to deviate from normal functioning' (p. 1).

Though it is well known that stress leads to various dysfunctional outcomes for individuals and organizations, there are relatively few studies, which have measured these (Jex and Crossley, 2005). Specifically, the measurement of organizational-level outcomes of SMIs has been least studied (Richardson and Rothstein, 2008). In addition, there is certain ambivalence towards the use of alternative methods for the treatment of stress. While on the one hand there are numerous studies showing the efficacy of yoga and meditation in the reduction of stress, there is yet some reluctance on the part of organizations to embrace these techniques. This is evidenced by the fact that a survey of 96 stress management experts in North America concluded that meditation was the least effective and least practical method for stress management (Bellarosa and Chen, 1997). In this article, we examine the physiological and psychological outcomes of an SMI based on the ancient Indian practice of Kriya yoga based on the science of breathing.

Outcomes of Stress

Stress not only affects health care costs, it also has an effect on productivity, customer service, accident rates and employee engagement (Jex and Crossley, 2005). Stress outcomes (also known as strains) may be of different types: physical (e.g., hypertension, diabetes and asthma), psychological (e.g., insomnia, depression and anxiety), emotional (e.g., unhappiness, dissatisfaction, fatigue and tension), cognitive impairments (e.g., concentration and memory problems) and behavioural (e.g., aggression and substance abuse). These problems can in turn lead to work-related problems such as higher absenteeism, less productivity and increased dependence on abusive substances (Thomas et al., 2006). In addition, these outcomes may be relevant to individuals or to organizations (Jex and Crossley, 2005). In this research, we study the impact of an SMI on two types of individual strains, namely psychological and physiological.

The most common psychological strains that have been measured in earlier field experiments are stress, anxiety, general mental health and job/work satisfaction (Richardson and Rothstein, 2008). The presence of stressors at work is related to various psychosomatic complaints (Frese, 1985). Physiological indicators of strain can be classified into three categories depending on the system affected: autonomic nervous system, neuroendocrine and immune (White and Mattson Porth, 2000). The most commonly studied physiological measures are systolic and diastolic blood pressure, while other measures used are epinephrine and norepinephrine levels, galvanic skin response and cholesterol

(Richardson and Rothstein, 2008). Work-related stress leads to an increase in the ratio of total cholesterol to high-density lipoprotein (HDL) cholesterol (Hendrix et al., 1985). Organizational-level indicators of strain are the least studied while evaluating the effectiveness of an SMI (Kunz, 1987). Even though some early studies have documented the impact of stress on performance and social behaviour (Cohen, 1980), later studies have not adequately measured these outcomes. In a recent meta-analysis, only 6 out of 36 studies measured organizational outcomes of which 4 studies measured absenteeism and 2 examined productivity (Richardson and Rothstein, 2008). This study addresses this issue to some extent since the study is done in the organizational context and some of the variables are measured through the reports of office colleagues.

Some of the effects of stress on organizational outcomes include increased receptivity to others' inputs in two-person groups (Driskell and Salas, 1991), altered communication style (Pettegrew et al., 1981), less differentiated performance ratings (Srinivas and Motowidlo, 1987), lower job satisfaction (Cavanaugh et al., 2000; Hendrix et al., 1985) and reduced health care costs (Kunz, 1987). Perhaps the most relevant finding for organizations is that high employee stress also has shown to be negatively related with employee performance (Jamal, 1985; Motowidlo, Packard and Manning, 1986; Salami, Ojukuku and Ilesanmi, 2010).

In this study, we simultaneously investigate the impact of an SMI on participants' psychological and physiological outcomes. As psychological outcomes, we studied perceptions of stress, life satisfaction, personality and emotional intelligence, and as physiological outcomes, we studied blood serum cortisol level and heart rate variability (HRV).

Stress Management Interventions

An SMI is 'any activity, program, or opportunity initiated by an organization, which focuses on reducing the presence of work-related stressors or on assisting individuals to minimize the negative outcomes of exposure to these stressors' (Ivancevich et al., 1990, p. 252). SMIs may be primary, secondary or tertiary targeting the sources of stress, the severity of stress symptoms and the detrimental effects of stress, respectively. The most common of these three types are secondary interventions such as cognitive-behavioural skills training, relaxation, meditation, breathing and goal setting wherein SMIs train individuals in dealing and coping with stress (Ivancevich et al., 1990).

Most SMIs and research on SMI effectiveness are focused on interventions targeted at individuals rather than focused on making changes in organizational-level variables such as work design and autonomy (Caulfield et al., 2004; Giga et al., 2003). One reason for this could be the relative difficulty in implementing and assessing the impact of an organization-wide SMI (Biron et al., 2010).

Bunce and Stephenson (2000) have identified several limitations of SMI research such as lack of reproducibility due to inadequate information provided and non-calculation of statistical power for determining the sample size. In this study, we have attempted to overcome some of these limitations and show the likely effects of one such SMI, based on an Indian breathing technique.

Art of Living's APEX Programme

The APEX is a programme conducted by the Art of Living Foundation, an international not-for-profit organization founded in 1981 by Sri Sri Ravi Shankar. The APEX programme is a 20–22-hour programme spread over two or three days with weekly follow-up sessions and is targeted at working executives.

The APEX programme has been conducted in over 200 organizations in India, including Larsen & Toubro (L&T), Siemens, LG, Accenture, Cap Gemini and Reliance Capital (Verma, 2011). The programme is designed to help participants deal with stress and undo some of the harmful effects of stress. It consists of conceptual inputs, interactive exercises and training in Sudarshan Kriya Yoga (SKY). SKY is a systematic breathing technique, which involves a sequence of rhythmic breathing exercises. Training in SKY is the central and distinctive feature of the APEX programme.

Brown and Gerbarg (2005a) have proposed a neurophysiologic theory explaining the effects of each of the stages of SKY on the nervous system and the stress response. While outlining the details of the various elements of the nervous system impacted by SKY, they suggest the following metaphor:

The stress response system and the parasympathetic nervous system respond like an orchestra to the breath rhythms set by the SKY. By taking the nervous system through its paces, similar to practicing musical scales, SKY provides a kind of autonomic/endocrine training exercise that ultimately may strengthen, stabilize, and enhance the flexibility of the system. (p. 199)

Based on past research and case studies on SKY, Brown and Gerbarg (2005b) suggest that SKY may be an effective form of treatment for depression, anxiety, phobias, post-traumatic stress disorder, addictions and other stress-related medical conditions.

Effects of SKY and the APEX Programme

The use of yoga and meditation to reduce stress and heal the negative effects of stress has been known since a long time. In recent times, the professed healing properties of yoga and meditation practices have been empirically tested by researchers by investigating the effects of these practices on psychological and physiological indicators of stress. For example, a field experiment conducted in an Indian corporation showed that adoption of the yoga way of life could lead to significant reduction in burnout as compared to exercising (Adhia et al., 2010). Similarly, use of yoga and meditation techniques led to a reduction in pulse and systolic blood pressure (Bruning and Frew, 1987). Various types of meditation have been shown to lead to reduced anxiety (Goleman and Schwartz, 1976), reduced stress (Anderson et al., 1999; Olivo, Dodson-Lavelle et al., 2009; West et al., 2004), better coping strategies (Walach et al., 2007), lesser mood disturbance, lesser fatigue, better sleep (Carlson and Garland, 2005) and better mental health (Oman et al., 2006). Even a single session of meditation of 20 minutes to one hour can cause a significant decrease in anxiety levels (Rausch et al., 2006) and salivary cortisol (Chan et al., 2006). Meditation can also enhance self-efficacy and create positive states of mind (Chang et al., 2004).

Eastern meditation techniques have not only reduced effects of stress, they have also shown significant benefits to individuals suffering from existing illness. For example, use of relaxation and tai chi has been shown to improve immune functions in persons with HIV infection (McCain et al., 2008). Similarly, mindfulness meditation helped participants to adapt to rheumatoid arthritis (Zautra et al., 2008).

There has been extensive research on SKY and its benefits in the last decade. Experiments have shown that SKY practitioners have better antioxidant status and lower blood lactate levels (Sharma et al., 2003), favourable effects on immunity, aging, cell death and stress regulation (Sharma et al., 2008), better sleep quality and structure (Sulekha et al., 2006) and significant reduction in depression (Janakiramaiah et al., 1998, 2000). It is also observed that SKY practitioners showed significant reduction of anxiety and depression in the tsunami-affected populations and in alcohol rehabilitation (Descilo et al., 2010; Vedamurthachar et al., 2006) as well as reduction in organizational role stress (Soni et al., 2013).

The effects of the APEX programme on executives have also been assessed in a recent study (Jawahar, 2012) in the form of participant responses 8–12 months after having done the programme. In this study, we investigate the effects of the APEX programme on psychological and physiological variables in an organizational context by using a quasi-experimental design.

The promotional literature of the APEX programme claims to reduce participants' stress levels, get rid of anxieties, reduce negative emotions and thereby transform the life of the participants (Art of Living, n.d.). Based on this, we selected the following outcome variables for this programme: perceptions of stress, life satisfaction, emotional stability, emotional intelligence, blood cortisol level and HRV.

Method

Participants

We conducted a power analysis to determine the minimum number of participants needed for the study (Cohen, 1988). Based on earlier studies (Anderson et al., 1999), we selected an alpha level of .05, power of .80 and an effect size of .40. Power analysis showed that a sample of 37 for each group was found to be sufficient.

The participants in this experiment were executives working at L&T's headquarters in Mumbai, India. L&T is a technology, engineering, construction and manufacturing company and is one of the largest and most respected companies in India's private sector. In order to enrol participants for the study, first an introduction on stress and Sudarshan Kriya was given to all employees of the organization. Then, an email was circulated in the organization explaining the details of the proposed experiment and all executives were given an option to participate in the experiment. The first 80 participants who volunteered were enrolled into the project by making them give their written consent to the conditions of the experiment. The consent form informed potential participants of their role in the research and clearly mentioned that they were free to withdraw from the experiment at any stage. If they agreed to participate, participants were told to commit to attending the sessions as per the schedule and to practise the techniques taught at home. Of the 72 participants who completed the entire experiment, 55 were males and 17 were females. The ages of the participants ranged between 22 and 65 years (median age = 31 years). We screened all the participants prior to the study to ensure that smokers, caffeine addicts and alcohol addicts were excluded from the study. The experimental and control groups were formed by randomly dividing the participants into two groups.

Design

The design of this study consisted of a randomized wait-list control design. The participants were told that since the programme had been oversubscribed, only half of the applicants would be able to be accommodated in the programme immediately, while the other half would be accommodated into the programme after a waiting period of three months. This is a commonly used design for field experiments and has been used in numerous experiments to study the effects of SMIs (Ganster et al., 1982; Gardner et al., 2005; Oman et al., 2006; Searle, 2008; Willert et al., 2010). To ensure confidentiality, all participants were provided with serial numbers.

The first batch of 37 participants (Group A) completed the APEX programme from April 22–24, 2011, and the second batch of 35 participants (Group B) completed the APEX programme from July 22–24, 2011.

The remaining eight participants dropped out of the study. Both the groups completed the APEX programme at the same location and with the same instructor. In both the groups, the programme proceeded as expected, there were no changes in the programme schedule and participants did not report any side effects. We collected data for all the participants in Group A and Group B three times, namely, April 13–15, 2011 (pretest for Group A); July 13–15, 2011 (post test for Group A and pretest for Group B); and October 19–21, 2011 (post test for Group B).

Data Collection

Participants were asked to provide the name and contact details of a close friend or confidant at work, who might be in a position to judge the feelings and experiences of the participant during the course of this experiment (Bhagat et al., 1985). Assessment on some of the measures was done by only self-report measures, while for other measures, we used the confidant reports. Participants and their confidants were provided paper-and-pencil versions of the questionnaires in sealed envelopes and were assured of complete confidentiality. A help desk was set up for responding to participants' queries, and they were provided with a telephone number where they could call and get their queries addressed during the entire nine months of the field experiment. In addition, participants and confidants were free to withdraw themselves from the experiment at any stage.

We collected data from participants on three occasions (viz., April, July and October, 2011) by handing over the questionnaires at their place of work and collecting the completed forms on the next day. In all cases, questionnaires were handed over in sealed envelopes and were collected back from the participants in sealed envelopes. Participants were assured of full confidentiality in the entire process since only their serial numbers identified them. In case participants or confidants did not return their questionnaires within a day, a follow-up visit was made to collect their questionnaires the next day. In case participants or confidants did not hand over the completed questionnaire even after two follow-up visits, the questionnaire was filled up by speaking to the participant/confidant on the phone on the third day. On an average, follow-ups were required in about 70 per cent of the cases. The HRV tests were conducted during the period 8.30 a.m. to 5.00 p.m. and cortisol tests were conducted in the morning, that is, between 8.30 a.m. and 9.30 a.m.

Follow-up Data Collection

After the APEX programme was conducted for the experimental and the control group, follow-up sessions to practise the Sudarshan Kriya were held in the office premises every week and participants were encouraged to attend the follow-up sessions.

In July 2012, a year after the participants had completed APEX programme, we conducted a follow-up study. We circulated an open-ended questionnaire to all the participants of the APEX programme (both experimental and control group). This questionnaire contained three questions. First, we inquired how often participants continued to practise the Sudarshan Kriya and then we asked what personal and professional benefits they experienced in their lives after participating in the APEX programme. While this data is susceptible to demand characteristics (Orne, 1962), it serves as a useful means of triangulating our findings from the survey instrument and the physiological tests. The findings of this study are especially likely to provide evidence on the long-term and sustainable effects of the programme.

Measures

Stress. Stress symptoms were measured using a single item scale developed and validated by Elo, Leppanen and Jahkola (2003).

Stress means a situation in which a person feels tense, restless, nervous, or anxious, or is unable to sleep at night because his or her mind is troubled all the time. Do you feel this kind of stress these days? (p. 445)

Participants' self-reports on this measure was recorded on a five-point Likert scale (1 = not at all; 5 = very much). The scale has adequate content, construct and criterion validity (Elo et al., 2003) and has been used for evaluating SMIs earlier (Elo et al., 2008).

Life satisfaction. Life satisfaction is defined as an evaluative summary of one's liking or disliking one's life (Heller et al., 2004). The five-item satisfaction with life scale developed by Diener et al. (1985) was used for which participants self-reported their life satisfaction.

Emotional intelligence. Emotional intelligence is defined as the ability to recognize and regulate emotion in oneself and others (Spector, 2005). Studies on emotional intelligence have followed one of the two predominant models, namely, the ability approach that views emotional intelligence as a set of cognitive abilities and the mixed or dispositional approach that combines abilities and a broad range of personality traits (Caruso et al., 2002; Tett, Fox & Wang, 2005). As an ability or skill, emotional intelligence is a capacity to engage in valued behaviour, entails a degree of mutability (e.g., through training) and calls for measurement in the context of correctness (i.e., right/wrong answers). As a disposition, emotional intelligence is a relatively stable inclination or tendency amenable to self-description. The ability model of emotional intelligence was developed by Mayer, Salovey and their associates, while the mixed model of emotional intelligence was popularized by Goleman (1995). In this study, we assessed emotional intelligence using Wong and Law's (2002) 16-item scale based on the ability model of emotional intelligence proposed by Salovey and Mayer (1990). In addition to this, we also assessed the emotional stability, a personality factor of the Big Five model of personality (McCrae and Costa, 1985, 1987), using a short version of the scale by Donnellan, Oswald, Baird and Lucas, (2006). Emotional stability was measured by self-reports of the participants, while emotional intelligence was reported by the participants' confidants.

Heart rate variability (HRV). HRV measures the beat-to-beat variation in heart rhythm, showing coordination between sympathetic and parasympathetic autonomic control and autonomic influence on the sinoatrial node and serves as a marker for physiological stress. Higher or lower HRV activity indicates the parasympathetic control; higher HRV indicates more, while low HRV indicates lesser parasympathetic control. Studies have shown that excess job stress reduces HRV and leads to many complications such as cardiovascular and metabolic disorder (Nakamura Takishima et al., 2009; Ottaviani et al., 2008). By contrast, regular yoga practice can acutely increase HRV; however, there are no studies to support its long-term effects. An increase in resting HRV secondary to prolonged yoga training would indicate lower physiological stress and reduced risk of chronic diseases and early mortality. The HRV tests were conducted during the period 8.30 a.m. to 5.00 p.m. The electrocardiogram (ECG) data were acquired at the sampling rate of 1,024 Hz using power lab 2/20 recording system. ADInstruments analyzed offline. Noise-free data were used for analysis. The HRV was recorded for five minutes for each participant using Ag–AgCl disposable electrodes. During the recording, participants were asked to lie down in a supine position. Before HRV analysis, the R peaks of ECG signals were detected automatically by

computer algorithm and reviewed manually. The R–R intervals (in millisecond) were then calculated to construct the RR tachogram (R–R interval series). In time domain analysis, the R–R interval series were used. Frequency domain analysis based on Fourier transform assumes equal sampling period of the series (i.e., uniform sampling process). All the HRV parameters were calculated using a five-minute window without overlap throughout the recordings.

Cortisol. Cortisol is a steroid hormone, directly affected by stress, produced in the adrenal cortex region of the glands, regulating blood pressure, cardiovascular functions, fats, proteins and carbohydrates metabolism. Cortisol is also involved in glucose metabolism, insulin release for blood sugar maintenance and serves as a marker for the stress. For the cortisol test, 5 ml of blood was collected between 8.30 a.m. and 9.30 a.m. to analyze the serum cortisol levels.

Results

Psychological Variables

A series of paired samples t-tests were done to determine the differences in the participants' psychological variables across the three measurement cycles. The mean values of the variables, mean differences and the *p* values of the mean differences across measurement periods for each of the variables are mentioned in Table 1.

For the participants of the April APEX programme (experimental group), there was a significant change in stress, life satisfaction, emotional stability and regulation of emotions just after they participated in the APEX programme. Subsequently, there was no significant change in these variables when they were measured in October. Specifically, the self-report levels of stress reduced significantly between April and July 2011 for the participants of the April batch of the APEX programme, and these remained unchanged in October 2011. Self-reported life satisfaction increased significantly between April and July 2011 and remained unchanged in October 2011. Finally, self-reported emotional stability and office confidant-reported regulation of emotions increased significantly between April and July 2011 and remained unchanged until October 2011. These results show a positive sustainable effect of APEX programme on the participants' psychological variables.

For participants of the July APEX programme (control group), there was a significant change in stress, life satisfaction, emotional stability and regulation of emotions in the period from July to October 2011 after they participated in the APEX programme. However, there was also an unexpected reduction in stress and an increase in life satisfaction over the period from April to July 2011 when the control group was not subject to any intervention. Similarly, office confidants reported an improvement in some aspects of participants' emotional intelligence (i.e., others' emotional appraisal and self-emotions appraisal) during the period from April to July 2011, even though participants were not subject to any intervention. Most likely, this could be due to demand characteristics—the tendency for participants in an experiment to respond favourably to the experimenter (Orne, 1962).

Physiological Variables

A series of paired samples t-tests were done to determine the differences in the participants' physiological variables across the three measurement cycles. The mean values of the variables and the *p* values of the mean differences across measurement periods for each of the variables are mentioned in Table 2.

Table 1. Mean Values and Mean Differences of Psychological Variables: Results of Paired Samples t-test

Variable	April APEX (Experimental Group)				July APEX (Wait-listed Control Group)					
	April 2011		October 2011		April 2011		October 2011		Difference between July 2011 and October 2011	
	July	October	July	October	July	October	July	October		
Stress (self-report)	2.45	1.36	1.55	-1.03 (0.00)	0.15 (0.49)	2.00	1.60	1.37	-0.30 (.09)	-0.32 (.05)
Life Satisfaction (Self-report)	1.87	2.12	2.01	0.18 (0.10)	-0.04 (0.68)	1.76	2.09	2.29	.33 (.00)	.18 (.03)
Emotional Stability (Self-report)	1.70	2.07	2.10	0.35 (0.02)	-0.02 (0.74)	1.94	1.75	2.00	-0.22 (.17)	.27 (.00)
Emotional Intelligence (Office Confidant)	2.79	2.77	2.87	0.02 (0.67)	0.16 (0.11)	2.65	2.83	2.87	.23 (.04)	.00 (.93)
Others' Emotions Appraisal	2.46	2.87	2.86	0.28 (0.10)	-0.04 (0.62)	2.66	2.62	2.91	.06 (.48)	.25 (.09)
Regulation of Emotions	2.83	2.88	2.96	0.04 (0.56)	0.04 (0.57)	2.69	3.00	2.87	.34 (.01)	-0.09 (.36)
Self-emotions Appraisal	2.94	2.89	3.02	0.02 (0.87)	0.10 (0.17)	2.80	2.95	2.98	.15 (.18)	-0.01 (.90)
Understanding of Emotions										

Source: Authors' own.

Note: Figures in brackets are *p* values.

Table 2. Mean Values, Standard Deviations and Mean Differences of Physiological Variables (Heart Rate Variability [HRV] and Cortisol): Results of Paired Sample *t*-test

Variable	April APEX (Experimental Group)				July APEX (Wait-listed Control Group)				Difference between July 2011 and July 2011	Difference between October 2011 and July 2011
	April 2011	July 2011	October 2011	Difference between July 2011 and April 2011	April 2011	July 2011	October 2011	Difference between July 2011 and April 2011		
Mean HR	74.68 ± 14.00	72.09 ± 19.52	70.39 ± 9.77	-2.59 (0.27)	69.48 ± 9.40	68.91 ± 9.71	70.69 ± 10.18	-57 (.31)	-1.78 (.37)	
SDNN (ms)	123.7 ± 149.30	109.19 ± 72.23	94.46 ± 61.87	-14.51 (0.68)	163.09 ± 159.63	132.42 ± 124.36	125.72 ± 119.05	-30.67 (.39)	-6.7 (.06)	
RMSSD (ms)	153.21 ± 219.02	127.03 ± 107.52	112.48 ± 85.43	-26.18 (0.71)	162.41 ± 226	136.74 ± 147.43	140.68 ± 154.08	-25.67 (.38)	-3.94 (.17)	
LF Norm (n.u)	40.69 ± 17.15	38.85 ± 21.32	42.47 ± 21.14	-1.84 (0.56)	38.87 ± 16.87	41.08 ± 19.37	40.27 ± 19.87	-2.21 (.24)	-81 (.45)	
HF Norm (n.u)	45.45 ± 14.22	44.31 ± 15.07	44.09 ± 16.64	-1.14 (0.68)	44.62 ± 8.54	47.08 ± 16.14	46.04 ± 16.21	-2.46 (.68)	-1.04 (.34)	
LF/HF Ratio	1.10 ± 0.81	1.31 ± 1.29	1.20 ± 1.61	-21 (0.44)	0.87 ± 0.64	1.26 ± 1.17	1.18 ± 0.83	-39 (.11)	-08 (.74)	
Cortisol (µg/dl)	14.65 ± 4.48	11.27 ± 3.63	9.23 ± 2.73	-3.38 (0.00)	12.09 ± 3.48	12.56 ± 3.27	9.96 ± 2.71	-47 (.46)	-2.6 (.00)	

Source: Authors' own.

Note: Values are group means ± SDs. HR = heart rate; SDNN = standard deviation of NN intervals; RMSSD = root mean square of the differences between adjacent NN intervals; LF = low frequency; HF = high frequency; n.u. = normalized units; LF norm = LF/(LF+HF)×100; HF norm = HF/(LF+HF)×100. Figures in brackets are *p* values.

No significant changes were found in the HRV parameters in both groups throughout the study. Blood serum cortisol values showed significant reduction for the experimental group between April and July and between July and October. In addition, cortisol values showed significant reduction for the control group between July and October. The continued reduction in cortisol values for the experimental group in the period between July and October could be because of their sustained practice of SKY technique.

Follow-up Study

The results of the follow-up survey conducted in July 2012 supported our findings from the field experiment. Out of 72 participants who were sent the questionnaire by email, 62 participants responded (i.e., a response rate of 86 per cent). Of those who responded, 13 participants reported that they continued practising Sudarshan Kriya every day, 13 participants reported that they practised Sudarshan Kriya once a week, and 16 participants reported that they practised Sudarshan Kriya once a month. Twenty participants reported that they had stopped practising the Sudarshan Kriya after the initial few months after the programme. Participants uniformly reported positive personal benefits because of their participation in the APEX programme. Most participants reported feeling more calm, less angry, more focused and a sense of well-being. Participants reported that ailments such as acidity, back pain, eye strain and cough and cold were cured. Participants also reported benefits in their professional life such as lesser anxiety about new projects, better concentration, lesser fatigue, better control of emotions and better prioritization of tasks.

Discussion

Participants in the experimental group reported lower levels of stress, higher levels of life satisfaction and higher levels of emotional stability after participating in the APEX programme. Reduction in stress was correlated by gradual reduction of plasma cortisol levels for experimental and control group participants after their participation in the APEX programme. In addition, office confidants reported participants higher on regulation of emotions after the programme. Earlier findings have shown lowering of anxiety, depression, stress and improved optimism and wellness in normal population who practises SKY (Kjellgren et al., 2007), reduced depression and anxiety in major depression disorder (Janakiramaiah et al., 1998, 2000; Vangala et al., 2000) and in alcohol rehabilitation (Vedamurthachar et al., 2006). It was also observed that plasma cortisol levels were reduced as depression scores decreased in these studies. Similar results were seen in the current study that the cortisol was reduced as stress reduces in experimental group from the beginning but not in the control group in the first three months. The improvements in the values of both self-report and office confidant-reported variables showed no significant change in the period of six months following the workshop, which shows that the changes were sustainable. Even the participants in the control group reported a reduction in stress, an improvement in life satisfaction and emotional stability. Office confidants reported that participants in the control group showed better regulation of emotions after participating in the APEX programme. Despite the small sample size, and the potential problems caused by demand characteristics in the control group, these findings are interesting in suggesting that the positive effects of SKY and APEX programme on emotional outcomes. Moreover, based on the follow-up survey done in July 2012, we found that most of the participants are still practising the technique learnt during the APEX programme and reporting numerous positive benefits on the personal and professional fronts.

This study is unique on several fronts. First, being a field experiment in an organizational setting, it establishes the efficacy of a Sudarshan Kriya-based SMI in an organizational context. Second, by simultaneously assessing the physiological and psychological outcomes, we provide a holistic perspective on the likely positive effects of a Sudarshan Kriya-based SMI. The psychological outcomes are especially noteworthy since they are peer reported. In other words, not only do participants feel that they have more emotional stability as a result of the SMI, but their office colleagues are able to notice it as well. Finally, we validate the findings of the field experiment with a follow-up survey after a year, which confirms the benefits gained by the SMI.

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Note

1. 'Sudarshan Kriya' is a registered trademark of Art of Living foundation and has been used earlier in the literature. In the stress management literature many such terms are used such as 'mindfulness meditation' or 'transcendental meditation'. In this article, the term Sudarshan Kriya has been explained as 'a systematic breathing technique, which involves a sequence of rhythmic breathing exercises'.

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