Impact of a Sudarshan Kriya Based Occupational Stress Management Intervention on Physiological and Psychological Outcomes[1]

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Abstract

In a field experiment with 72 participants, we study the impact of Sudarshan Kriya 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.

Keywords: Sudarshan Kriya, Stress, Emotional Intelligence, Life Satisfaction, Cortisol

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In the last twenty 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. One 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). In response to rising stress, organizations have adopted numerous methods. One of these is the use of yoga and meditation classes for managers. In this study, we measure the impact of one such stress management intervention; i.e., Art of Living's "APEX" program on the physiological and psychological outcomes of Indian managers.

Job Stress and its Outcomes

For the purpose of this paper, 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)." In this study, we simultaneously investigate the impact of a stress management intervention 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).

Art of Living's APEX Program: A Stress Management Interventions

A stress management intervention (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, Matteson, Freedman, & Phillips, 1990, p. 252). In this study, we show the likely effects of one such SMI, based on an Indian breathing technique.

The Achieving Personal Excellence (APEX) is a program conducted by the Art of Living Foundation, an international non-for-profit organization founded in 1981 by Sri Sri Ravi Shankar. The APEX program is a 20 to 22 hour program spread over two or three days with weekly follow up sessions and is targeted at working executives. 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 program.

Effects of Sudarshan Kriya Yoga (SKY) and the APEX Program

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. 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), favorable effects on immunity, aging, cell death, stress regulation (Sharma et al., 2008), better sleep quality and structure (Sulekha, Thennarasu, Vedamurthachar, Raju, & Kutty, 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, 2009; Vedamurthachar et al, 2006). The effects of the APEX program on executives have also been assessed in a recent study (Jawahar, 2012) in the form of participant responses eight to twelve

months after having done the program. In this study, we investigate the effects of the APEX program on psychological and physiological variables in an organizational context by using a quasi-experimental design.

The promotional literature of the APEX program 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 program: perceptions of stress, life satisfaction, emotional stability, emotional intelligence, blood cortisol level, and heart rate variability.

Method

Participants

The participants in this experiment were executives working at Larsen & Toubro Limited's (L&T) 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 enroll 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 practice 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 years to 65 years

(Median age = 31 years). We screened all the participants prior to the study to ensure that heavy 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 program had been oversubscribed, only half of the applicants would be accommodated in the program immediately, while the other half would be accommodated into the program 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, Mayes, Sime, & Tharp, 1982; Gardner, Rose, Mason, Tyler, & Cushway, 2005; Oman, Hedberg, & Thoresen, 2006; Searle, 2008; Willert, Thulstrup, Hertz, & Bonde, 2010). To ensure confidentiality, all participants were provided with serial numbers.

The first batch of 37 participants (Group A) completed the APEX program from April 22-24, 2011 and the second batch of 35 participants (Group B) completed the APEX program from July 22-24, 2011. The remaining eight participants dropped out of the study. Both the groups completed the APEX program at the same location and with the same instructor. In both the groups, the program proceeded as expected, there were no changes in the program schedule, and participants did not report any side effects. We collected data for all the participants in Group A and Group B three times, viz., 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, McQuaid, Lindholm, & Segovis, 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 seventy percent of the cases. The Heart Rate Variability (HRV) tests were conducted during the period 8.30 a.m. to 5.00 p.m. and cortisol tests were conducted in the morning i.e., between 8.30 a.m. to 9.30a.m.

Measures

Stress. Stress symptoms were measured using a single item scale developed and validated by Elo, Leppanen, and Jahkola (2003). 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, Leppanen, & Jahkola, 2003) and has been used for evaluating SMIs earlier (Elo, Ervasti, Kuosma, Mattila, 2008).

Life satisfaction. Life satisfaction is defined as an evaluative summary of one's liking or disliking one's life (Heller, Watson, & Ilies, 2004). The 5-item satisfaction with life scale developed by Diener, Emmons, Larsen, and Griffin (1985) was used for which participants self-reported their life satisfaction.

Emotional intelligence. 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 & Costa, 1985; McCrae & Costa, 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 sino-atrial node, surves as 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, Kometani, & Yokogoshi, 2009; Ottaviani,

Shapiro, Davydov, & Goldstein, 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 Heart Rate Variability (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 1024 Hz using power lab 2/20 recording system. AD Instruments and were 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 & reviewed manually. The R-R intervals (in ms) 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, serves as 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 program (experimental group), there was a significant change in stress, life satisfaction, emotional stability, and regulation of emotions just after they participated in the APEX program. 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 program 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 program on the participants' psychological variables.

For participants of the July APEX program (control group), there was a significant change in stress, life satisfaction, emotional stability, and regulation of emotions in the period July to October 2011 after they participated in the APEX program. 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

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 favorably 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. 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.

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 program. Reduction in stress was correlated by gradual reduction of plasma cortisol levels for experimental and control group participants after their participation in the APEX program. In addition, office confidants reported participants higher on regulation of emotions after the program. Earlier findings have shown lowering of anxiety, depression, stress and improved optimism and wellness in normal population who practices SKY (Kjellgren, Bood, Axelsson, Norlander, & Saatcioglu, 2007), reduced depression and anxiety in major depression disorder (Janakiramaiah et al, 1998, 2000; Vangala, Pandey, Janakiramaiah,

Gangadhar, & Vedamurthachar, 2000), 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 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 program. 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 program on emotional outcomes.

This study is unique on two 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.

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

Variable	April APEX (Experimental Group)					July APEX (Waitlisted Control Group)				
	April 2011	July 2011	October 2011	Mean Difference between July 2011 and April 2011	Mean Difference between October 2011 and July 2011	April 2011	July 2011	October 2011	Difference between July 2011 and April 2011	Difference between October 2011 and July 2011
Stress (self-report)	2.45	1.36	1.55	-1.03 (.00)	.15 (.49)	2.00	1.60	1.37	-.30 (.09)	-.32 (.05)
Life satisfaction (self-report)	1.87	2.12	2.01	.18 (.10)	-.04 (.68)	1.76	2.09	2.29	.33 (.00)	.18 (.03)
Emotional Stability (self-report)	1.70	2.07	2.10	.35 (.02)	-.02 (.74)	1.94	1.75	2.00	-.22 (.17)	.27 (.00)
Emotional Intelligence (office confidant)										
Others' Emotions Appraisal	2.79	2.77	2.87	.02 (.67)	.16 (.11)	2.65	2.83	2.87	.23 (.04)	.00 (.93)
Regulation of Emotions	2.46	2.87	2.86	.28 (.10)	-.04 (.62)	2.66	2.62	2.91	.06 (.48)	.25 (.09)

Self Emotions Appraisal	2.83	2.88	2.96	.04 (.56)	.04 (.57)	2.69	3.00	2.87	.34 (.01)	-.09 (.36)
Understanding of Emotions	2.94	2.89	3.02	.02 (.87)	.10 (.17)	2.80	2.95	2.98	.15 (.18)	-.01 (.90)

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 (Waitlisted Control Group)				
	April 2011	July 2011	October 2011	Difference between July 2011 and April 2011	Difference between October 2011 and July 2011	April 2011	July 2011	October 2011	Difference between July 2011 and April 2011	Difference between October 2011 and July 2011
Mean HR	74.68 ±14.00	72.09 ± 19.52	70.39 ± 9.77	-2.59 (.27)	-1.7 (.26)	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 (.68)	-14.73 (.64)	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(.71)	-14.55(.32)	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 (.56)	-3.62 (.40)	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 (.68)	-.22 (.89)	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 (.44)	-.11 (.69)	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 (.00)	-2.04 (.00)	12.09 ±3.48	12.56 ±3.27	9.96 ±2.71	-.47 (.46)	-.2.6 (.00)

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.