

Impact of a Low Cost, Non-Pharmacological Yogic Breathing Technique Intervention on General Women's Health in India and UK: A Questionnaire-Based Study

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Abstract

Background: Women have increased health care requirements in comparison to men during their lifetime, although there are indications throughout the world that all health and social care needs are not always met. Traditionally it is believed that women suffer more compared to men and this may be in the form of acute transient illnesses, chronic health conditions, and serious functional disabilities. Both men and women may experience stress, this may be felt differently by women in general and there might be geographical variations as well. Therefore this may have a debilitating impact not only on women's mental health but also on physical health e.g. Stress has been linked to increased incidence of menstrual and reproductive health problems in women. The objective of the study is a questionnaire-based study to evaluate the efficacy of a non-pharmacological intervention (Sudarshan Kriya Yoga -yogic breathing technique) to improve the general health of women.

Methods: A validated questionnaire, the SF 36 form was used to evaluate the efficacy of a non-pharmacological intervention yogic breathing (Sudarshan Kriya Yoga: SKY) technique on women's general health. The study period was from January 2018 to August 2018 and was conducted in both the UK and India. A total of four hundred and ten (410) women completed the questionnaire before and following the intervention. The statistical package used was MS Excel and a RAND score analysis was performed. Chronbach's alpha test was used to measure internal consistency.

Results: Women aged 18-40 years participated in this study. Fifty-four percent (54%) of them were between 26-35 years of age. The Chronbach's alpha score was 0.92, 0.82, 0.77, 0.78 and 0.73 for physical functioning, role limitations, emotional well being, pain, and general health respectively. A statistically significant improvement in the general health was seen for 75% of women following the intervention (the practice of yogic breathing: SKY technique). Besides, there was an improvement in physical activities which was dependent on the frequency of the daily practice of SKY technique (Critical Chi-square value; 11.07 (0.05, 5). However, all of the parameters were independent of the duration of the technique used (I.e. for physical activities, critical chi-square value: 7.81(0.05, 3).

Conclusion: This study highlights the benefits of low cost, non-pharmacological yoga-based mind-body intervention for improvement in general women's health.

Abbreviations: Sudarshan kriya Yoga: SKY; Premenstrual syndrome (PMS)

Background

Women have increased health care requirements in comparison to men across their lifetime, although there are indications that these health and social care needs are not always met [1]. In this context, the focus on women's health around the world is one of the top priorities of the United Nations and World Health Organization. Women live longer than men and may experience more acute transient illnesses, chronic health conditions, and serious functional disabilities when compared to men [2]. Men and women both experience stress in life but its physical and psychological effects on mind and body may differ. Farooq et al [3] described health effects of stress in women in various groups and these include sleep disorders (difficulty in sleeping, early morning awakening, poor quality of sleep), immune suppression, headaches (tension headache) and migraines. Anxiety and depression are also quite common in women. Hammen et al [5] described that women experience stress more acutely than men and this increases the risk of developing anxiety and depression [4]. This explains why women are twice likely to experience depression compared to men [5]. The other forms of mental illnesses women suffer more than men include post-traumatic stress disorder, panic attacks and obsessive-compulsive disorder [6].

Stress increases the risk of heart problems in women. Higher levels of stress can initiate raised blood pressure (hypertension) and heart rate. Subsequently, high blood pressure can cause serious health problems such as stroke and myocardial infarction if left uncontrolled [6,7]. Also, long term stress can lead to gut problems which include irritable bowel syndrome (IBS) and this is twice as common in women compared to men [4, 8]. There is also a strong link between stress and weight gain in women compared to men [7,9]. Although short term stress suppresses appetite, persistent stress levels lead to increase levels of cortisol secretion which in turn leads to increased appetite and weight gain [8]. This is a vicious cycle if the cycle of depression is not interrupted and can lead to overeating and increased adipose tissue formation and storage in the body.

Often increased stress levels in women are associated with reproductive health and menstrual health problems. Women with a higher level of stress are more likely to have problems with conceiving compared to women with lower levels of stress [8]. This inability to get pregnant can itself become an additional source of stress [10] in view of surrounding family pressures and social stigma. Women with long term stress may also experience menstrual problems such as irregular periods, painful periods (dysmenorrhoea) and more severe premenstrual syndrome (PMS) [11].

Stress has a negative impact on health. To reduce this impact of stress on health it is important to have good social support and high self-esteem [12]. Mind-body interventions are also described to be beneficial in stress-related mental and physical health-related disorders.

Current research is finding an association between the autonomous nervous system and general health in women. It is well known that breathing techniques affect the autonomic nervous system. In this study, we present the result of a survey which assessed if yogic breathing (Sudarshan Kriya yoga) is a unique method for balancing the autonomic nervous system and influencing physical, psychological and social health in women.

Various studies [13-16] establish the effects of yogic breathing on brain function and physiologic factors, but the mechanisms have not been clarified. Sudarshan kriya Yoga is an advanced cynical controlled breathing practice with its roots in yoga. It is taught by the Art of Living globally in 156 countries and has manifold benefits for the mental and physical health of an individual.

Sudarshan kriya yoga (SKY), a sequence of specific breathing techniques (Ujjayi, Bhastrika, and Sudarshan Kriya) can relieve anxiety, depression, daily stress, post-traumatic stress, and therefore diminish the incidence of stress-related medical ailments. The contrivances during this unique breathing technique create a state of calm alertness include augmented parasympathetic drive (increased vagal tone), relaxing of stress response systems, the simultaneous release of neuroendocrine hormones, thereby negating the detrimental effects of cortisol. The SKY model has an empirical value, research implications, and clinical applications. However, this model has not been evaluated in the context of general women's health.

Methods

Description of the intervention: Sudarshan Kriya Yoga (SKY) has 4 components - Ujjayi or "Victorious Breath": This comprises experiencing the conscious sensation of the breath touching the throat. This slow breath technique (2-4 breaths per minute) increases airway resistance during inspiration and expiration and controls airflow so that each phase of the breath cycle can be prolonged to an exact count. The subjective experience is physical and mental calmness with alertness. Bhastrika or "Bellows Breath": Done with eyes closed, the air is forcefully inhaled and exhaled rapidly using abdominal contractions at a rate of 30 breaths per minute. "Om" sound chanted three times with very prolonged expiration.

Sudarshan Kriya Yoga itself is a cyclical breathing exercise which is done using the normal breath. 3 different rhythms of breath are used: slow medium and fast cycles in succession.

The entire process takes about 30 minutes and leads to a state of physical rejuvenation and mental relaxation. A questionnaire-based survey was used to evaluate the SKY technique on the general health of women. The survey was conducted in two countries: India and the United Kingdom. Ethical approval was obtained by the IRB of Sri Sri Institute for Advanced Research (SSIAR/IEC/05). Written consent was obtained from all the participants. The SF-36 questionnaire is a self administered questionnaire containing 36 items which take about five minutes to complete. It measures health on eight multi-item dimensions, covering functional status, well being, and overall evaluation of health [14]. The SF 36 questionnaire is a validated questionnaire and is easy to use, acceptable to patients, which fulfills stringent

criteria of reliability and validity. It taps eight health concepts: physical functioning, bodily pain, role restrictions due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions. It also includes a single item that provides an indication of perceived change in health (after one year). In all, there are 36 items for which measurement was done using the questionnaire. Table 1 lists the items averaged together to create each scale.

Data collection

Participants attending different Art of Living programs in India and the UK were explained the study in detail through verbal as well as written information. Participants from each program who volunteered to participate in this study were included. The data of women was collected between January 2018 to August 2018. The inclusion criteria were women aged 18 to 40 years of age.

Measurement properties

Internal consistency was assessed by item-total correlation and Cronbach's alpha. Item-total correlations of 0.4 or higher were considered satisfactory and should be approximately equal within each scale [15]. Normative data were collected as responses to the questionnaire. The raw scores from the test were translated into a common scale. The common scale used was the RAND score. The RAND scoring of the SF-36 is an alternative scoring for the same questionnaire [17]. These common scales allow comparison between different sets of scores.

Statistical Analysis: Statistical analysis was performed using MS Excel version 2007

Table 1: Abbreviated Item content for the SF 36 Health Survey Health domain scales (adapted from An excerpt from the User's Manual for the SF-36v2 Health Survey)

Scale	Item	Abbreviated Item Content
Physical Functioning (PF)	3a	Vigorous activities, such as running , lifting heavy objects, or participating in strenuous sports
	3b	Moderate activities, such as a moving a table, pushing a vacuum cleaner, bowling, or playing golf
	3c	Lifting or carrying groceries
	3d	Climbing several flights of stairs
	3e	Climbing one flight of stairs
	3f	Bending, kneeling, or stooping
	3g	Walking more than a mile
	3h	Walking several hundred of yards
	3i	Walking one hundred yards
	3j	Bathing or dressing oneself
Role–Physical (RP)	4a	Cut down amount of time one spent on work other activities
	4b	Accomplished less than you would like
	4c	Limited in kind of work or other activities
	4d	Had difficulty performing work or other activities(e.g., it took extra effort)
Bodily pain (BP)	7	Intensity of bodily pain
	8	Extent pain interfered with normal work
General Health (GH)	1	Is your health: excellent, very good, good, fair, poor
	11a	Seem to get sick a little easier than other people
	11b	As healthy as anybody I know
	11c	Expect my health to get worse
	11d	Health is excellent
Vitality (VT)	9a	Feel full of life
	9e	Have a lot of energy
	9g	Feel worn out
	9i	Feel tired
Social Functioning (SF)	6	Extent health problems interfered with normal social activities
	10	Frequency health problem health interfered with social activities
Role Emotional (RE)	5a	Cut down the amount of time spent on work or other activities
	5b	Accomplished less than you would like
	5c	Did work or other activities less carefully than usual
Mental Health (MH)	9b	Been very nervous
	9c	Felt so down in the dumps that nothing could cheer you up
	9d	Felt calm and peaceful
	9f	Felt downhearted and depressed
	9h	Been Happy
Reported Health Transition (HT)	2	How health is now compared to 1 year ago

Results

Four hundred and ten (410) women completed the questionnaire. Women aged 18-40 years participated in this study. Fifty-four percent (54%) of them were between 26-35 years of age. The various categories of age distribution are shown in Figure 1.

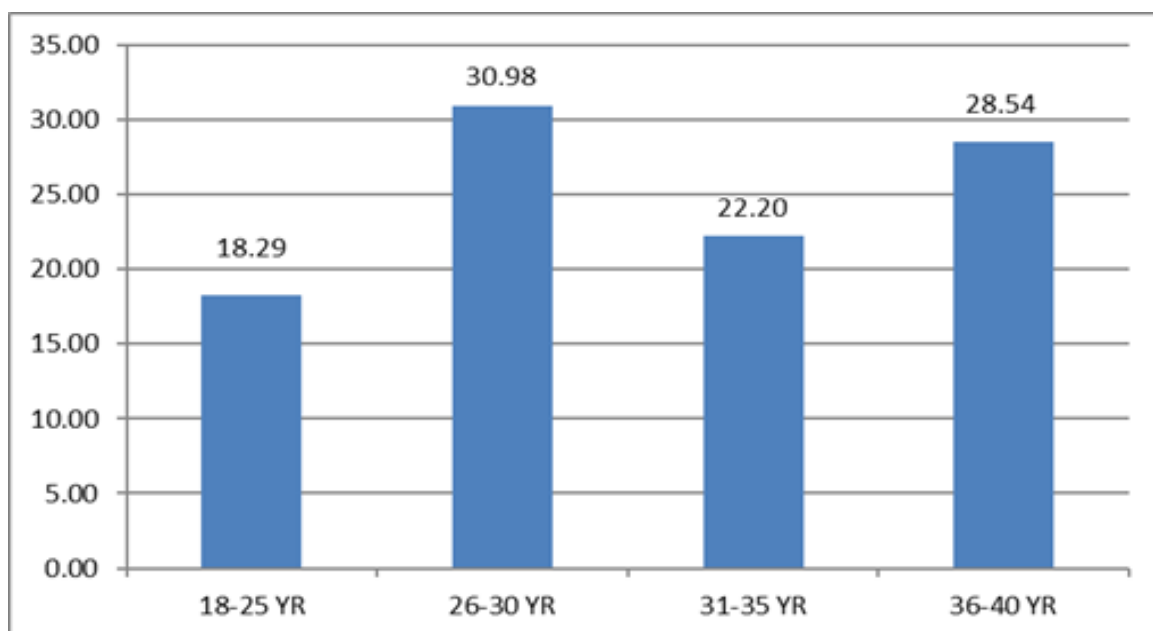
Table 1 gives the abbreviated item content for the SF 36 health survey for health domain scales. The scoring was performed using the scoring rules for the RAND 36 item health survey version 1. Scale scores represent the average for all items in the scale that the respondent answered. Internal consistency of the scale was determined by calculating Cronbach's alpha for each domain of the scale. Table 2 presents information on the reliability, central tendency, and variability of the scales scored using this method of averaging. It may be noted that Cronbach's alpha values vary from 0.55 to 0.91. Cronbach's alpha was at least 0.70 and 0.90 for the group and individual level analyses respectively proving the validity of the internal consistency [15] (Table 2). There are eight questions in the RAND scale which measure pre and post responses for various aspects of women's health. Apart from this, there is one question which measures a pre and post response to overall health condition: Overall rating of general health. There has been an improvement in all these domains post SKY and this improvement is statistically significant. The

improvement in general health post SKY is of the order of 75%. The details are given in Table 3.

The respondents have grouped age-wise in four groups as mentioned above. It has been observed that there is a statistically significant improvement ($p < 0.05$) in post SKY responses in all the four age groups in respect of all the attributes of health except the attribute of pain interfering with normal work, which is found to be dependent on age group (Chi Sq Cal/Crit (0.05,12) 30.46/21.07). Thus it can be observed that improvement in health is more or less homogeneous across all the age groups. The details are shown in Table 4.

Interestingly, the number of years of SKY practice (1 to 5 yrs, 6 to 10 yrs, 11 to 15 yrs, and 16 yrs and more) has shown no relationship with women's general health in all the attributes of health. The improvement is homogeneous to all the age groups. Table 5 gives the details. However, some of the attributes of general health like cutting down on work due to health, the extent that physical health/emotional problems interfered with normal social activities with family after SKY, the experience of pain and extent pain interfering with normal work are dependent on frequency of practice of SKY. Table 6 gives the details of Chi sq values.

Figure 1: Age distribution of the women who completed the questionnaire



A total of 410 women participated in the study and completed the questionnaire. The respondents in the various age groups were 18-25 years (75), 26-30 years (127), 31-35 years (91), 36-40 (117). Figure 1 shows the age group-wise distribution in % form.

Table 2: Measurement of Chronbachs alpha score

SCALE	ITEM	Chronbach's ALPHA	MEAN	SD
Physical Functioning	10	0.916	24.4209	3.0277
Role Limitations	5	0.82	19.8982	3.4097
Energy/Fatigue	4	0.621	34.0783	4.8012
Emotional well being	5	0.773	27.5775	3.0314
Social functioning	2	0.559	27.3399	3.3091
Pain	2	0.776	27.6232	3.5351
General Health	5	0.727	25.9178	6.0798

Table 3: Overall comparison before and after SKY practice: impact on general health

Attribute	Before SKY	After SKY	Change Significant (p<0.05)
Rating of general health (% of Ex/V Good)	14.39%	74.63%	Yes
Amount of time cut down on work due to health (Yes%/No %)	44.39/54.39	22.20/76.59	Yes
Accomplished less than normal due to health (Yes/No %)	52.93/43.17	22.93/73.17	Yes
Limitation in work or other activities due to health (Yes/No%)	50.98/48.05	17.56/81.46	Yes
A Had difficulty in performing work(Yes/No%)	60.0/39.27	15.37/83.90	Yes
Didn't do work or other activities as carefully due to health (Yes/No %)	49.51/49.51	19.76/79.27	Yes
Extent that physical health/emotional problems interfered with your normal social activities with family, friends, groups (Not at all/slightly %)	8.78/20.49	36.83/39.76	Yes
Body Pain experienced (severe/V. Severe %)	19.75/11.95	4.62/1.46	Yes
How much did pain interfere with your normal work (Not at all/A little)	15.61/19.26	33.90/41.95	Yes

Table 4: A statistically significant improvement ($p < 0.05$) in post SKY responses in all the four age groups in respect of most of the attributes of health.

Attribute	Dependency	Chi Sq Cal	Chi SqCrit (alpha, df)
Amount of time cut down on work due to health (Yes%/No %)	Independent	0.08	7.81(0.05,3)
Accomplished less than normal due to health (Yes/No %)	Independent	3.44	7.81(0.05,3)
Limitation in work or other activities due to health (Yes/No %)	Independent	1.31	7.81(0.05,3)
A Had difficulty in performing work(Yes/No%)	Independent	1.36	7.81(0.05,3)
Didn't do work or other activities as carefully due to health (Yes/No %)	Independent	1.14	7.81(0.05,3)
Extent that physical health/emotional problems interfered with your normal social activities with family, friends, groups (Not at all/slightly %)	Independent	13.62	21.02(0.05,12)
Body Pain experienced (severe/V. Severe%)	Independent	18.50	24.99(0.05,15)
How much did pain interfere with your normal work (Not at all/A little %)	Dependent	30.46	21.07(0.05,12)

Table 5: NUMBER OF YEARS SINCE SKY and improvement of all symptoms

ATTRIBUTE	DEPENDENCY	CHI SQ CAL	CHI SQ CRIT(alpha, df)
Health rated after SKY	Independent	11.27	16.91(0.05,9)
Amount of time cut down on work due to health after SKY	Independent	2.52	7.81(0.05,3)
Accomplished less than normal due to health	Independent	4.09	7.81(0.05,3)
Limitation in work or other activities due to health	Independent	5.74	7.81(0.05,3)
Had difficulty in performing work after	Independent	3.38	7.81(0.05,3)
Didn't do work or other activities as carefully due to health after SKY	Independent	3.63	7.81(0.05,3)
Extent that physical health/emotional problems interfered with your normal social activities with family after SKY	Independent	10.66	21.02(0.05,12)
Pain experienced	Independent	23.46	24.99(0.05,15)
How much did pain interfere with your normal	Independent	16.74	21.02(0.05,12)

Table 6: Frequency of Practice of SKY and dependency

ATTRIBUTE	DEPENDENCY	CHI SQ CAL	CHI SQ CRIT(alpha, df)
Health rated after SKY	Dependent	30.79	24.99(0.05,15)
Amount of time cut down on work due to health	Dependent	14.10	11.07(0.05,5)
Accomplished less than normal due to health	Independent	7.58	11.07(0.05,5)
Limitation in work or other activities due to health	Independent	4.56	11.07(0.05,5)
AA(Had difficulty in performing work after SKY	Independent	5.60	11.07(0.05,5)
Didn't do work or other activities as carefully due to health after SKY	Independent	2.89	11.07(0.05,5)
Extent that physical health/emotional problems interfered with your normal social activities with family after SKY	Dependent	51.67	31.41(0.05,20)
Pain experienced after SKY	Dependent	48.57	37.65(0.05,25)
How much did pain interfere with your normal work after SKY)	Dependent	31.41	31.41(0.05,20)

Figure 2: Frequency of practice of SKY



Discussion

Our study is the first study which demonstrated the effect of SKY practice on general women's health. This study has shown how increased frequencies of SKY practice not only improved social and mental functioning of women but also decrease the time taken off work due to general health issues in women. In addition, our study showed a reduction in pain, improvement in the quality of life and significant improvement in general health in all domains in 75% of women. The limitations of this study include recruitment of participants into this study who had enrolled in the Art of Living programs, which could involve an element of self-reported bias in the study. The study was not randomized which would eliminate the element of bias and also would allow an individual observation of the impact of SKY on health parameters.

Mental stress has an effect both on the brain and heart functions. SKY technique is an effective stress reducer and reliever. It improves human stress tolerance and enhances cognitive performance. A recent study has shown the beneficial effects of SKY techniques as a good alternative to medication for stress management [13]. In addition, SKY induces significant oscillations in cardiac autonomic tone. Parasympathetic activity increases and sympathetic activity decreases and thereby balancing the adrenergic-vagal tone. This balance is achieved over longer periods of the practice of SKY technique [16].

SKY practices have shown to work at the molecular level as demonstrated by rapid gene expression alterations which may be the basis for their long-term cell biological and higher-level health effects [18]. In accordance to the pain task force white paper, more research and dissemination of the role of effective non pharmacological treatments in pain focused on the short and long-term therapeutic and economic impact of comprehensive care practices are required [19].

The key points of the study include significant improvement in respect of all the attributes of health post SKY responses in all the four age groups, thus it can be observed that improvement in health is more or less homogeneous across all the age groups. In addition, the amount of time cut down on work due to health after SKY practice was decreased dependent on the increased frequency of practice. The findings of this study empha-

size the importance of an effective non-pharmacological intervention to aid women globally. This study highlights the use of SKY practice in general women's health and is the first study in the literature evaluating SKY practice on parameters of women's health including social and emotional wellbeing.

The findings of this study are valuable in establishing a role for non-pharmacologic yoga-based mind-body intervention like SKY practice in improving physical, social and mental functions in women across the world. A larger study in the form of randomized controlled trials needs to be conducted to evaluate this important observation.

Conclusions

This study shows that a cost-effective non-pharmacological intervention (yogic breathing technique) showed a reduction in pain, improvement in the quality of life and significant improvement in physical and mental health in 75% of women. These findings have paramount importance in aiding the improvement of general women's health worldwide. This cost-effective intervention is valuable in reducing the stressors of everyday living which results in a marked improvement in the quality of life.

Declarations

Ethics approval and consent to participate: Ethical approval was obtained by the IRB of Sri Sri Institute for Advanced Research (SSIAR/IEC/05). The consent obtained from study participants was verbal. The ethics committee approved verbal consent being obtained from women who consented to participate, as this was a questionnaire-based study. Availability of data and material: Yes can be provided on request. Authors' contributions: SS, SJ: conception of the research project, drafting the manuscript

NR, AG, SR, DK: a collection of data

SK: Statistical analysis

RW: Edited and help with drafting the manuscript

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