

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Effect of Sudarshan Kriya Yoga™ and Associated Meditation Techniques on the Connection and Sensitivity towards Environment

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ABSTRACT: The environment needs our attention now more than ever before – the reason – environmental degradation and global warming. These issues have assumed alarming global proportions and not only require immediate attention and action at political and policy level, but from every individual in our society. Along with intervention and policy discussions, the current efforts in the conservation and protection of environment are also focused on the behavioral aspects of humans and their responses to environmental issues. Several strategies are being implemented to achieve grassroots solutions using ‘collective effect’ of individuals who have a far-reaching impact on the environment and its conservation. ‘Collective Effect’ is described as participation from the community and change in their behavior towards the environment. Mental and emotional sensitivity towards the surroundings and connection with the environment is an important part of collective effect and hence incrementing the rates of individual participation towards actions that mitigate environmental degradation. It has been observed that on regular practice of Sudarshan Kriya Yoga (SKY) and associated meditation techniques, an individual not only improves self-awareness, but as observed, develops human values within, that reflects in the connection and sensitivity with environment as well. A multi-country cross-sectional study was undertaken to determine the effect of the aforementioned techniques taught in Art of Living workshops on the connectivity with nature, environmental concern and environmental behavior in people from 32 countries from across the globe. Using scientifically accepted sociometric parameters, here we present for the first time the documentation and analysis of the relationship between the effect of the practice of SKY, associated meditation and breathing techniques and connectivity with nature, environmental concern and environmental behavior. A questionnaire-based assessment was conducted on 1200 subjects who participated in the Art of Living workshops, between the age group of 18-70 years. Pre and Post assessments were conducted in person and also through digital links of assessment form, using the ‘Connectedness to Nature Scale’ (CNS) as a tool.

A statistically significant increase in t ($\alpha = 0.05$) has yielded very encouraging results, where a shift in the participants responses to questions that reflect connectivity with nature, environmental concern and environmental behavior has mostly been observed from the Neither Agree Neither Disagree category to the Strongly Agree category. Through this unique, first of its kind study we have shown a positive correlation between SKY and associated meditation practices

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Vol. 7, Issue 12, December 2018

and an individual's sensitivity and care towards environment.

KEYWORDS: Sudarshan Kriya Yoga (SKY), Meditation, Environment conservation, Connectivity with nature, Environmental concern, Environmental behavior, sensitivity, people's participation, environmental degradation, global warming.

I. INTRODUCTION

The global human population of 7.6 billion individuals is growing at a rate of 3,60,000 new humans each day. Due to this population explosion, the Earth's resources are being used at its maximum. Currently, 55% of the total population lives in cities, and is expected to reach 68% by 2050 [1]. This increase to 68% translates to adding 2.5 billion people by 2050 to urban areas, 90% of which will be mostly in Asia and Africa. Leading to a skewed distribution, India is projected to have added 416 million urban dwellers, China 255 million and Nigeria 189 million [1].

In city dwellers, exposure to the natural environment has become severely limited. Humans have used the environment to the fullest and polluted it as well; overstepping the self-purification capacity of all realms of nature including water, air and land – this has created severe damage, which results in high cleanup costs [2]. This has also resulted in loss of biodiversity, affected livelihoods and natural food sources (e.g. fish). This has led many scientists to call our times as the 'Anthropocene epoch – a human-dominated geological epoch' [3]. This term describes the significant impact human activities have had on the environment [4].

The present study evaluates the hypothesis that the practice of SKY and associated meditation techniques offered by the Art of Living create a major positive shift in the attitude of individuals and makes them sensitive to the pertinent environmental issues of degradation and global warming. The present study aims to evaluate the change in individuals' attitude of environmental sensitivity as a result of practicing Sudarshan Kriya Yoga and associated meditation techniques learned from the Art of Living, in terms of "Connectivity with Nature, Environmental Concern and Environmental Behavior." To this end, we employed the Connectedness to Nature Scale (CNS) as a measuring tool.

II. LITERATURE SURVEY

Human influenced activities have led to rising of temperatures across the globe (global warming). While global warming refers to the rise in temperature with specific reference to man-made activities, climate change includes global warming and the effects caused due to it. This global climate crisis has called for immediate action [5]. Global average temperature, an indicator of global climate change shows an increase of approximately 1.4°F since the early 20th Century [6]. The developmental activities mainly in the industrialized world do not have localized effects, but have far reaching consequences to places unrelated to such activities. Environmental degradation and its consequences are being experienced by living organisms across the globe. The degradation of the environment shows a bleak picture even as restoration efforts are being taken up on war footing at the global, national and local levels.

People's participation contributes tremendously to the success of any environmental conservation effort [7, 8]. Although well observed, this is less acknowledged and an under-researched area. For the majority of restoration efforts, only technology coupled with policy without people's participation has taken place. Environmental protection, including restoration efforts, depend to a great extent on the daily choices made by individuals – their behavior towards the environment (sensitivity), what they consume or what they are willing to give up (making intelligent choices), apart from the schemes implemented by regulatory bodies. Therefore, studying and understanding the underlying principles of pro-environmental attitudes and behaviors, as well as the factors that determine them is a fundamental part of understanding the true potential to foster greater sustainable development [9].

A few studies have been conducted to identify the various factors that affect the connection of an individual with the environment and nature. The role of music in developing the values of conservation has been discussed [10]; quantitative studies have explored the significant and meaningful relationship between friluftsliv, operationally defined as Scandinavian/Norwegian philosophy of nature-based outdoor recreation participation, and environmental connectedness [11, 12]. Celikyay and Uzun [13] state that environmental law is only the beginning of the environmental protection process. It consists only a theoretical framework with some rules for environmental

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Vol. 7, Issue 12, December 2018

protection. To achieve good governance for environmental protection, environmentally sensitive local administrations and communities are essential. In a case study on Rajayoga (based on the eight-fold path of yoga that emphasizes the benefits of meditation for spiritual self-realization and the purposeful evolution of consciousness), it was mentioned that spiritual values are the core of sustainable life and depletion in these values causes the social issues. The results claim that Rajayoga practice develops the spiritual values and this leads to a disciplined and positive life resulting in a positive impact on nature and environment; results further state that environmental sustainability [14] is deeply associated with the spiritual sustenance and we need to address many of these environmental issues at the spiritual level [15]. Another research study showed how sustainable consumption was achieved through spiritual practices [16]. Kals et al. [17] showed the significance of emotional affinity toward nature for protecting the environment and nature. Witt et al. [18] reported that inner growth and contemporary spirituality was associated with connectedness with nature and willingness to change and more sustainable lifestyles; while focus on money and secular materialism is associated with instrumentalism. Apart from teenagers and adults, studies have also been carried out with school children as subjects in order to develop a tool that could indicate or predict long-term environmental interest and the development of a conservation ethic among children [19].

The Art of Living is an international not-for-profit educational and humanitarian organization founded in 1981. It has been conducting workshops to teach yoga, pranayama, meditation, Sudarshan Kriya Yoga (SKY) and human values for more than 37 years [20]. The techniques taught by the Art of Living have been instrumental in transforming the lives of millions in 155 countries around the globe. Through these techniques people experience reduced stress, enhanced wellbeing, happiness, peace of mind and improved mental and physical health. This sensitivity and responsibility for the environment has also been observed to be heightened in individuals who practice techniques including Sudarshan Kriya Yoga and meditation techniques. It is also observed that they also gradually adopt a more eco-friendly lifestyle. This is evident by the multitude of environmental initiatives initiated by the volunteers of the Art of Living. For example, Art of Living volunteers have nurtured close to 55 million saplings globally, including planting a record 9.6 million saplings in the year 2008 as part of the Mission Green Earth [21]. Art of Living volunteers, along with scientific experts, have also initiated holistic river rejuvenation (restoring the activity of the river) work for 41 rivers in India, consisting of desilting and cleanup of water bodies like ponds, lakes and rivers, riverine ecosystem development, construction of check-dams and water pools, practice of zero budget natural farming, among others. This multipronged approach has led to flowing of dried-up streams, rivers apart from water level rise in dried-up bore-wells and open wells relieving villagers from water scarcity and drought, and increased agricultural outputs. Apart from India, Art of Living volunteers are engaged in several environmental initiatives around the world. The visible success of these projects in a short time with limited resources can be attributed to extensive participation from thousands of volunteers and community who have undergone Art of Living Programs and awareness camps. Taking up such huge tasks with wide-scope and a large-scale by volunteers is only possible when one feels the connectivity with nature.

These spiritual practices including yoga, pranayama (breathing techniques), Sudarshan Kriya Yoga and associated meditation techniques are gaining popularity as evident from the presence of the Art of Living in more than 155 countries, with close to 370 million people already been positively impacted. It has been observed anecdotally that this is mainly due to the fact that individuals who have undergone such spiritual practices not only feel that they have improved mental and physical health, but also have a greater connection with protecting and conserving the environment (environmental concern) and making eco-friendly and sustainable living choices (environmental behavior). With more than 100 publications, research on SKY with respect to reduction in stress-induced hormones and responses has been undertaken from the late 1990s. Yogic breathing, defined by Zope and Zope [22] as a manipulation of breath movement, has been shown to positively affect immune function, autonomic nervous system imbalances, and psychological or stress-related disorders. Sudarshan Kriya Yoga (SKY) is a type of cyclical controlled breathing practice with roots in traditional yoga that provides relief for depression [22] (Zope and Zope, 2013). It is a unique rhythmical breathing technique, and along with Ujjayi breathing (breathing against airway resistance) and Bhastrika (forceful nasal breathing) form the Sudarshan Kriya Yoga (SKY) [23]. Numerous researchers have demonstrated significant improvements in psychological and physiological outcomes with SKY in adults, including decreases in clinical and subclinical anxiety and depression, subjective stress, post-traumatic stress symptoms, impulsivity, tobacco use, among others. It helps to increase level of calmness, mental focus, regulation on emotions and, in other words the

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Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

overall wellbeing [23]. During various anti-stress programs in several populations, SKY has demonstrated significantly reduced anxiety scores, indicating stabilization of mental activity, enhanced brain function, and resiliency to stress [22]. The first and foremost principle of environmentalism (concern and action taken to protect the environment) is ‘everything is interconnected’ [24]. Through the experience of the Art of Living, it has been observed that this sensitivity is something everyone has within but only gets expressed in one’s actions when they meditate regularly. “The Nature and the environment are very delicate and sensitive. In order to grasp their delicate nature we need to have sensitivity within ourselves” [25]. The sensitivity and connectivity that our ancient civilizations had with nature and the environment, is now witnessing a downward spiral, even though exposure to the natural environment plays a key role in human development: physical, emotional and intellectual, with the environment even impacting the gene expression [26].

People’s participation is a key component of environment conservation, as discussed. Attempts are being made to provide theories to explain the development of different attitudes, such as the New Environmental Paradigm that focuses on the relationship between people and nature, and sees humans as a part of the natural environment [27, 28]. Psychologists have developed several explicit measures of connection with nature, such as the Inclusion of Nature in Self (INS) [29], Environmental Identity (EID) [30], Connectedness to Nature (CTN) [31], and Nature Relatedness (NR) [32]. It is equally important to identify factors that enhance connection and care towards environment in people. Identification of these attributes and encouraging their practice has to be an important part of environmental conservation efforts.

III. PROPOSED METHODOLOGY AND DISCUSSION

Study population

This assessment was carried out on 1200 subjects from 32 countries across the globe, between the age group of 18-70 years, all who had undergone the Sudarshan Kriya Yoga (SKY) and associated meditation techniques of the Art of Living. Assessments were conducted in person and also through digital links using social media. For in person assessment, subjects were randomly selected from visitors, various program participants and residents in The Art of Living International Center.

The Connectedness to Nature Scale (CNS) was used as a tool for assessment. We chose to use this scale as it can effectively predict environmental behaviors [31, 33]. Dutcher et al. [34] proposed that environmental concern and behavior are a function of a sense of connectivity with nature, i.e. environmental values result from developing connectivity with nature. When an individual is connected to nature, a sense of boundaries between, nature and others tend to be less strong, and this can be operationally defined and quantified, thus creating the CNS. Using this a survey was conducted wherein the respondents (landowners) showed a high level of connectivity with nature, and connectivity was associated with a significant and positive relationship to environmental concern and environmental behavior in multiple regression models.

Concept measurement

Demographic and other personal details were followed by the sociometric parameters of Connectedness to Nature Scale [34] that consisted of 16 questions –

1. Connectivity with nature – this comprised of five questions that were designed to determine the extent to which the survey participants experienced a sense of connectivity with the natural environment. Four of the five questions used the Likert response categories that ranged from strongly disagree to strongly agree and were scored from one to five respectively. The fifth question’s response was scored from one to three.
2. Environmental concern – this parameter was operationalized by five questions [35]. Each of the five items was scored using a 5-point Likert scale of agreement.
3. Environmental behavior – a series of six yes/no-based questions were used to measure this parameter [36].

International Journal of Innovative Research in Science, Engineering and Technology

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Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Table 1: Sociometric Parameters – Connectedness to Nature Scale

Connectivity with nature	1) I see myself as part of a larger whole in which everything is connected by a common essence.
	2) I feel a sense of oneness with nature.
	3) The world is not merely around us but within us.
	4) I never feel a personal bond with things in my natural surroundings, like trees, a stream, wildlife, or a view on the horizon.
	5) Self-and-nature circles.
Environmental concern	1) If things continue on their present course, we will soon experience a major ecological catastrophe.
	2) The problems of the environment are not as bad as most people think.
	3) We are fast (quickly) using up the world's natural resources.
	4) People worry too much about human progress harming the environment.
	5) We are spending too little money on improving and protecting the environment.
Environmental behavior	Have you or members of your household: 1) Contributed money time to an environmental or wildlife conservation group?
	Have you or members of your household: 2) Stopped buying a product because it caused environmental problems?
	Have you or members of your household: 3) Attended a public hearing or meeting about the environment?
	Have you or members of your household: 4) Contacted a government agency to get information or complain about an environmental problem?
	Have you or members of your household: 5) Voted for or against a political candidate, in part, because of his or her position on the environment?
	Have you or members of your household: 6) Changed your behavior in any way because of your concern for the environment?

These three sections consist of five, five and six questions respectively as mentioned (Table 1). Subjects were required to respond to these 16 questions on the basis of their experiences before and after undergoing the Art of Living workshops.

Total respondents were 1200; however since not all participants responded to each question, the number of respondents for each question was different. The subjects were randomly selected from the total population of people who have undergone SKY and associated meditation.

Student *t* test (two tailed paired *t*-test) was run on the data to analyze the shift between pre and post responses. Chi square analysis was carried out to determine if the years of practice made a difference to environmental connection and sensitivity.

The significant improvement in the sociometric parameters in subjects who underwent the SKY and associated meditation techniques offered by the Art of Living suggest that these practices play a pivotal role in peoples' participation in environmental restoration efforts. SKY, a breath-based technique's role in improving majority of the subjects' connectivity, perception and sensitivity for the environment is in accordance with many of the studies where breathing techniques are known to and regularly recommended for relaxation, stress management, control of psycho physiological states, and to improve organ function [37].

This reduction in anxiety due to the practice of the SKY, meditation and breathing techniques, helps one experience a peaceful state of mind, a pre-requisite as one can say, to develop that sensitivity to things around you, including your

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

environment and nature on the whole. SKY has also been shown to reduce stress, anxiety and impulsive behavior. It also increases happiness and calms the mind. Several research studies have also shown that breathing techniques and meditation increases awareness [38, 39, 40]. This sense of awareness is both towards the self and to their surroundings. These practices have also been shown to increase happiness, empathy and a sense of connectedness – however this has been more explored for human interactions. We have successfully shown that practice of SKY and associated meditation techniques also positively impact the sense of connectedness with the environment as well.

A large body of research demonstrating that connectedness to nature is an important predictor of environmentally responsible behavior is also available [41]. The degree to which humans feel connected to nature determines their attitude towards issues related to the environment [42]. The change of individual behaviors and lifestyles is generally considered to be of vital importance for making the transition to a sustainable society [43, 44, 45]. In the present study, the significant change in the various parameters of the Connectedness to Nature scale before and after undergoing the Sudarshan Kriya Yoga (SKY) and associated meditation techniques offered through the Art of Living indicates that these techniques can not only bring a positive change to an individuals health and personal life but also to their surrounding as well. A variety of factors have shown to play a role in the development of connection to nature including contact with the natural world, childhood experience, certain interventions and socio-cultural status [46]. Connection to nature may be an important influence on other environmental behaviors, practices and beliefs.

IV. RESULTS

The results in this study were analyzed for the effect of Sudarshan Kriya Yoga and associated meditation techniques on the sociometric parameters of Connectivity with nature, Environmental concern and Environmental behavior. 1200 subjects were randomly selected for the assessment as they had undergone Sudarshan Kriya Yoga and associated meditation techniques offered by Art of Living. The sample size and therefore the degrees of freedom varied for each statement depending on the number of respondents for the same. 90% respondents were from India and rest from the other countries. 90% of participants had undergone SKY and associated meditation techniques and 10% had undergone only SKY.

The Connectedness to Nature Scale was significantly and positively associated with both environmental concern and environmental behavior. The survey respondents generally indicated a high level of connectivity with nature. Analysis of our results revealed a significant change using the Student's *t*-test at $\alpha = 0.05$ (Table 2), in the attitude of participants who underwent Sudarshan Kriya Yoga and associated meditation techniques. This is evident from their response to questions related to Connectivity with nature, Environmental concern and Environmental behavior.

The questions for Connectivity with nature mainly comprised of those relating to an individual's attitude and response to nature (Table 1).

International Journal of Innovative Research in Science, Engineering and Technology

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Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

Table 2: Paired *t*-test Results of responses of subjects before and after Art of Living programs (Sudarshan Kriya Yoga and associated meditation techniques)

Statements	Shift in Likert Scale response		P Value ($\alpha = 0.05$)
	Pre	Post	
OVERALL TWO DOMAINS CONNECTIVITY WITH NATURE AND ENVIRONMENTAL CONCERN			0.00158 x10 ⁻¹⁷²
DOMAIN WISE			
Connectivity with Nature (First Four Questions)			0.00823 x 10 ⁻²⁰⁴
Environmental Concern			0.00323 x 10 ⁻⁷⁸
INDIVIDUAL			
Connectivity with Nature			
1) I see myself as part of a larger whole in which everything is connected by a common essence.	3	5	0.0079 x 10 ⁻¹⁹⁵
2) I feel a sense of oneness with nature.	3	5	0.00125 x 10 ⁻¹⁷⁵
3) The world is not merely around us but within us.	3	5	0.00282 x10 ⁻²¹⁶
4) I never feel a personal bond with things in my natural surroundings, like trees, a stream, wildlife, or a view on the horizon.	3	3	0.00247 x10 ⁻¹⁹
5) Self and Nature circles.	1	3	0.00405 x10 ⁻²⁰⁵
Environmental Concern			
1) If things continue on their present course, we will soon experience a major ecological catastrophe.	4	5	0.00143 x10 ⁻⁸³
2) The problems of the environment are not as bad as most people think.	3	3	0.013 ^{NS}
3) We are fast (quickly) using up the world's natural resources.	4	5	0.00327 x10 ⁻⁶⁵
4) People worry too much about human progress harming the environment.	3	4	0.00306 x10 ⁻³⁰
5) We are spending too little money on improving and protecting the environment.	4	5	0.00495 x10 ⁻⁷⁰

Likert Scale response: 1 = Strongly Disagree; 2 = Mostly Agree; 3 = Neither Agree Neither Disagree; 4 = Mostly Agree; 5 = Strongly Agree

The significant change ($\alpha = 0.05$) was evident from the P value which was ≤ 0.05 (0.00823×10^{-204}) (for the first four questions with five options on the Likert scale) and 0.00404×10^{-205} (for the last question with three options) (Table 2). The Connectivity with Nature section revealed, for a majority of responses, a shift in attitude of the subjects from Neither Agree Neither Disagree to Strongly Agree. Figure 1 shows the percentage change in participants' response to the questions on Connectivity with nature (before and after undergoing the Art of Living workshops) for the Strongly Agree category (first four questions) and Mostly Agree category (fifth question).

In case of Environmental Concern, the domain P value at $\alpha = 0.05$ was 0.00323×10^{-78} . This is a clear indication of the shift in response from the Disagree categories to Agree (Table 2). Figure 2 shows the percentage change in participants' response to the questions on Environmental concern (before and after undergoing the Art of Living workshops) for the Strongly Agree category. For the third parameter of Environmental Behavior where responses were in the form of Yes and No (six questions) and calculated as change in percentage, a stark increase in the post assessment responses was observed for the Yes responses which was $\geq 50\%$ of the pre responses, as depicted in Figure 3.

International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 7, Issue 12, December 2018

The overall domain P value including the nine questions of Connectivity with nature and Environmental concern was 0.00158×10^{-172} at $\alpha = 0.05$ level of significance (Table 2).

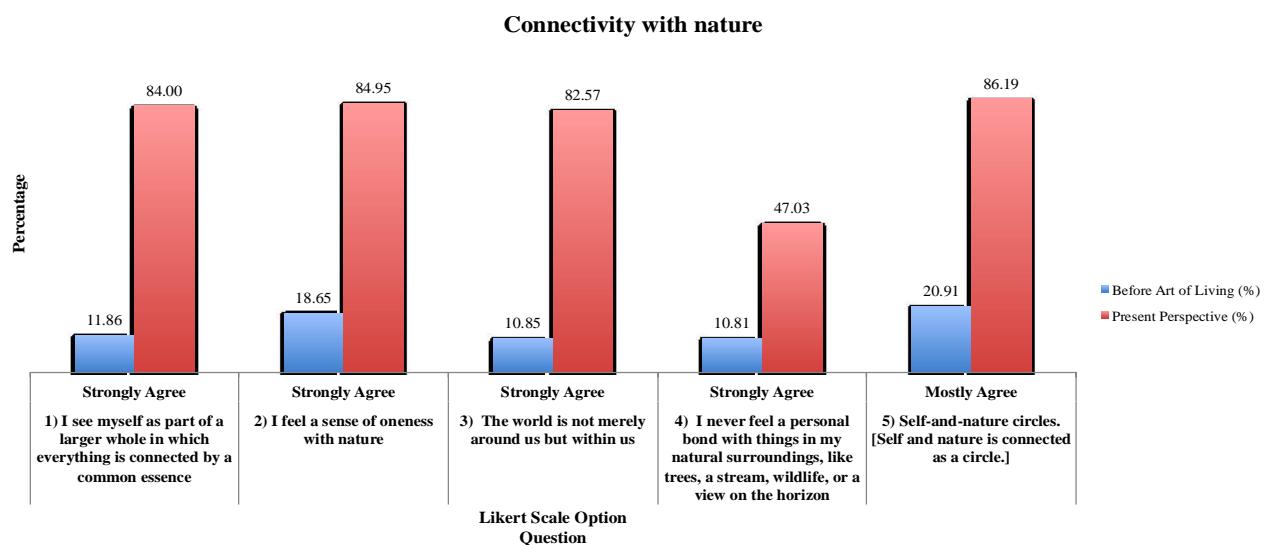


Figure 1: Changes in responses of subjects' to the Connectivity with Nature questions, pre and post Sudarshan Kriya Yoga and associated meditation techniques. The changes for the Likert Scale 'Strongly Agree' category have been highlighted.

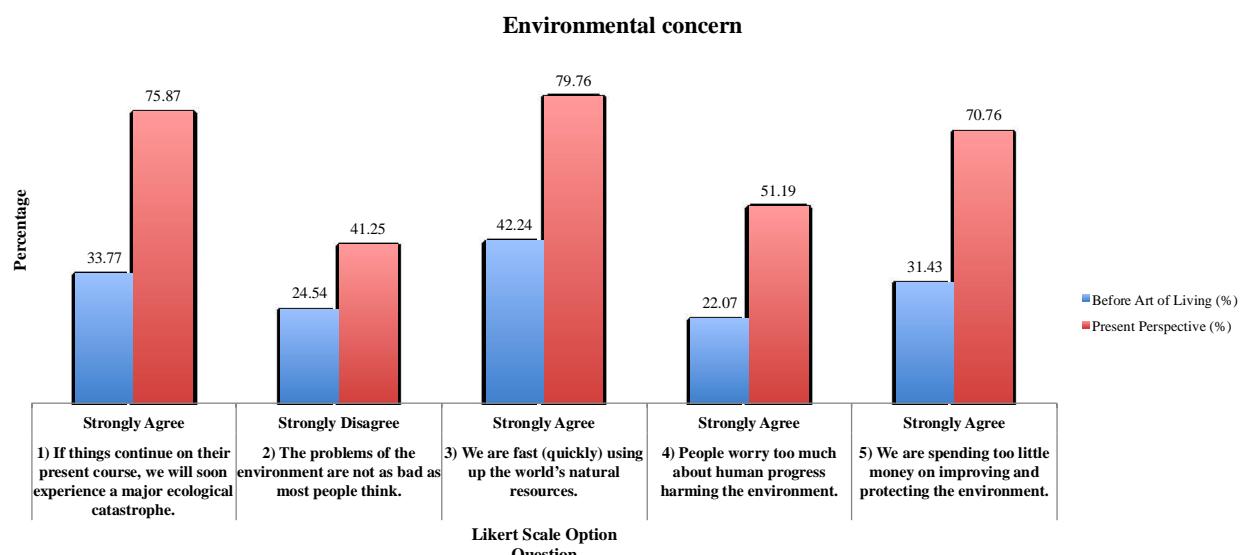


Figure 2: Changes in responses of subjects' to the Environmental Concern questions, pre and post Sudarshan Kriya Yoga and associated meditation techniques. The changes for the Likert Scale 'Strongly Agree' category (except for question 2) have been highlighted.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 12, December 2018

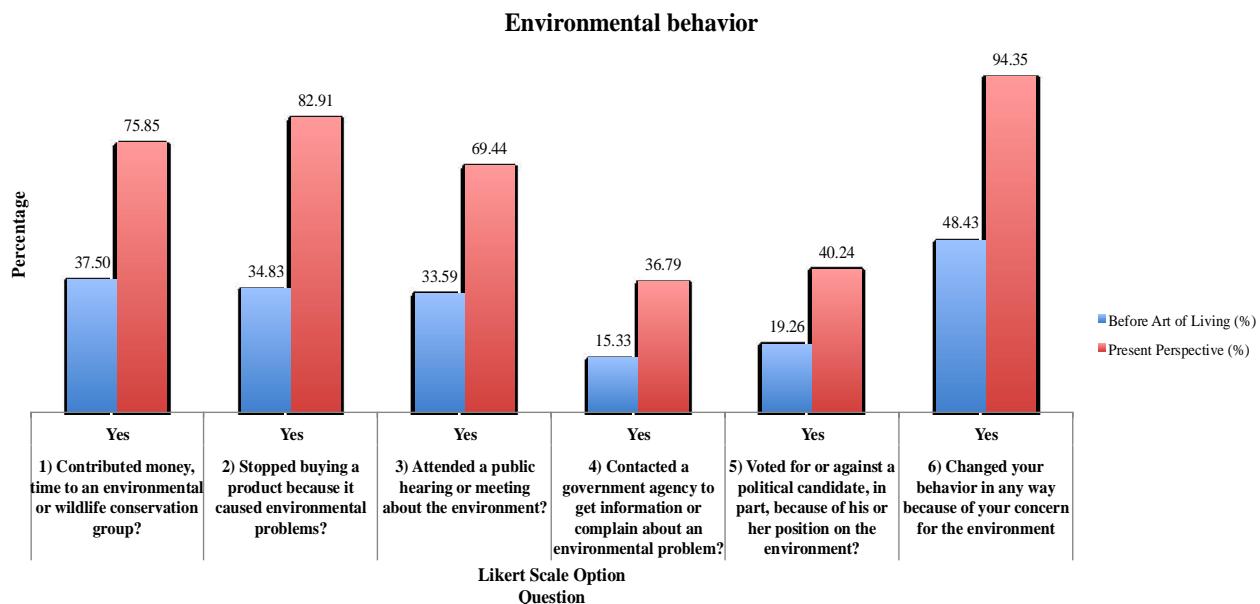


Figure 3: Changes in responses of subjects' to the questions on Environmental Behavior, where subjects were asked if "Have you or members of your household" followed by the aforementioned six questions. Only changes in the proportion of the Yes response (%) has been highlighted here for pre and post Sudarshan Kriya Yoga and associated meditation techniques.

Table 3: Chi Square test results of subjects' response with respect to their years of practice after having undergone the Sudarshan Kriya Yoga and associate meditation techniques. Only significant responses have been highlighted here.

Category	Question	Chi Square calculated	Chi Square critical (α , df)
Connectivity with Nature	Q1) I see myself as part of a larger whole in which everything is connected by a common essence	15.74	15.50 (0.05, 8)
	Q5) Self and nature circles	10.16	9.48 (0.05, 4)
Environmental Concern	Q2) The problems of the environment are not as bad as most people think	19.52	15.50 (0.05, 8)
	Q3) We are fast (quickly) using up the world's natural resources	16.08	15.50 (0.05, 8)
Environmental Behavior	Q2) Have you or members of your household Stopped buying a product because it caused environmental problems	9.72	5.99 (0.05, 2)

A Chi-square analysis (Table 3) for the following statements revealed that the number of years of practice was positively correlated to the subjects' environmental connection, concern and behavior. The results mentioned in the table show a general trend that greater than three years of spiritual practices make people more sensitive to their environment. This strengthens our hypothesis that spiritual practices make people sensitive to their environment; in their attitude as well as in making sustainable choices; choices that satisfy their needs without compromising the needs of the future generations.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 12, December 2018

V. CONCLUSIONS

In this study, we show that individual sensitivity and care towards environment is positively impacted by practices like the Sudarshan Kriya Yoga, and associated meditation and breathing techniques. A marked and significant improvement in the Sociometric parameters of Connectivity with nature, Environmental concern and Environmental behavior scales was observed as hypothesized in the practitioners of SKY and associated meditation techniques before and after practice. This improvement indicates the positive impact of SKY and associated meditation techniques on the attitude of concern and sensitivity for environmental issues and nature as a whole. This can be attributed to the overall improvement in health and well-being, happiness and greater peace of mind which in turn leads to increased empathy, connectedness and awareness, both towards oneself and one's surroundings.

These results are very significant as people's participation is an important, but often overlooked component of environmental conservation efforts. Similar studies suggesting an improvement in human behavior after practicing yoga, pranayama and meditation are gaining popularity, and are contributing immensely in understanding and exploring the crucial role peoples' participation play in making environmental restoration efforts sustainable. The increased connectivity with nature and environment after SKY and associated meditation techniques have a role to play in the success of environmental restoration efforts taken up by Art of Living, which are completely volunteer driven and community based. Results indicate that after undergoing the Art of Living workshops participants experienced an increased sense of connection with nature, and their concern and behavior for the environment showed a positive change. SKY and associated meditation techniques have the potential to become a powerful adjunct strategy for environmental conservation along with policy and technology.

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Vol. 7, Issue 12, December 2018

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