Yogic Breathing, Sudarshan Kriya for Treatment of: Depression, Anxiety, Stress, PTSD, Aggression, and Violence

Yoga, an ancient Indian philosophical method, can relieve stress, induce relaxation, and give many health benefits. However varied, its many techniques constitute a psychophysiological therapy which invites applications to psychiatric disorders. For reviews of yoga philosophy, techniques, neurophysiological findings, and studies in anxiety, depression, OCD (Shannahoff-Khalsa et al. 1999), and epilepsy, see Yardi (Kraft et al. 2001) and Becker (Becker, 2000).

Janakiramaiah and colleagues have showed benefits of a yogic breathing technique called Sudarshan Kriya (SKY) in an open preliminary study of 15 dysthyrmics and 9 unipolar major depressives. Depression improved after one month of SKY practice 30 minutes/day and improved further by 3 months (Naga Venkatesha Murthy et al. 1997). In an extension of this study, 15 additional dysthyrmics and 15 melancholics responded positively (Naga Venkatesha Murthy et al. 1998). In a subsequent open study, 80% of 46 dysthyrmics completed a 3-month protocol of SKY 30 min/day. 68% of the completers attained remission (Janakiramaiah N et al. 1998). A comparison study of 45 hospitalized melancholic depressives randomized to ECT, imipramine, or SKY demonstrated that all three treatments were effective with ECT being slightly more so than SKY or imipramine (Janakiramaiah N et al. 2000). Lack of double blinding or placebo control groups limit these studies. Nevertheless, if one considers the low expectable placebo response rate in melancholic depressives, prior research findings that SKY improved REM latency and slow wave sleep and significantly reduced cortisol, it appears that SKY has powerful biological effects. Compliance with the breathing technique in these studies ranged from 56-80% compared to 50% compliance with prescription antidepressants (with complaints of significant side effects from medications).

In developing a neurophysiological model of the effects of yogic breathing on the CNS, we have drawn upon several related fields of research, including: effects of breathing and chanting on hypercapnia and consequent improvements in autonomic regulation and cardiac function; hyperventilation studies; vagal nerve stimulation (VNS); thalamic oscillators; SMR (sensorimotor rhythm) and vigilance; and neuroendocrine effects. Space limitations permit only a cursory partial overview of this model.

Sudarshan Kriya yoga consists of a specific sequence of breathing patterns (pranayam) separated by brief periods of normal breathing: Ujjayi – slow strained breathing against airway resistance at 3 cycles/minute; Bhastrika – forceful exhalation at
20-30 cycles/minute; brief chanting of “om”; Sudarshan Kriya – rhythmic cyclical breathing of slow, medium and fast cycles; meditation; and rest.

Strained breathing occurs in nature when an animal is defeated in battle (Fokkema, 1999). It inhibits activity, increases brain perfusion, increases attention and vigilance (via vagal afferents), slows heart rate, restores energy, prevents hypoxia/hypercapnia (Sovik, 2000; Spicuzza et al. 2000), and prepares the animal to protect itself. During Ujjayi, people feel calmed. The proposed mechanism would be a shift to parasympathetic dominance via vagal stimulation. Bhastrika causes autonomic sympathetic activation and CNS excitation on EEG (Roldan and Dostalek, 1985; Roldan and Dostalek, 1983) with activation of temporo-parietal cortical areas, producing rhythms that are similar to the gamma frequency bands hypothesized to reflect synchronization of neural assemblies (Kwon et al. 1999). The subjective experience is of excitation during Bhastrika followed by emotional calming with mental activation and alertness. Sudarshan Kriya may work like mechanical hyperventilation and electronic unilateral vagal nerve stimulation, which lead to stimulation of thalamic nuclei (see Figure 3) resulting in quieting of frontal cerebral cortex. Slowing of the EEG with hyperventilation is mediated by the vagal nerves, thalamus, and non-specific thalamic projection system (NSTPS) (Balzamo et al. 1991; Patel and Maulsby, 1987). MRI studies show that it quiets the frontal cortical areas, but not the subcortical (Posse et al. 1997). Hyperventilation increased blood flow (PET) to the thalamus in epileptics (Prevett et al. 1995). Vagal nerve stimulation (like hyperventilation) stimulates vagal afferents first to the nucleus tractus solitarius (NTS) and then to the parabrachial nucleus (PB) (see Figure 3). From the PB two pathways diverge. One projects to thalamic nuclei. The midline ventrobasal nucleus of the thalamus probably affects cortical synchronization. The other path to the hypothalamus, amygdala, stria terminalis, and limbic system, affects autonomic, endocrine, and emotional processes (Schachter and Saper, 1998). In a one-year open follow up study of 30 patients treated with VNS for treatment resistant depressive episode, a significant response rate was sustained and further improvements occurred in mental health, social function, and vitality (Marangell et al. 2002).

**Figure 104-4 Neurophysiological Model of Vagus Nerve Stimulation Pathways**

SMR (a pattern of 12-20 cycles/sec found in the sensorimotor cortex) is generated by oscillations of activity between thalamic nuclei. In humans, this requires decreased eye and body movements and creates a more focused state with improved memory, vigilance, attention, sleep, and resistance to seizures (Sterman, 1996). A thalamic gating system is also involved in post-reinforcement synchronization (PRS), a 4-12 Hz rhythm in the parietal cortex associated with reward, satiety, and pleasure. A pilot study comparing 19 AOL Sudarshan Kriya teachers with 15 control subjects found that the EEGs of AOL teachers had increased beta activity (similar to SMR) in the left parieto-occipital area indicating activation of the thalamic generator. This occurred with increased alpha activity. The subjective experience was of calmness and relaxation combined with increased vigilance and attention.
Over time, yoga may reduce stress hormones by transiently increasing opioids, prolactin, vasopressin, and other hypothalamic pituitary hormones. The hypothalamic pituitary axis (HPA) is overactivated in biological depression. In PTSD it is acutely overactivated and then chronically depleted. A 3-month study of SKY found a significant reduction in cortisol (a measure of stress response system activation), increased prolactin acutely, and decreased depression scores (Gangadhar et al. 2000). Meditation was found to result in a 5-fold increase in vasopressin (Travis, 2001). It is likely that meditation and Kriya release not only prolactin and vasopressin, but also oxytocin via vagal afferents to the hypothalamus and anterior pituitary (see Figure 3). Oxytocin enhances feelings of bonding and affection (Carter, 1998; Nelson and Panksepp, 1998). Oxytocin secretion was found to be low in major depression and to increase after treatment with SSRIs (Uvnas-Moberg et al. 1999).

This neurophysiological model presumes strengthening (and stabilizing) of the autonomic and stress response systems, quieting of cortical areas involved in executive functions (such as anticipation, planning and worry), progressive activation of hypothalamic (HPA hormone release), midbrain, and limbic systems (with emotional release and sometimes recall of repressed memories), and balancing of cortical areas (synchronization) by thalamic and medullary generators, and eventual stimulation of the reward systems of the medial forebrain bundle. This model may be of heuristic value in identifying areas for future clinical research. For an in-depth discussion of this model, see Brown and Gerbarg 2002.

SKY can augment the psychotherapeutic and pharmacological treatment of nonpsychotic patients with anxiety and depression, or serve as an alternative treatment for those who prefer not to take medications. Bipolar I patients or unstable rapid cyclers should not be treated with SKY because there is risk of exacerbation of mania. But bipolar-II patients who are stabilized on anticonvulsants other than lithium (yogic breathing can lower lithium levels by increasing lithium excretion) and atypical antipsychotics have benefited from SKY.

Although no formal studies have been done yet, SKY is known to relieve symptoms of PTSD. Dr. Sageman has found that patients with PTSD benefited from SKY training (Sageman, personal communication 2002). In effect, the 6-session SKY course provides both exposure therapy and cognitive-behavioral therapy in a supportive group setting. Like exposure therapy, the rapid breathing can provoke re-experiencing of trauma symptoms in a safe setting. The instructor and group communicate to each participant that they care about and belong to one another. AOL provides psychoeducation in basic human values of acceptance, social responsibility, and community service (Sageman, 2002). The overall effect of this multi-modal program is amelioration of feelings of anxiety, fear, neglect, abuse, rejection, depression, isolation, and worthlessness. Patients with PTSD should be given careful preparation including explanations of what will occur in SKY courses and possible physical/emotional reactions. The therapist should keep in contact with the patient during and after the course to assist with intense emotions that may emerge. Ideally, the physician or therapist should
take at least the introductory course before referring patients in order to understand the program, make appropriate referrals, and support patients through the process.

Programs using SKY for adult incarcerated criminals and for juvenile offenders have found that it substantially reduces aggression and incidents of violence. In a 4-month open pilot study 86 juvenile 707B offenders (ages 13-18) who had committed violent crimes with deadly weapons, primarily gang members from Los Angeles County, were given SKY instruction for one week (20-25 hours) in the Prison Smart Program. They also participated in 30 minutes of guided meditation and breathing 3 nights a week. Participants had significant overall decreases in anxiety, anger, fear, reactive behavior, and fighting (Suarez, 2002).

SKY courses are sponsored by the Art of Living Foundation, a non-profit international organization. AOL has an affiliation with the United Nations. Its mission is to promote human values by charitable works and by teaching SKY techniques in more than 100 countries. Volunteer AOL teachers brought relief to hundreds of traumatized and grieving New Yorkers by offering free courses after the 9/11 World Trade Center attacks. Information on courses in most major cities can be found at www.artofliving.org.

References


