



## **Annotated Bibliography of Research on Sudarshan Kriya Yoga (SKY) in the treatment of Clinical Depression**

*With an addendum referencing clinical anxiety*

Sudarshan Kriya Yoga (SKY) is a standardized breath based meditative technique which is easy to master under the instruction of certified teachers from the Art of Living Foundation. Independent research published in peer-reviewed journals has documented that SKY is both clinically feasible and effective in the treatment of individuals diagnosed with clinical depression and/or anxiety. Additional studies in populations with subclinical depression/anxiety can be provided upon request.

Key findings from published studies of SKY used as sole or adjunctive treatment include:

- SKY has demonstrated a 68-77% success rate in treating people suffering from depression. Substantial relief has been documented in 2-3 weeks. Several studies documented that by one month patients had achieved remission.
- Results have been shown to persist 6 months post intervention, with no follow-up provided.
- SKY has been shown to be uniformly effective regardless of severity of depression (e.g.:dysthymia, MDD), length of time suffering from depression, or degree of brain dysfunction accompanying depression.
- SKY, used as sole treatment has been shown to be as effective as pharmacotherapy for depression, and has been posited as a more effective form of relapse prevention..
- SKY is self-administered and selfempowering, and is free of unwanted side effects. It can greatly reduce doctor and hospital caseloads, thus making it both cost effective and staff effective.

The following list of peer-reviewed published papers consist of primary research studies.

1. Sharma, A., Barrett, M. S., Cucchiara, A. J., Gooneratne, N. S., & Thase, M. E. (2017). [\*\*A breathing-based meditation intervention for patients with major depressive disorder following inadequate response to antidepressants: a randomized pilot study.\*\*](#) *The Journal of clinical psychiatry*, 78(1), e59.

Major Depressive Disorder (MDD) has been recognized as a major public health issue. Antidepressant medications and psychotherapy for MDD are effective as first line treatment only 50-60% of the time. While a number of adjuncts are used to enhance the effects of antidepressant treatments, they typically offer limited additional benefits. The

present study evaluated the feasibility, efficacy and tolerability of a SKY-based intervention in MDD outpatients with inadequate response to antidepressants despite a minimum of 8 weeks at a stable dose of antidepressant treatment (which they were required to maintain without change for the duration of this study). In this randomized, waitlist-controlled pilot study, a significant and clinically meaningful improvement in the patients' depressive and anxiety symptoms was observed after 8 weeks of SKY practice ( $n=13$ ; age:  $\mu=39.4$  years,  $\sigma=13.9$ ) as compared to the control ( $n=12$ ; age:  $\mu=34.8$  years,  $\sigma=13.6$ ). The mean change in HDRS-17 total score was -11.55 for individuals who practiced SKY as opposed to a mean change of -0.50 for the control group. The author concluded that the high completion rate (77%), tolerability with no adverse events suggests SKY offers a promising adjuvant treatment option for MDD patients who have an incomplete response to antidepressants.

2. Toschi-Dias, E., Tobaldini, E., Solbiati, M., Costantino, G., Sanlorenzo, R., Doria, S., ... & Montano, N. (2017). [Sudarshan Kriya Yoga improves cardiac autonomic control in patients with anxiety-depression disorders.](#) *Journal of affective disorders*, 214, 74-80.

Physical exercise and breathing training are believed to be effective in improving cardiac autonomic control (CAC) among individuals diagnosed with affective spectrum disorders. Patients with mood disorders have autonomic dysfunction and reduced cardiorespiratory coupling. The authors of this paper evaluated the impact of SKY training on CAC and cardiorespiratory coupling. Secondary outcomes included depression, anxiety and perceived stress. Study participants were individuals ( $n=46$ , mean age= 44 years) who despite having been under stable pharmacological treatment for at least 6 months, continued to be diagnosed with anxiety and/or depression disorders in accordance with (DSM-IV). Individuals were randomized to either conventional therapy ( $n=22$ ) or conventional therapy plus SKY ( $n=24$ ) for 15 days. After 15 days, significant reductions in levels of depression, anxiety and stress were observed in the SKY compared to controls. A significantly greater increase in cardiovascular coupling was also observed for the experimental group ( $K^2_{HF}= 87\%$ ) relative to the control group ( $K^2_{HF}= 64\%$ ). This indicated that SKY techniques significantly improved cardiorespiratory coupling in patients with anxiety and/or depression disorders, confirming the antidepressant effect of SKY techniques. The authors concluded that SKY could be effectively used as a non-pharmacological technique to reduce depression and anxiety disorders and cardiovascular risks.

3. Doria, S., De Vuono, A., Sanlorenzo, R., Irtelli, F., & Mencacci, C. (2015). [Anti-anxiety efficacy of Sudarshan Kriya Yoga in general anxiety disorder: a multicomponent, yoga based, breath intervention program for patients suffering from generalized anxiety disorder with or without comorbidities.](#) *Journal of affective disorders*, 184, 310-317.

In this paper, the authors studied the possible efficacy of SKY in alleviating anxiety and depression symptoms in Caucasian adult outpatients. Participants were individuals with a primary diagnosis of DSM-IV Anxiety and/or Mood disorder (n=69; age: 25-64 years). The SKY intervention consisted of 10 sessions over the course of two weeks, followed by weekly SKY follow-up classes for a period of six months. Each individual session lasted approximately two hours. After 15 days of SKY practice, participants showed a significant and clinically meaningful change ( $p<0.001$ ) of -7.45 in their Hamilton Rating Scale for Anxiety (HRSA) scores, and a clinically meaningful and significant change ( $p<0.001$ ) of -3.30 in their Hamilton Rating Scale for Depression (HRSD) scores. On Further assessment after 3 months and 6 months of SKY practice indicated that the lower scores were consistently maintained. These results indicated that SKY workshops and follow-ups in conjunction with independent practice of the breathing techniques could significantly lower clinical anxiety and depression levels. (Of interest was the finding of no significant difference between scores of participants who remained on pharmacotherapy and those who terminated pharmacotherapy before enrolling in the study, suggesting that the significant improvement in participants is attributable specifically to SKY.)

4. Janakiramaiah, N., Gangadhar, B. N., Murthy, P. N. V., Harish, M. G., Subbakrishna, D. K., & Vedamurthachar, A. (2000). [Antidepressant efficacy of Sudarshan Kriya Yoga \(SKY\) in melancholia: a randomized comparison with electroconvulsive therapy \(ECT\) and imipramine.](#) *Journal of affective disorders*, 57(1-3), 255-259.

In this paper the authors compared the therapeutic efficacy of Sudarshan Kriya Yoga (SKY), electroconvulsive therapy (ECT) or imipramine (IMN) as sole treatment in patients diagnosed with melancholia. Participants were inpatients (n=45) diagnosed with DSM-IV melancholic depression and with scores  $\geq 17$  on the Hamilton depression rating scale (HRSD). Individuals were randomized into 3 groups and administered a specific sole treatment: SKY, ECT, or IMN. At 4 weeks, all three groups showed a significant reduction in the mean HRSD scores. Although the ECT group showed the strongest decrease in depression, effect sizes for the SKY group were comparable to IMN, indicating that the therapeutic effects of SKY were on par with a common pharmacological treatment for depression. The authors conclude that larger sample sizes and longer trial periods are necessary for comprehensively understanding the efficacy of SKY, particularly in light of its potential for relapse prevention. The authors speculate that SKY may be a more efficacious form of relapse prevention.

5. Hamilton-West, K., Pellatt-Higgins, T., & Sharief, F. (2019). [Evaluation of a Sudarshan Kriya Yoga \(SKY\) based breath intervention for patients with mild-to-moderate depression and anxiety disorders.](#) *Primary Health Care Research & Development*, 20.

Common mental health issues affect about one in five individuals globally. The authors studied the potential benefits of a SKY based intervention program offered by the UK National Health Service (NHS) to its patients in a community setting. Participants (n=991, age:  $\mu=46.0$  years,  $\sigma=14.3$ ) were selected based on Patient Health Questionnaire (PHQ-9) scores indicating mild to severe depression and Generalized Anxiety Disorder (GAD-7) scores indicating mild to severe anxiety. This SKY program was formatted as four weekly stress-buster sessions. Patients could then opt to continue onto a second phase consisting of one weekend intensive workshop of 3 hours on 3 consecutive days, and four weekly 90 minute follow-up sessions. Participants showed significantly ( $p<0.001$ ) reduced PHQ-9 and GAD-7 scores. A clinically meaningful change was observed in 74.6% of the participants who went on to the program second phase (n=169). These findings indicate that SKY techniques are beneficial to patients and could be offered more widely as a cost and staff effective therapeutic option.

6. Janakiramaiah, N., Gangadhar, B. N., Murthy, P. J., Harish, M. G., Shetty, K. T., Subbakrishna, D. K., ... & Vedamurthachar, A. (1998). [Therapeutic efficacy of Sudarshan Kriya Yoga \(SKY\) in dysthymic disorder.](#) *Nimhans Journal*.

Current treatments for dysthymia/persistent depressive disorder are only moderately effective with a mean response rate of approximately 50% in. Participants in this study (male=22, female= 24) were hospital outpatients aged 18 to 46 who were experiencing dysthymia for a mean of 3.15 years prior to study enrollment. SKY was provided as sole treatment, with neither pharmacotherapy or psychotherapy permitted for the duration of the study. Patients learned SKY during the first week of the intervention, were subsequently supervised on their return visits by the certified instructor, and were instructed to practice SKY at home daily for approximately 30 minutes for 3 months. There was an 80.4% completion rate. At one month 68% of completers had remitted, and remission persisted at three month assessment. Patients were assessed by blinded psychiatric interviews, video ratings, and standard self-reported scales, including BDI, HDRS – 17, CGI, and SGI. In addition, the abnormally low levels of both P 300 ERP brain waves and prolactin levels which were evidenced at pretest normalized, suggesting beneficial biological change with SKY practice. Finally, a dose response was observed with non-remitting patients practicing  $\leq 2x$  weekly. The author concluded "... SKY has remarkable therapeutic effects... SKY may be a more acceptable and efficacious alternative to medical management of dysthymia for both acute treatment and relapse prevention. It has the advantage of fostering the patient's autonomy and self-reliance besides cutting health care costs."

7. Descilo, T., Vedamurtachar, A., Gerbarg, P. L., Nagaraja, D., Gangadhar, B. N., Damodaran, B., ... & Brown, R. P. (2010). [Effects of a yoga breath intervention alone and in combination with an exposure therapy for post-traumatic stress disorder and](#)

[depression in survivors of the 2004 South-East Asia tsunami](#). *Acta Psychiatrica Scandinavica*, 121(4), 289-300.

There is a need for development of effective interventions for addressing psychological trauma and mood disorders in situations of mass disasters. The authors explored if a short intervention that includes the SKY breathing technique (called Breath-Water-Sound, BWS) has the potential to decrease the symptoms of post-traumatic stress disorder (PTSD) and depression. Study participants were 183 individuals who survived the 2004 South-East Asia tsunami and remained in refugee camps 8 months post-tsunami, and scored  $\geq 50$  on the Post-traumatic Checklist-17 (PCL). Participants were randomized by refugee camp to either BWS; BWS followed by an exposure therapy intervention called traumatic incident reduction (TIR); or to the wait list control condition. After 6 weeks, There was a significant decrease in PCL scores in both the BWS and BWS+TIR arms; however, no difference was observed between the two treatment arms suggesting that adding TIR did not improve outcomes in study participants. A similar pattern of significance was observed in Beck Depression Inventory (BDI-21) scores and the General Health Questionnaire (GHQ-12) scores. Encouragingly, the decreases of at least 60% in PCL-17 scores and 90% in BDI scores that occurred in the 2 treatment groups containing BWS were maintained at 24-week follow-up, despite no follow up post week 6. The authors propose that study results suggest that BWS may provide a safe, easily administered, and effective intervention to decrease PTSD and depression following a mass disaster.

8. Vedamurthachar, A., Janakiramaiah, N., Hegde, J. M., Shetty, T. K., Subbakrishna, D. K., Sureshbabu, S. V., & Gangadhar, B. N. (2006). [Antidepressant efficacy and hormonal effects of Sudarshana Kriya Yoga \(SKY\) in alcohol dependent individuals](#). *Journal of affective disorders*, 94(1-3), 249-253.

In this study the authors assessed the effectiveness of Sudarshan Kriya Yoga (SKY) on mood and hormone levels in patients with alcohol dependence immediately following an acute detoxification period. Study participants were males ( $n=60$ ; age: 18-55 years) with alcohol dependence syndrome in an inpatient setting. After the standard detoxification process, participants were randomly assigned to one of the two groups: SKY therapy plus treatment as usual (TAU) or TAU only. Two weeks post intervention, a statistically significant decrease in depression (BDI score) was observed in the both the TAU+ SKY ( $39.7 \pm 5.8$  to  $16.4 \pm 3.7$ ) as well as the TAU group ( $39.8 \pm 5.4$  to  $16.4$ ), with a significantly greater decrease in depression in the SKY+TAU compared to TAU only ( $p < 0.001$ ). Similarly both biomarkers of depression, plasma cortisol and adrenocorticotrophic hormone (ACTH) dropped significantly in both groups post intervention, but again significantly more so in SKY group ( $p < 0.001$ ,  $p < 0.001$ ). No side effects for SKY were observed. The authors concluded that findings indicated SKY can be used as a safe anti-depressant therapy and to provide relief from alcohol withdrawal symptoms.



9. Murthy, P. N. V., Janakiramaiah, N., Gangadhar, B. N., & Subbakrishna, D. K. (1998). [P300 amplitude and antidepressant response to Sudarshan Kriya Yoga \(SKY\)](#). *Journal of affective disorders*, 50(1), 45-48.

Depressed individuals with biological dysfunction ( i.e. low pretreatment brain wave P300 ERP amplitude and latency) require a longer time for responding to some treatments such as electroconvulsive therapy (ECT) and pharmacotherapy, as compared to those not displaying biological dysfunction. This study of 15 dysthymic and 15 melancholic depression male patients investigated whether treatment success of SKY, being offered as sole treatment, is affected by degree of 'biological dysfunction'. There was a significant reduction in both the Hamilton Rating Scale for Depression (HDRS) and Beck's Depression Inventory (BDI) scores post intervention. At one month 73% of patients showed significant improvement, and improvement persisted at retesting at 3 months. Neither severity of depression, nor severity of biological dysfunction influenced the quick response time or degree of effectiveness of SKY. The author concluded that SKY "...has independent antidepressant effects... exerts its antidepressant effect in about 3 weeks...[and] is uniformly effective regardless of the pretreatment P300 amplitude".

10. Carter, J., Gerbarg, P. L., Brown, R. P., Ware, R. S., & D'Ambrosio, C. (2013). [Multi-component yoga breath program for Vietnam veteran post traumatic stress disorder: randomized controlled trial](#). *J Trauma Stress Disor Treat* 2, 3, 2.

Although therapies for PTSD have been developed, approximately two thirds of people who have received treatment still meet diagnostic criteria for PTSD post treatment. Since evidence suggests that some forms of yogic breath techniques may increase parasympathetic activity and reduce overactive sympathetic activity, it may have potential in addressing symptom severity in individuals with PTSD. The current randomized controlled trial investigated the effects of the SKY program in treatment resistant male Vietnam veterans (mean age=58 years) who despite multiple PTSD treatment protocols, remained classified as having severe PTSD for more than 30 years. All were classified as disabled due to service-related PTSD, were heavy drinkers, and were still being treated with medications. The SKY program consisted of a 22 hour program spread over five days; plus 2 hour follow-up sessions once weekly for the 1st month, and once monthly thereafter for 5 months. At week six, compared to waitlist controls the SKY treatment group evidenced a significant improvement in PTSD symptoms per the Clinician-Administered PTSD Scale (CAPS) (pre:56.3±12.3 to 6 week post 42.1±18.2) , as well as on the PCLM-17. A significant reduction in depression per CES – D (24.7 – 16.9) was also observed at six weeks, with further improvement on all scales evidenced at six months. There was a 92% retention rate among intervention participants, and the authors suggest that yoga breath techniques geared toward

veterans suffering from PTSD may provide a valuable adjunct of tool in the treatment of such very ill individuals.

11. Vasudev, K., et al., [Sudarshan Kriya Yoga program in posttraumatic stress disorder: A feasibility study.](#) *International Journal of Yoga*, 2020. **13**(3): p. 239.

Similar to mood disorders, the current treatment options for PTSD offer an overall response rate of 60% and a remission rate of 20%–30%. The current study reported upon the feasibility and efficacy of a modified SKY Breath Meditation program (adapted for PTSD populations) as an adjunctive therapy in the treatment of PTSD, depression and anxiety. The active SKY learning phase constituted a 6 day program of 2.5–3 hours daily. This was followed by weekly booster sessions (90 min/wk) for 3 weeks, and then bimonthly sessions for the next 8 weeks. Participants were asked to practice SKY at home daily (25 min/day) during the study. The study showed that SKY offers significant and clinically meaningful reductions in symptoms of PTSD at week 12, which were sustained at week 24, despite there being no intervention support after week 12. Participants also experienced significant and clinically meaningful improvements at week 24 in accompanying clinical depression (*HAM-D* and clinical anxiety (*HAM-A*). The authors concluded that SKY offers potentially clinically significant effects on symptoms of PTSD, as well as accompanying depression and anxiety which can be sustained without professional support.

### **Clinical Anxiety Supplement:**

The following additional studies report on the efficacy of SKY in reducing clinical anxiety. Studies 1,2,3,5,7&11 above also report on clinical anxiety. There are multiple additional studies investigating the effects of SKY on sub-clinical anxiety in both healthy and health compromised populations, which are referenced in the SKY Research Summary document.

12. Katzman, M. A., Vermani, M., Gerbarg, P. L., Brown, R. P., Iorio, C., Davis, M., ... & Tsirgielis, D. (2012). [A multicomponent yoga-based, breath intervention program as an adjunctive treatment in patients suffering from generalized anxiety disorder with or without comorbidities.](#) *International journal of yoga*, 5(1), 57.

General Anxiety Disorder (GAD) is one of the most prevalent psychiatric conditions. In this study, the authors investigate the SKY program as a treatment for treatment resistant GAD patients, who had previously received various treatments including cognitive behavioral therapy (CBT) and mindfulness-based therapies (MBT). Participants (age: 18-65 years; n=41) in the study were individuals with a primary diagnosis of GAD, a minimum of 8 weeks of standard treatment (anxiolytics), and a total score of  $\geq 20$  on the Hamilton Anxiety Scale (HAM-A). The participants were provided the SKY program and were encouraged to practice the 20 minute home breathing practice daily. After 4-weeks there was a significant decrease in HAM-A scores among participants ( $t=4.59$ ;  $P<.01$ ). The response rate ( $\geq 50\%$  decrease in the HAM-A score) to

the treatment was 73% and the remission rate (HAM-A score  $\leq$  7) was 41%. A significant change was also noted in the anxiety sensitivity index (ASI) and Penn State Worry Questionnaire (PSWQ) scores. The results indicate that Eastern SKY practice may significantly alleviate anxiety symptoms in those suffering from serious remission-resistant GAD.

13. Seppälä, E. M., Nitschke, J. B., Tudorascu, D. L., Hayes, A., Goldstein, M. R., Nguyen, D. T., ... & Davidson, R. J. (2014). [Breathing-based meditation decreases posttraumatic stress disorder symptoms in US Military veterans: A randomized controlled longitudinal study.](#) *Journal of traumatic stress*, 27(4), 397-405.

Conventional treatments for veterans with Post Traumatic Stress Disorder (PTSD) have had limited success. Considering the significant impact of meditation-based interventions on wellness, the authors studied the impact of Sudarshan Kriya Yoga (SKY) in veterans diagnosed with PTSD. Participants in the study included male veterans (>18 years old) who served in wars in Iraq or Afghanistan (n=21). A week after the 7-day SKY intervention, the treatment group (n=11) showed significantly ( $p<0.001$ ) fewer symptoms of PTSD as compared to pretreatment, and as compared to the control group (n=10). These included symptoms associated with re-experiencing, hyperarousal, mood, and anxiety (PCL-M). Reductions in hyperarousal correlated with reductions in psychophysiological measures of the startle response. The researchers also observed a decrease in respiration rate. Follow-up measurements after a month and a year showed no significant difference from the first follow-up, indicating a sustained effect of the SKY intervention. These findings indicate that SKY intervention could be a viable, long-lasting intervention for addressing PTSD.

14. Sureka, P., Govil, S., Dash, D., Dash, C., Kumar, M., & Singhal, V. (2014). [Sudarshan kriya for male patients with psychoactive substance dependence: A randomized control trial.](#) *ASEAN Journal of Psychiatry*, 16(1), 28-37.

This 3-month single blind randomized controlled study (N=111) investigated the efficacy of SKY for enhancing multiple aspects of wellbeing in male patients diagnosed to be suffering from Substance Dependence by ICD-10 (DCR) criteria, aged between 18-65 years. The treatment group (n=56) was trained in SKY and instructed to practice daily for 6 weeks. Control group participants were instructed to sit in an armchair with their eyes closed and pay gentle attention to their breath, and continue at home for an equal duration. After 6 weeks of daily SKY practice, the mean GAF scores increased from 48.43 to 66.77 in the treatment group (n=58). GAF scores decreased from 49.12 to 47.55 in the control group (n=58). A similar statistically significant positive change was observed for anxiety, positive well being, general health, and psychological general well being of the SKY treatment group as compared to their baseline and to the control.



15. Binawara, B., Kapoor, A., Mehra, M., Gupta, M., Tilwani, K., & Maharia, S. (2014). [Effect of Sudarshan Kriya Yoga on cardiovascular parameters and comorbid anxiety in patients of hypertension.](#) *Scholars Journal of Applied Medical Sciences*, 3307-3314.

The authors studied the effect of SKY on cardiovascular health and anxiety in hypertensive patients with comorbid anxiety. All participants were on hypertensive medications (n=100; age: 30-70 years). The experimental group (n=50) practiced SKY daily and evidenced a significant decrease systolic and diastolic blood pressure (p<0.001), pulse rate (p<0.001) and HAM-A (p<0.001). No significant changes were observed among the control group. The authors concluded that SKY creates a balance in the autonomic nervous system functions by parasympathetic dominance and thus can produce a salutary impact on cardiovascular and mood status.

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