

Brief report

Antidepressant efficacy and hormonal effects of Sudarshana Kriya Yoga (SKY) in alcohol dependent individuals

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Abstract

Background: Sudarshana Kriya Yoga (SKY) has demonstrable antidepressant effects. SKY was tested for this effect in inpatients of alcohol dependence.

Methods: Following a week of detoxification management consenting subjects ($n=60$) were equally randomized to receive SKY therapy or not (controls) for a two-week study. SKY therapy included alternate day practice of specified breathing exercise under supervision of a trained therapist. Subjects completed the Beck Depression Inventory (BDI) before and after the two weeks of this intervention. Morning plasma cortisol, ACTH and prolactin too were measured before and at the end of two weeks.

Results: In both groups reductions in BDI scores occurred but significantly more so in SKY group. Likewise, in both groups plasma cortisol as well as ACTH fell after two weeks but significantly more so in SKY group. Reduction in BDI scores correlated with that in cortisol in SKY but not in control group.

Limitations: Antidepressant effects of SKY were demonstrated in early abstinence that also had substantial spontaneous improvement. It is not known if this effect contributes to sustained abstinence.

Conclusion: Results extend the antidepressant effects of SKY in alcohol dependence subjects. Reduction in stress-hormone levels (cortisol and ACTH) along with BDI reductions possibly support a biological mechanism of SKY in producing beneficial effects.

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1. Introduction

Treatments aiming at reducing craving or achieving abstinence in alcohol dependent individuals have met with varied, yet limited success. Relapse rates are close to 50% (Boothby and Doering, 2005). Depression is the commonest comorbid condition in these individuals (Manwell et al., 2004; Hasin et al., 2005). Symptoms of depression often manifest in acute withdrawal. Such mood symptoms

may well persist even after the acute phase of withdrawal potentially making way for relapse (Trevisan et al., 1998). Accordingly, there is evidence for successful use of an antidepressant in detoxification phase itself (Hasin et al., 2002; Liappas et al., 2005). Sudarshana Kriya Yoga (SKY), a breathing therapy developed by the Spiritual Guru Sri Sri Ravishankar (1994) of the Art-of-Living Foundation, demonstrated significant antidepressant effects (Janakiramaiah et al., 1998, 2000).

Hormonal changes occur with clinical affective states. Depression is associated with stress and as a result elevated levels of cortisol and ACTH (Kiive et al., 2004,

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Wetterling and Junghans, 2000). Stress associated with alcohol withdrawal and/or the coexisting depression is known to activate brain corticotrophin-releasing factor (CRF) systems (Bruijnzeel et al., 2004). CRF is released during alcohol withdrawal and stress in central nucleus of amygdala (Merlo Pich et al., 1995). Activation of CRF neurotransmission is suggested to bring about adaptive changes leading to drug/alcohol seeking behaviour (Koob, 1999). SKY has also showed significant neuro-endocrinological effects in patients with depression. SKY produced prolactin elevation acutely and after two weeks of practice lowered serum cortisol responses to SKY (Janakiramaiah et al., 1998; Sudarshan, 1999). The latter effect may reflect antidepressant as well as anti-stress effects of SKY. We tested therefore, the effects of SKY therapy on mood symptoms and hormone levels in patients with alcohol dependence immediately following acute detoxification period.

2. Methods

2.1. Subjects

Sixty consecutive male subjects (age 18–55 years) with alcohol dependence syndrome (DSM-IV) formed the sample. All individuals were admitted for the first time in the de-addiction center of National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, for detoxification and signed an informed consent statement. Those, having severe physical illness like cardiac illness, hypertension, uncontrolled diabetes, epilepsy, respiratory disease, neurological illness, head injury or organic mental illness, high suicidal risk, dependence on any drug other than tobacco and alcohol were excluded from the study. So also were those with history of mania and schizophrenia and mental retardation. Each subject underwent a detailed medical and psychiatric assessment including the measurement of severity of alcohol dependence (Stockwell et al., 1983) by a team of qualified psychiatrists.

2.2. Detoxification

Standard detoxification program that included only benzodiazepines and B-complex was initiated from the day of admission and completed by day-7. Subjects were then randomly assigned to one of two groups for a two-week study: (a) SKY therapy (b) continued inpatient care only; to be referred to as SKY and Control groups respectively. Only for treating sleep symptoms, the treating physician uninvolved in this study, used benzodiazepines. Before the intervention, the two groups were comparable on the parameters given in Table 1.

2.3. SKY therapy

The Sudarshana Kriya Yoga (SKY) is a specific breathing technique (Pranayama) (Su=proper, Darshana=vision, Kriya=purifying action) based on ancient Vedic tradition (Sri Sri Ravishankar, 1994). SKY sessions were held in the mornings one hour or later after breakfast. The SKY consisted of three distinctive breathing periods (Pranayama): 1. *Ujjayi pranayama*: Consists of slow deep breathing. Each cycle includes breathing in, holding, breathing out and holding. 2. *Bhastrika pranayama* consists of forced inhalation and exhalation 20 times. Ujjayi and Bhastrika pranayama requires about 12–15 min. 3. *Cyclical breathing* consists of slow, medium, and fast cycles of breathing practiced for a total duration of 30 min. These three procedures are done in sitting posture

Table 1

Social–demographic and illness characteristics: comparison between SKY and Control subjects

Variable	Group		Significance
	SKY (n=30)	Control (n=30)	
Age (yr)	35.60 (8.07)	37.77 (7.34)	$t=0.99; p>0.05$
Married*	25	23	$\chi^2=0.30; p>0.05$
Employed*	25	21	$\chi^2=1.99; p>0.05$
Urban:rural*	16:14	18:12	$\chi^2=0.47; p>0.05$
Alcohol expense Rs/month	2533 (683)	2617 (654)	$t=0.47; p>0.05$
Drinking duration (yr)	10.83 (5.65)	11.43 (6.75)	$t=0.34; p>0.05$
SADQ ^a score	33.20 (5.54)	31.73 (6.29)	$t=0.98; p>0.05$
BDI-pre	39.7 (5.8)	39.8 (5.4)	$F_1=10.28, p<0.001;$ $F_2=1654.33, p<0.001;$
BDI-post	9.6 (3.7)	16.4 (4.2)	$F_3=25.4, p<0.001$
Cortisol-pre	8.3 (3.1)	8.5 (3.4)	$F_1=6.89, p<0.001;$ $F_2=47.6, p<0.001;$
Cortisol-post	3.6 (1.8)	6.4 (3.0)	$F_3=7.24, p<0.001$
ACTH-pre	284.0 (59.1)	277.9 (34.8)	$F_1=4.64, p<0.001;$ $F_2=120.8, p<0.001;$
ACTH-post	191.5 (47.9)	242.4 (38.9)	$F_3=23.9, p<0.001$
Prolactin-pre	5.7 (2.4)	6.8 (1.7)	$F_1=3.13, p>0.05;$ $F_2=143.67, p<0.001;$
Prolactin-post	12.2 (3.3)	9.1 (2.3)	$F_3=34.2, p<0.001$

Cortisol ($\mu\text{g/dl}$), ACTH (pg/ml) and prolactin (ng/ml).

Cell contents refer to Mean (SD) except *numbers.

F_1 — group effect, $df=1, 58$; F_2 — occasion effect, $df=1, 58$; and F_3 — interaction, $df=1, 58$.

^a Severity of Alcohol Dependence Questionnaire (Stockwell et al., 1983).

(*Sukhasana*) with eyes closed. This was followed by *Yoga Nidra* (lying in a tranquil state) for about 20 min (Janakiramaiah et al., 1998, 2000).

2.4. Sample collection and test procedure

Five ml of venous blood was collected in heparinized syringe at 9 AM on day-7 (pre) and day-21 (post). The (fasting) samples were collected before the treatment session on both days. The sample was immediately centrifuged to separate plasma. The plasma samples were coded and stored at $-70\text{ }^{\circ}\text{C}$ for hormonal assays. Plasma prolactin and cortisol were assayed using commercially available kits (Abbot Diagnostics). ACTH levels were measured using Radio Immuno Assay (RIA) kits (DSL-USA). The lab personnel were unaware of the clinical details. All subjects completed the Beck's Depression Inventory (BDI) (Beck et al., 1961) at the end of first week after admission (pre, day-7) and two weeks later (post, day-21).

2.5. Statistical analysis

The socio-demographic profile and clinical characteristics were analyzed using univariate statistical methods. The pre-treatment values at day-7 (pre) were compared in both groups using independent samples *t* test. The post treatment values and the change over two assessments at day-21 (post) of the both groups were compared using Repeated Measures ANOVA. At day-7 SKY and control groups did not differ on BDI scores or on the any hormone levels (Table 1). Percentage changes in BDI scores between pre- and post assessments as well as similar change in ACTH and Cortisol levels were computed. These were subjected to angular transformation and Pearson's correlation was computed between the BDI score and the hormone levels. The value of statistical significance level was fixed at 0.05.

3. Results

BDI scores significantly dropped at post-assessment and the drop was more in the SKY group. Drop also occurred in the plasma cortisol as well as ACTH levels differentially; being more in SKY group. Cortisol values dropped in all SKY individuals and in only 22 of the controls ($\chi^2=9.2$, $df=1$; $p=0.005$). In the total sample the percent drop in BDI correlated positively with that of ACTH ($r=0.53$, $p<0.001$) and also that of cortisol ($r=0.52$, $p<0.001$). Percentage drop in ACTH and cortisol too were correlated ($r=0.35$, $p=0.14$). When examined separately the correlation between percentage

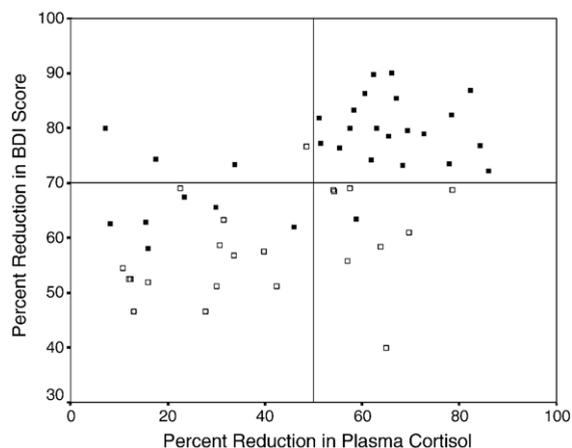


Fig. 1. Relation between BDI score and plasma Cortisol reductions over two weeks. ■ SKY ($n=30$); □ Control ($n=22$); plasma cortisol levels rose in eight controls (not represented in the illustration); in all these individuals the BDI score reduction was less than 70%.

drop in BDI and that in cortisol was significant ($r=0.52$, $p=0.003$) for the SKY group only. Prolactin values increased (though nonsignificantly) in the total sample with SKY individuals having higher increase. These results are presented in Table 1 and Fig. 1. No individual developed seizure either in SKY or control group in the two-week treatment period.

4. Discussion

In this study the effect of SKY in reducing the depressive symptoms in alcohol dependent subjects in early abstinence was tested. Depression scores as well as ACTH and cortisol levels dropped in the two weeks of the study with or without SKY though, the drop was more so in the SKY group. Reduction in depression scores correlated with the reduction in plasma cortisol levels in the SKY group but not in the control group.

These findings extend the antidepressant efficacy of SKY reported earlier (Janakiramaiah et al., 1998, 2000; Rohini et al., 2000). Adding SKY in the early period of detoxification management was not associated with additional risk of seizures. Liappas et al. (2005) suggest the advantages of adding an antidepressant during this period to reduce depressive symptoms. This study suggests that SKY can be a potential yet safe antidepressant therapy. Depression scores continued to fall after detoxification in the two weeks of study that may reflect benefits of abstinence and further relief from withdrawal state. It is arguable that SKY only augmented this benefit. Benefits of SKY as antidepressant treatment should therefore be tested after longer abstinence in selected patients continuing to manifest clinical depression.

In our earlier studies we found elevations in prolactin, but not cortisol, acutely following SKY session but not a sham-SKY session (Janakiramaiah et al., 1998). In this study we measured resting values of these hormones before starting SKY and two weeks after the daily-treatment sessions. Accordingly, the hormone changes observed cannot be compared across studies. Prolactin levels although changed, did not significantly differ between groups. If the blood samples had been collected shortly after the last session, effects SKY on prolactin elevation could have been confirmed. On the other hand, ACTH and cortisol levels were reduced after the two weeks of intervention in SKY group. Acute 'stress' of physical exercise is associated with elevation in cortisol but this returns to baseline at 90 min post-exercise (Kiive et al., 2004). Therefore, the cortisol and ACTH changes noted in this study cannot be attributed to acute 'stress' of the SKY. Instead, it can be argued that SKY has lowered the stress and hence ACTH and cortisol levels thereof. The change in the two hormone levels was correlated and hence this may suggest a common mechanism. Reduction in BDI scores too correlated with the reduction in these hormone levels. This was significant for the SKY group and not so for the control. This further supports a more specific anti-stress effect of SKY that brought down depression scores as well as the two hormone levels. Changes in hormone levels provide a more objective evidence of beneficial effects of SKY. Brown and Gerbarg (2005) suggest that vagal nerve stimulation would occur with SKY and this brings out the mental and hormonal effects.

One of the limitations in this study was absence of a 'control' treatment procedure. The SKY subjects were exposed to additional time of a professional (the yoga therapist). Did this contribute to 'placebo' effects in lowering the depression scores? In an earlier study (Janakiramaiah et al., 2000), the antidepressant effects of SKY compared with imipramine and in patients with diagnosis of melancholia, a condition less likely to respond to placebo effect (Nelson et al., 1990). The placebo effect is also less likely to produce a change in hormone levels. The reductions in depression and cortisol too were correlated. Although the 'placebo' effect cannot be totally excluded, the findings of this study suggest that such is less likely. There is also an inherent difficulty in designing a 'control' treatment for a procedure such as SKY. Is it the therapist's contact, some rhythms of breathing, physical exertion or even participating in a group exercise? It remains to be seen if SKY therapy in the early detoxification stage confers extended benefit in maintaining abstinence/control over alcohol consumption for longer periods. There is indirect support from earlier studies that continued SKY practice extends antidepressant effects. It is likely that

continued SKY practice, by its antidepressant effects, also improves abstinence in patients with alcohol dependence.

5. Conclusion

In this randomised controlled trial, SKY demonstrated significant antidepressant effects when offered to alcohol dependent subjects after the acute phase of detoxification. The findings support the view that SKY may lower plasma levels of ACTH and cortisol. The antidepressant effects correlated with lowering of serum cortisol. Whether SKY practice facilitates extended control over alcohol consumption is a promising area for research.

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