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Short Communication

Voluntarily induced vomiting – A yoga technique to enhance pulmonary functions in healthy humans

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ABSTRACT

Vomiting is a complex autonomic reflex orchestrated by several neurological centres in the brain. Vagus, the cranial nerve plays a key role in regulation of vomiting. *Kunjala Kriya* (Voluntarily Induced Vomiting), is a yogic cleansing technique which involves voluntarily inducing vomiting after drinking saline water (5%) on empty stomach. This study was designed with an objective to understand the effect of voluntary induced vomiting (ViV) on pulmonary functions in experienced practitioners and novices and derive its possible therapeutic applications. Eighteen healthy individuals volunteered for the study of which nine had prior experience of ViV while nine did not. Pulmonary function tests were performed before and after 10 min of rest following ViV. Analysis of Covariance was performed adjusted for gender and baseline values. No significant changes were observed across genders. The results of the present study suggest a significant increase in Slow Vital Capacity [$F_{(1,13)} = 5.699$; $p = 0.03$] and Forced Inspiratory Volume in 1st Second [$p = 0.02$] and reduction in Expiratory Reserve Volume [$F_{(1,13)} = 5.029$; $p = 0.04$] and Respiratory Rate [$F_{(1,13)} = 3.244$, $p = 0.09$]. These changes suggest the possible role of ViV in enhancing the endurance of the respiratory muscles, decreased airway resistance, better emptying of lungs and vagal predominance respectively. We conclude that ViV when practiced regularly enhances the endurance of the respiratory muscles and decreases airway resistance. These findings also indicate need for scientific understanding of ViV in the management of motion sickness and restrictive pulmonary disorders like bronchitis and bronchial asthma.

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1. Introduction

Yoga is a comprehensive lifestyle practice which involves practices for the body, mind and the intellect through physical postures (*asanas*), voluntary breath regulation (*pranayama*), cleansing practices (*kriya*) and meditation (*dhyana*). Yoga is being practiced in India since thousands of years. Studies have established the therapeutic benefit of Yoga practices irrespective of an individual being obese [1], hypertensive [2,3], diabetic [4] or even suffering from cancer [5,6]. Yoga practices are efficacious in not only regulating the autonomic nervous system but also beneficially regulating the gene expressions [7]. With all the available evidence to possibly suggest Yoga as a non-pharmacological intervention for

several lifestyle diseases and non-communicable diseases, the basic underlying mechanism of several practices remains unexplored. This study aims to understand the physiological adaptation of pulmonary functions following *Kunjala Kriya* (voluntarily induced vomiting – ViV), a yogic cleansing technique in experienced and novice practitioners. There is no published scientific literature available documenting safety and psycho-physiological effects of ViV until date, making the present study as a novel effort. Despite the practice being observed as ‘involving considerable risk’ by the modern medical professionals, the safety of its practice is time tested and no complications have been reported.

Hatha Yoga Pradipika, an ancient Yoga scripture describes *Kunjala Kriya* (Voluntarily Induced Vomiting – ViV) as one of the six cleansing techniques to clean the body and regulate the mind [8]. Following practice of ViV, subjectively, an individual feels emptiness of stomach. Traditional practitioners suggest acute fever, visceral infection, hernia and cardiovascular disorders as contraindications for the practice. *Gheranda Samhita*, an ancient

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treatise on Yoga claims that this practice when performed everyday can cure ailments of liver and spleen [9].

Vomiting, a survival mechanism conserved during evolution in humans and several organisms is understood to be one of the most complex autonomic reflex orchestrated by several neurological centres in the brain. The stimulus is manifested as an orderly response through excessive salivation, inhibition of normal gastric motility, retro-peristaltic movement, relaxation of lower esophageal sphincter, tachycardia, sweating, breath retention and contraction of abdominal and thoracic muscles. Despite vomiting being one of the most common clinical sign, understanding its neurobiology and relevance in maintaining is incomplete. Current understanding states, vagus as the key moderator of vomiting, manifested in strict co-ordination of nucleus tractus solitarius with area postrema, brainstem vestibular centres, sensory and emotional areas and several other areas of the brain [10].

ViV is a common practice observed in patients suffering from bulimia apart from their laxative abuse, and diuretic abuse driven by distorted body-image perception. Complications of repeated ViV include dental erosion and discolouration of teeth. Due to the acidic contents coming in contact with the oesophagus, pharynx and oropharynx, symptoms of hoarseness, sore throat, dry cough, and difficulty in swallowing are reported [11].

ViV immediately after food has been viewed as a psychiatric illness. Ancient Yogic literature recommends practice of ViV following consumption of saline water in empty stomach to be therapeutically beneficial. Hence, this study was designed with an objective to document the safety of its practice and possibly explore a mechanism of action of ViV from the perspective of Yoga practices.

2. Materials and methods

A flyer was displayed in the classrooms of undergraduate naturopathy and yoga medical students regarding the study. Participants were recruited after obtaining a written informed consent. Eighteen volunteers were recruited into two groups: Novices and Experienced group. All participants were informed about the study and a written informed consent was obtained. All volunteers recruited for the study were reported to be healthy. Emergency medical treatment facility was available to address any unanticipated complications. The experimental and novices group consisted of nine individuals in each group with age of 19.2 ± 0.9

years and 19.6 ± 0.7 years respectively. Volunteers having experience of performing ViV for more than four times were recruited in the experienced group. There were 5 men and 4 women and 7 men and 2 women in the experienced and novices groups respectively.

The practice of ViV involves drinking warm saline water (5%) in the morning on an empty stomach, sitting in squatting position until the individual feels a sense of fullness or nausea. The individual is then recommended to stand and bend forward from the low back and voluntarily trigger vomiting by gently touching the root of the tongue and uvula. It is observed that with practice, triggering the vomit may be required once or not at all whereas, in novices, it is required to trigger three to four times until most of the consumed water is vomited out. The participants rested in supine position and voluntarily relaxed the entire body for 10 min following vomiting. Pulmonary function tests were performed as per standard guidelines [12] immediately before and after the practice of ViV using Schiller Spirovit SP-1 system.

Analysis of co-variance (ANCOVA) was performed to understand the between group changes, adjusted for the baseline values and gender. Body Mass Index (BMI) was not considered as a covariate in our study as all the volunteers in both groups were having a BMI of $20.1 \pm 0.4 \text{ kg/m}^2$. There was no significant difference observed amongst the genders.

3. Results

The slow vital capacity [$F_{(1,13)} = 5.699$; $p = 0.03$] increased in experienced group as compared to the novices. Within group comparison showed a contrasting change with a significant increase in slow vital capacity (SVC) in experienced group ($p = 0.01$) as compared to the significant reduction observed in the novices ($p = 0.02$). Expiratory reserve volume (ERV) [$F_{(1,13)} = 5.029$; $p = 0.04$] decreased significantly in novices as compared to a non-significant increase in experienced practitioners. Within group comparison indicated a significant reduction in ERV in novices ($p = 0.04$) while no change was observed in the experienced group. A reduction in respiratory rate (RR) was observed in both experienced ($p = 0.01$) and novices ($p = 0.03$), with the extent of reduction being greater in the experienced group [$F_{(1,13)} = 3.244$, $p = 0.09$]. A significant increase in Forced Inspiratory Volume in first second (FIV1) was observed in experienced group ($p = 0.02$) (Table 1).

Table 1

Table represents the Mean \pm SD of the lung volumes measured in experienced and novices before and 10 min after ViV.

Variables	Experienced Group			Novices Group			F	Sig. (ANCOVA) p value	Partial Eta Squared
	Pre	Post	p value	Pre	Post	p value			
SVC	2.61 \pm 0.6	3.04 \pm 0.4	0.017 ^a	3.02 \pm 0.3	2.56 \pm 0.3	0.027 ^a	5.699	0.033 ^x	0.305
ERV	0.87 \pm 0.2	0.97 \pm 0.5	0.588	0.86 \pm 0.1	0.57 \pm 0.4	0.044 ^a	5.029	0.043 ^x	0.279
IRV	0.91 \pm 0.4	0.87 \pm 0.4	0.679	0.93 \pm 0.3	0.93 \pm 0.5	0.996	2.029	0.178	0.135
FVC	2.61 \pm 0.5	2.71 \pm 0.5	0.533	2.71 \pm 0.5	2.47 \pm 0.7	0.208	1.042	0.326	0.074
PEF	6.63 \pm 1.9	6.64 \pm 1.6	0.990	7.62 \pm 1.4	6.98 \pm 1.8	0.170	1.172	0.685	0.013
FIVC	2.52 \pm 0.5	2.58 \pm 0.5	0.579	2.81 \pm 0.3	2.65 \pm 0.3	0.116	0.390	0.543	0.029
FIV1	2.36 \pm 0.4	2.49 \pm 0.5	0.021 ^a	2.75 \pm 0.4	2.55 \pm 0.3	0.131	1.268	0.280	0.089
PIF	4.10 \pm 1.4	4.34 \pm 1.2	0.561	4.83 \pm 1.2	4.44 \pm 1.4	0.075	1.163	0.300	0.082
RR	15.28 \pm 4.3	10.69 \pm 2.7	0.01 ^b	16.36 \pm 5.0	13.44 \pm 2.3	0.032 ^a	3.244	0.095	0.200
TV	0.82 \pm 0.1	0.99 \pm 0.4	0.179	0.72 \pm 0.1	0.87 \pm 0.4	0.264	0.041	0.843	0.003

Levels of significance as understood from within group comparison using paired t test: ^a $p \leq 0.05$; ^b $p \leq 0.01$; ^c $p \leq 0.001$.

Levels of significance as understood from between group comparison using Analysis of Covariance adjusted for Gender and baseline differences: ^x $p \leq 0.05$; ^y $p \leq 0.01$; ^z $p \leq 0.001$.

SVC – Slow Vital Capacity; ERV – Expiratory Reserve Volume; IRV – Inspiratory Reserve Volume; FVC – Forced Vital Capacity; PEF – Peak Expiratory Flow; FIVC – Forced Inspiratory Vital Capacity; FIV1 – Forced Inspiratory Volume in 1st Second; PIF – Peak Inspiratory Flow; RR – Respiratory Rate; TV – Tidal Volume.

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