

Development and Validation of Integrated Yoga Module for Obesity in Adolescents

Abstract

Background: Obesity is a growing global epidemic and cause of noncommunicable diseases. Yoga is one of the effective ways to reduce stress which is one of the causes of obesity. Nowadays, children in adolescent age are more prone to get obese due to lack of physical activity making them more sedentary. **Aim:** To identify the design and validation of Integrated Approach of Yoga Therapy Module (IAYTM) for obesity in adolescents. **Materials and Methods:** First phase – IAYTM for obesity was designed based on the literature review of classical texts and recently published research articles. Second phase – Designed IAYTM was validated by 16 subject matter (yoga) experts. Content-validity ratio (CVR) was analyzed using Lawshe's formula. **Results:** Yoga practices were designed for Integrated Yoga Module for Obesity in Adolescents. Yoga practices with CVR ≥ 0.5 and which were validated by 16 yoga experts and approved in faculty group discussion were included in final Integrated Yoga Therapy Module. **Conclusion:** The yoga practices were designed and validated for IAYTM for obesity in adolescents.

Keywords: Adolescence, integrated approach of yoga therapy, obesity, validation

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Introduction

Obesity

Obesity (body mass index [BMI] $>30 \text{ kg/m}^2$) is more common in women than men. The risk of obesity starts at a BMI of 25 kg/m^2 and it is much lower (23 kg/m^2) in southeastern countries that contain genetic predisposition to metabolic disorders. East Asian countries use lower values of BMI.^[2] Obesity increases the likelihood of diseases such as heart disease, type 2 diabetes, obstructive sleep apnea, cancer, and osteoarthritis.^[3] Researchers consider obesity as one of the most serious public health problems of the 21st century.^[4] International organizations such as the WHO, UNICEF, and CARE consider obesity as one of the most neglected public health problems in the society.^[5] It is commonly caused by a combination of excessive food intake, lack of physical activity, and genetic susceptibility.^[6] Therefore, it can be prevented through a combination of social changes and personal choices.

Adolescent obesity

The prevalence of overweight and obesity in children has dramatically increased

over the past two decades.^[7] In 2010, 43 million children were obese and this number is expected to reach 60 million by 2020. Of the approximately 45 million, 35 million live in the developing countries. Obese children are likely to remain so in adulthood and are at greater risk of developing noncommunicable diseases such as diabetes, hypertension, cardiovascular diseases, and cancers.^[8] Two systematic review articles^[9] and one clinical review article^[11] suggest that yoga has beneficial effects on mental and physical health in children and adolescents.

Yoga modules to control obesity

Yoga has emerged as one of the evidence-based practices widely used across the globe. Over 10 million Americans practice yoga for health reasons in 2002 and the number has increased to 13 million in 2007.^[12,13] Several schools of yoga have come up different modules of yoga practices that have shown a range of positive benefits on BMI in adults and children. A randomized controlled trial on 72 obese adult males resulted in improvement in BMI, hip circumference, waist circumference, and skin-fold thickness. Fourteen weeks of

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integrated yoga-based lifestyle change included yogic diet, asana, pranayama, relaxation techniques, meditation, and yogic counseling.^[14] Yoga/meditation users with normal BMI appeared to be more satisfied with their body weight and shape than nonyoga/meditation users.^[15] Studies provide strong evidence that the modified Qigong breathing exercise can significantly reduce or even suppress the sense of hunger on an empty stomach. Qigong practice typically involves moving meditation, coordinating slow flowing movement, deep rhythmic breathing, and calm meditative state of mind. Qigong is now practiced throughout China and worldwide for recreation, exercise and relaxation, preventive medicine and self-healing, alternative medicine, and cultivation. Stomach pH was increased by 3 and intestinal pressure was reduced by 12 mmHg in the experimental group and did not change significantly in the control group. The breathing exercise provides comfort in different circumstances, such as lack of regular meals, limited volume or caloric diet, and even during temporary complete absence of food in therapeutic fasting which is useful in obesity.^[16]

In a randomized controlled trial on yoga practice for reducing the male obesity and weight-related psychological difficulties, it has been proved that the yoga practice is effective for obesity control for adult male in an urban setting. Improvement in anthropometric and psychological parameters was observed in that study.^[17] The 12-week yoga intervention had positive effects on anthropometric and self-reported variables in women with abdominal obesity. Sixty women with abdominal obesity (waist circumference ≥ 88 cm; BMI ≥ 25) were randomly allocated in a 2:1 ratio to either yoga intervention ($n = 40$) or a waiting list ($n = 20$). Intergroup significant differences in the waist/hip ratio, body weight, BMI, body fat percentage, body muscle mass percentage, mental and physical well-being, self-esteem, subjective stress, body awareness, and trust in bodily sensations were observed.^[18]

Mindfulness-based interventions may be both physically and psychologically beneficial for adults who are either overweight or obese. Fifteen studies measuring posttreatment outcomes of mindfulness-based interventions in 560 individuals were identified in an review article.^[19] Average weight loss was 4.2 kg. Overall effects were large for improving eating behaviors, medium for depression, anxiety, and eating attitudes, and small for BMI and metacognition outcomes. Therapeutic effects for BMI, anxiety, eating attitudes, and eating behaviors remained significant. Another RCT study of a 12-month computerized mindfulness-based intervention for obese patients with binge eating disorder support that mindfulness work as de-automation element and a moderator of motivation to exercise which can lead to the reduction of impulsive eating and also to an increase in levels of physical activity.^[20]

Few studies has been conducted on quality of life for the obese people. A short-term yoga-based lifestyle intervention

study, including asana, pranayama, relaxation techniques, lectures, group support, nutrition awareness program, and individualized advice, had positive effect on the overall health the obese people.^[21]

These studies have designed and used different yoga modules for obesity. However, there is no validated yoga module for obesity in adolescents. Therefore, this study has been designed to propose a validated yoga module for obesity in adolescent with practices of breathing and loosening, asana, pranayama, and relaxation techniques.

Yoga is a voluntary and mindful technique that has positive impact on obesity at physical and psychological levels. Yoga has effect on serum leptin and serum ghrelin; there two hormones have been recognized to harbor major influence on the energy balance mechanism. Leptin is a mediator of long-term regulation of energy balance, suppressing food intake and thereby inducing weight loss.^[22] A study states that voluntary exercise leads to the maintenance of a lower body weight and leaner composition, as well as to improved leptin action, independent of fat mass.^[23] Moderated meditation analyses showed that higher levels of mindfulness were associated with better-perceived quality of life through lower body shame.^[24] Similar effect on serum leptin by yoga is expected as yoga is a voluntary and mindful technique to get control over mind and body.

Yoga in adolescence

Studies suggest that school-based yoga may provide unique benefits beyond participation in physical practice of yoga under expert supervision was helpful in achieving optimum level of self-adjustment in adolescent students.^[25,26] However, to the best of our knowledge, there are no studies on the effect of yoga on obesity in adolescence. Hence, this study was designed to provide Integrated Approach of Yoga Therapy module (IAYTM) for obesity in adolescents.

Validation

Validation using content–validity ratio (CVR) developed by Lawson is a tool to check product, service, or system meets requirements and specifications fulfilling its intended purposes.^[27] As there are many different modules of yoga for obesity used by different investigators from different parts of the globe, it was felt that there is a need to have a validated common protocol for obesity which we plan to use in a study on yoga for obesity in adolescents. Hence, the present study for validation was planned and implemented.

Materials and Methods

The designing, validation, and feasibility of Integrated Yoga Therapy Module (IYTM) for obesity [Figure 1] were carried out in the following steps:

Step 1: The need of the adolescents with obesity were enlisted [Table 1].

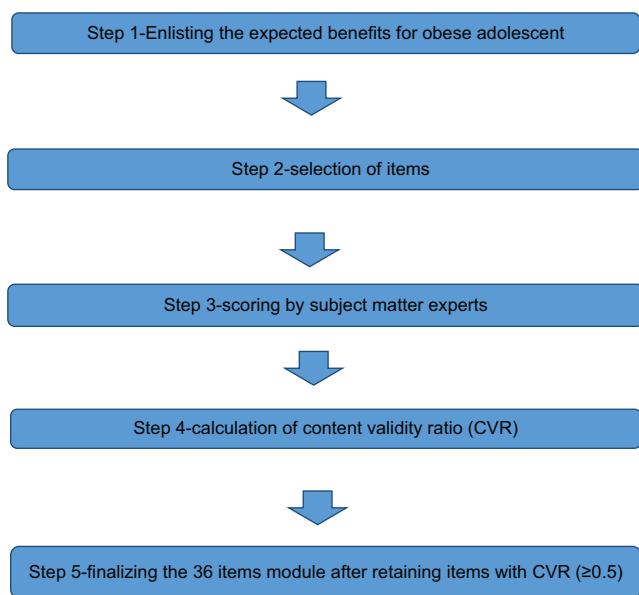


Figure 1: Flowchart of steps in the development for obesity in adolescents

Table 1: Need of adolescents with obesity

Obese adolescents need	
1	Calorie reduction by nutritious yogic diet
2	Increase calorie expenditure
3	Specific practices to reduce fat in different parts of the body, specially around hips, arms, and viscera
4	Deep relaxation to prevent exhaustion after exercises
5	Detoxification to clear constipation and other endotoxins resulting from wrong eating habits and stress
6	Stress management
7	Mind management to adhere to lifestyle
8	Vital energy balance-autonomic balance
9	Mindfulness to achieve mastery over craving for junk food, alcohol consumption if any and enjoy eating healthy food
10	Motivation to allot time for long-term adherence to lifestyle
11	Fun during parities to enjoy adherence

Step 2: The basis of integrated approach to yoga therapy to achieve these goals was understood by studying several yoga texts by the researcher under the guidance of senior yoga masters. This was complemented by the present day scientific understanding that obesity is not only a physical problem but has also deep roots in the mind and emotions. Abdominal obesity has been suggested to be associated with perturbations of the regulation of the hypothalamic-pituitary-adrenal axis. In a study on 51-year-old men ($n = 284$), salivary cortisol concentrations were determined on repeated occasions over a random working day and perceived stress was reported in parallel which results that perceived stress-dependent cortisol values were strongly related to perturbations of other endocrine axes as well as abdominal obesity.^[28] Excessive stress affects biosynthesis of physiological processes and causes an imbalance in cognition and emotions also which results in metabolic disorders such as obesity.^[29] During

stress corticotrophin-releasing hormone and norepinephrine are released which has impact on hypothalamo-pituitary axis leading to behavioral and peripheral changes. This leads to release of large quantity of glucocorticoids inhibiting action of insulin on skeletal muscles and adipose tissues which is the cause of metabolic disorder such as obesity.^[30] This supports that mind and body has strong interaction in pathophysiology of obesity. It proves that along with physical causes, disturbances or problems in mind and emotions are also major contributing factors of obesity pathophysiology.

Attention bias for food could be a cognitive pathway to overeating in obesity. The study results demonstrate that state differences in health versus palatability mind-sets can cause attenuated attention bias for high-calorie food cues in participants with higher eating restraint which can cause bias attention for food.^[31]

The concept of how obesity as a mind-body problem occurs was formulated based on the descriptions of five aspects of human existence (*Pancha Kosha Viveka*)^[32] and the downward causation of stress-induced diseases (*Adhija Vyadhi*). It states that human being exists at five different layers of existence (*Annamaya* – body, *Pranamaya* – vital energy, *Manomaya* –mind, and *Vijnaanamaya* – intellect, and *Anandamaya Kosha* – soul) which are interconnected and has counterimpact on each other also. Stress at mind disturbs *Prana* and results in abnormalities at body level called disease. Obesity also has root cause as mental stress along with other physical causes. Hence, treatment of obesity includes working on all *Koshas* (body, mind, *Prana*, and intellect). IAYTM for obesity in adolescents also is designed on the basis of *Pancha Kosha* model.

We then went on to compile the corrective techniques described in many texts (Patanjali yoga sutra, Hath Yoga Pradipika, Hatharatnavali, Bhagavad Gita) which offer a reversibility model. Thus, a need-based table of practices for long-term holistic change at all the five aspects of personality^[33,34] was prepared. Publications (books and published articles) on yoga for obesity were also reviewed to prepare the list of all practices used in all these studies This yielded forty practice items that are tabulated in Table 2.

Step 3: Validation of the module for obesity: Validation of the 40-item module was carried out by arranging a focused group discussion faculty group discussion (FGD) by inviting sixteen subject matter expert (SMEs), that included five Doctor of Medicine in Yoga, eight Doctorates (PhD) in Yoga with minimum experience of 4–5 years in the field of yoga, and three yoga therapists (MSc in yoga) involved continuously for >7 years in teaching the IAYT techniques to obese participants of all ages. These 16 SMEs marked the content validity on a three (0–2)-point scale, viz., not necessary – 0, useful but not essential – 1, and essential – 2. After validation, data were analyzed using Lawshe’s CVR.^[35]

Table 2: Basis for development of module

Domains	Yoga practices	Expected benefits
A. <i>Annamaya Kosha</i> : Raja yoga	1. Yogic diet	1. Reduce calorie intake with wholesome nutrition
	2. Kriyas (cleansing techniques)	1. Clear constipation 2. Mastery over hunger pangs
	3. Shithileekarana vyayamas (loosening practices) and Surya Namaskar	1. Exercise effect of yoga to spend calories 2. Regulation of <i>Pranic</i> circulation
	4. Asanas in standing, prone, supine and sitting positions	1. Reduces adiposity in specific parts with emphasis on abdomen, hips, and arms 2. Trains mind to be stable and calm during stressed condition
	5. Deep relaxation	1. Avoid exhaustion during and after the practice 2. Improves metabolism 3. Re-gaining and restarting efficiency of body system
B. <i>Pranamaya Kosha</i>	6. Breathing exercises	1. Balances of vital energy
	7. Breathing Kriya (rapid breathing practices)	1. Provides detoxification effect 2. Breathing in names of animals offers fun for adherence
	8. Pranayama (slow breathing practices)	1. Economizes the expenditure of vital force - to achieve mastery with awareness over <i>Prana</i> flows
C1. <i>Manomaya Kosha</i> : Raja yoga	9. Practices of <i>Dharana</i> followed by <i>Dhyana</i>	1. Provides mastery over cravings for junk foods and binge eating habits 2. Increases mindful eating
	10. Om meditation	1. Reduces stress
C2. <i>Manomaya Kosha</i> : Bhakti yoga	11. Yogic counseling using concepts of pure love to the divine	1. Provides catharsis by cognizing the suppressed emotions 2. Emphasizes the faith in reality
	12. Singing devotional songs	3. Provide guidance in confictions in mind 1. Emotion culture through fun and devotion
D. <i>Vijnanamaya Kosha</i>	13. Yogic counseling and lectures using concepts of Jnana yoga	1. Gives right knowledge to achieve the required targets 2. Enjoy eating healthy food
	i. Happiness analysis	
	ii. Sweet meditation	
E. <i>Anandamaya Kosha</i>	14. Yogic counseling and interactive lectures using concepts of Karma yoga - enjoy each moment of life by counting blessings	1. Teaches sense of duty in each act 2. Maintain awareness under all circumstances
	15. Work in blissful awareness of self-existence	1. Make to face examinations without stress and fear

Statistical analysis

Sixteen SMEs validated all the 40 practices. Lawshe's CVR was calculated for all the 40 items using the formula $CVR = (n_e - N/2)/(N/2)$,^[36] wherein n_e = number of SME panelists indicating "essential" and N = total number of SME panelists. As per Lawshe's significance table, the value of CVR for 16 SMEs = 0.5 which means all items with CVR >0.5 are valid and essential for the module.

Results

- Step 1: We presented the list of the needs of adolescents with obesity to FGD; the final comprehensive list of 11 items evolved is tabulated in Table 1
- Step 2: Table 2 shows basis of development of the module with five yogic personality domains and 15 categories of practices; the benefits each component would offer is also tabulated
- Step 3: Table 3 shows the list of 54 items that evolved all groups of practices.

CVR was calculated for physical and breathing practices only. Among them, 33 yoga practices [Table 4] with $CVR \geq 0.5$ were included in designed IYTM. Others practices such as diet, meditation, counseling and lectures on yoga were discussed in faculty group discussion (FGD) meeting and were approved by all participants. Hence, those were also included in IYTM.

Discussion

This study developed a validated module of integrated yoga as a prelude to an RCT for obese adolescents. The content validity was assessed in four steps. After enlisting the needs of obese adolescents at their physical, mental, emotional, spiritual, and behavioral levels, 15 categories of yoga practices under five domains with yogic scriptural basis (*Annamaya* – physical, *Pranamaya* – vital energy, *Manomaya* – mental and emotional, *Vijnanamaya* – intellectual, and *Anandamaya* – spiritual and behavioral) was tabulated. As a next step, 54 items of actual

Table 3: List of 54 items that evolved all groups of practices

Domain	Type of practice	Name of practice	CVR		
A. <i>Annamaya Kosha</i> : Raja yoga	Diet	Yogic diet	Approved in FGD		
		Fasting			
	Kriya	Jala neti	0.34		
		Sutra neti	0.26		
		Vaman dhauti	0.6		
		Laghu Shankhprakhshalana	0.73		
		Trataka	0.43		
		Kapalabhati	0.875		
		Shithileekarana vyayamas (loosening practices) and Surya Namaskar	Jogging with jumping: Backward, forward, and side with Mukha dhauti	0.875	
			Backward and forward bending (Pashchaata Purstaata namana)	0.625	
			Side bending (Parshva Namana/Parshva Karshana)	0.75	
			Backswing (Prushtha Andolana)	0.75	
			Hip twist (Nitamba Vyavartana)	-0.75	
			Hip rotation (Nitamba Chankramana)	0.5	
			Spinal stretch with folded legs (Baddha pada merudanda prasarana)	0.875	
			Bhunaman	0.75	
			Chakki Chalana stretch	0.5	
			Butterfly	0.75	
			Tiger stretch (Vyaghra Prasaarana)	0.625	
			Dhanurasana and Dhanurasana Swing	1	
			Surya Namaskar (5 dynamic and 1 slow)	0.875	
			Asanas in standing, prone, supine and sitting positions	Ardha Kati Chakrasana	0.625
				Padottanasana	0.25
		Trikonasana		0.875	
		Parivritta Trikonasana		0.5	
		Vajarasana		0.75	
		Ushtrasana		1	
		Sasankasana		0.75	
		Vakrasana		0.5	
		Bhujangasana		1	
		Shalabhasana		0.875	
		Naukasana		0.75	
	B. <i>Pranamaya Kosha</i>	Deep relaxation		QRT (Sheeghra shaitilya tantra)	0.75
Hands in and out breathing (Antar bahya Hastha chalana Shvasana)				0.375	
Breathing exercises		Hands stretch breathing (Hasta Prasaarana Shvasana)		0.625	
		Ankle stretch breathing (Gulf Prasaarana Shvasana)		0.75	
		Alternate leg raise breathing (Vyatyasa paadottana Shvasana)	0.625		
		Both leg raise breathing (Dwayam Padottanasana shvasana)	0.625		
		Side leg raising breathing (Paarshva Padottanasana shvasana)	0.25		
		Breathing Kriya (rapid breathing practices)	Dog breathing	0.40	
			Rabbit breathing	0.75	
		Pranayama (slow breathing practices)	Nadi shuddhi	0.5	
			Bhastrika	0.375	
			Surya AV 27rounds 4 times a day	0.75	
Bhramari 9 round	0.375				
C1. <i>Manomaya Kosha</i> : Raja yoga	Practices of <i>Dharana</i> followed by <i>Dhyana</i>	Seetali/Seetkari/Sadanta	-0.875		
		Nadanu Shandhan	Approved in FGD		
C2. <i>Manomaya Kosha</i> : Bhakti yoga	Meditation	OM meditation (Omkar Dhyana)			
		Yogic counseling using concepts of pure love to the divine			
C1. <i>Manomaya Kosha</i> : Bhakti yoga	Singing devotional songs	Lecture on Bhakti yoga			
		Bhajan session			

Contd...

Table 3: Contd...

Domain	Type of practice	Name of practice	CVR
D. <i>Vijnanamaya Kosha</i>	Yogic counseling and lectures	Lecture on Jnana yoga Counseling	
E. <i>Anandamaya Kosha</i>	14. Yogic counseling and interactive lectures 15. Work in blissful awareness of self-existence	Yogic counseling Karma yoga activity	

FGD=Focused group discussion, CVR=Content-validity ratio, QRT=Quick relaxation technique

Table 4: IYTM practices with content validity ratio ≥ 0.5 and focused group discussion approved practices

Serial number	Name of practice	CVR
1	Yogic diet	Approved in FGD
2	Fasting	
3	Vaman dhouti	0.6
4	Laghu Shankhprakashalana	0.73
5	Kapalabhati	0.875
6	Jogging with jumping: Backward, forward and side with Mukha dhauti	0.875
7	Backward and forward bending (Pashchaata Purstaata namana)	0.625
8	Side bending (Parshva Namana/Parshva Karshana)	0.75
9	Backswing (Prushtha Andolana)	0.75
10	Hip rotation (Nitamba Chankramana)	0.5
11	Spinal stretch with folded legs (Baddha paada merudanda prasaarana)	0.875
12	Bhunaman	0.75
13	Chakki Chalana stretch	0.5
14	Butterfly	0.75
15	Tiger stretch (Vyaghra prasaarana)	0.625
16	Dhanurasana and Dhanurasana swing	1
17	Surya Namaskar (5 dynamic and 1 slow)	0.875
18	Ardha Kati Chakrasana	0.625
19	Trikonasana	0.875
20	Parivritta Trikonasana	0.5
21	Vajarasana	0.75
22	Ushtrasana	1
23	Sasankasana	0.75
24	Vakrasana	0.5
25	Bhujangasana	1
26	Shalabhasana	0.875
27	Naukasana	0.75
28	QRT (Sheeghra shaithilya tantra)	0.75
29	Hands stretch breathing (Hasta Prasaarana Shvasana)	0.625
30	Ankle stretch breathing (Gulf Prasaarana Shvasana)	0.75
31	Alternate leg raise breathing (Vyatyasa paadottana shvasana)	0.625
32	Both leg raise breathing (Dwayam Padottanasana shvasana)	0.625
33	Rabbit breathing	0.75
34	Nadi shuddhi	0.5
35	Surya AV 27 rounds 4 times a day	0.75
36	Nadanu Shandhan	Approved in FGD
37	OM meditation (Omkar Dhyana)	
38	Lecture on Bhaktiyoga	
39	Bhajan session	
40	Lecture on Jnana yoga	
41	Counseling	
42	Yogic counseling	
43	Karma yoga activity	

FGD=Focused group discussion, CVR=Content-validity ratio, QRT=Quick relaxation technique

yoga practices were selected and subjected to assessment by 16 subject experts in a focussed group discussion meeting. Then, the CVR was calculated to develop the final list by retaining all those items with CVR >0.5.

Advances in technology has resulted in children spending their leisure time in television, mobiles, and ipads resulting in sedentary lifestyle and childhood obesity since last two decades.^[37,38] Low levels of physical activity are definitely promoted by an automated and automobile-oriented environment that is conducive to sedentary lifestyle.^[39] Hence, weight management by changing sedentary lifestyle of adolescents through yoga practices was the goal of designing IAYT module for obesity in adolescents. Urbanization leads to consumption of huge amount of food items at home and at restaurants, plus consumption of high-calorie food such as high-fat, low-fiber foods, and intake of sweetened beverages that have been shown to promote obesity.^[40,41] Urbanization is only the external cause of overeating. The root cause of overeating is a form of stress resulting from demanding situations in the academic and personal lifestyle among adolescents. Regular practice of yoga, especially relaxation techniques, reduces the risk of overeating. Meditation trains the mind to search for happiness form inside instead of searching outwardly. It also make the mind to enjoy eating healthy food. The control over mind decreases the cravings toward junk and fast food resulting in proper intake of high-fiber and less-fat diet.

Yoga practices with CVR <0.5 was removed from IAYTM [Table 5]. The reason for their CVR <0.5 could be these practices are not focused and not having direct impact on adolescent obesity. The principle of selection of yoga practices is physical exercise along with relaxation of mind. However, few texts on Hatha yoga lay more emphasis on improving health through different yogic practices.^[42] This module for obesity in adolescents reduces weight as it provides exercise effect to different parts of body, especially arms, abdomen, hip, and thigh region. Muscle work out

in body region reduces adipose tissues leading to weight loss. It offers enough work out to burn excessive calories that results in proper balance of calorie intake and energy expenditure. Yoga practices provide deep relaxation to internal body systems which is essential to regain normal functioning of the system. Yoga also strengthens the mind determination to adhere to healthy lifestyle.

Practices of *Manomaya Kosha* such as Bhajans (devotional music) and lecture on *Bhaktiyoga* releases stress in mind with relaxation. Practices of *Vijnanamaya Kosha* such as lecture on *Jnana yoga* and counseling help to motivate children in right direction towards success and their goal of life by clearing the intellectual complexes and conflicts. Activity like *Karmayoga* trains their mind to do work with the sense of duty and not as the burden of life which leads to relaxed mind.

These yoga practices makes IAYTM unique from other yoga modules.

Conclusion

- The yoga practices for IAYTM were designed as per yoga texts and the experience of yoga experts
- The designed IAYTM was validated by 16 yoga experts by using Lawshe's content validity formula.

Strength and limitations

This study provides a validated yoga module for obesity in adolescents. We did not conduct other validity and reliability tests for obesity in adolescents. Furthermore, all the panelists of SMEs were from the same school of Yoga (S-VYASA, Bangalore, Karnataka, India). Further study can be planned with reliability test on yoga module for obesity in adolescents.

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Conflicts of interest

There are no conflicts of interest.

References

1. Obesity and overweight Fact sheet,WHO. Available from: www.who.int/mediacentre/factsheets/fs311/en. [Last accessed on 2015 Jan, Last retrieved on 2016 Feb 02].
2. Kanazawa M, Yoshiike N, Osaka T, Numba Y, Zimmet P, Inoue S. Criteria and classification of obesity in Japan and Asia-Oceania. *World review of nutrition and dietetics* 2005;94:1-12.
3. Haslam DW, James WP. "Obesity". *Lancet* (Review). 2005;366:1197-209. doi:10.1016/S0140-6736(05)67483-1.
4. Dibaise JK, Foxx-Orenstein AE. Role of the gastroenterologist in managing obesity. *Expert Review of Gastroenterology and herpetology* (Review) 2013;7:439-51.
5. World Health Organization (WHO). Obesity: Preventing and

Table 5: IYTM practices with content validity ratio <0.5

Yoga practice	CVR
Jala neti	0.34
Sutra neti	0.26
Trataka	0.43
Hip twist (Nitamba Vyavartana)	-0.75
Padottanasana	0.25
Hands in and out breathing (Antar bahya Hasta chalana Shvasana)	0.375
Side leg raising breathing (Paarshva padottanasana shvasana)	0.25
Dog breathing	0.40
Bhastrika	0.375
Bhramari 9 round	0.375
Seetali/Seetkari/Sadanta	-0.875

CVR=Content validity ratio

- managing the global epidemic. Report of a WHO consultation. (1-253). World Health Organ Tech Rep Ser 2000;894:i-xii.
6. Yazdi FT, Clee SM, Meyre D. Obesity genetics in mouse and human: Back and forth, and back again. *Peer J* 2015;3:e856.
 7. De Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*. 2007;85:660-7.
 8. Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. *Int J Obes Relat Metab Dis: J Int Assoc Stud Obes* 1999;23 Suppl 2:S2-11.
 9. Birdee GS, Yeh GY, Wayne PM, Phillips RS, Davis RB, Gardiner P. "Clinical applications of yoga for the pediatric population: A systematic review," *Academic Pediatrics* 2009;9:212.e9-220.e9.
 10. Galantino ML, Galbavy R, Quinn. Therapeutic effects of yoga for children: A systematic review of the literature. *Pediatric Physical Therapy* 2008;20:66-80.
 11. Kaley-Isley LC, Peterson J, Fischer C, Peterson E. Yoga as a complementary therapy for children and adolescents: A guide for clinicians. *Psychiatry (Edgemont)* 2010;7:20-32.
 12. Shannahoff-Khalsa DS. Patient perspectives: Kundalini yoga meditation techniques for psycho-oncology and as potential therapies for cancer. *Integer Cancer Ther* 2005;4:87-100.
 13. Moadel AB, Shah C, Wylie-Rosett J, Harris MS, Patel SR, Hall CB, *et al.* Randomized controlled trial of yoga among a multiethnic sample of breast cancer patients: Effects on quality of life. *J Clin Oncol* 2007;25:4387-95.
 14. Rshikesan PB, Subramanya P. Effect of Integrated Approach of Yoga Therapy on Male Obesity and Psychological Parameters-A Randomised Controlled Trial. *J Clin Diagn Res* 2016;10:KC01-KC06.
 15. Lauche R, Sibbritt D, Ostermann T, Fuller NR, Adams J, Cramer H. Associations between yoga/meditation use, body satisfaction, and weight management methods: Results of a national cross-sectional survey of 8009 Australian women. *Nutrition*. 2017;34:58-64.
 16. Voroshilov AP, Volinsky AA, Wang Z, Marchenko EV. Modified Qigong Breathing Exercise for Reducing the Sense of Hunger on an Empty Stomach. *J Evid Based Complementary Altern Med* 2017;1:21.
 17. Rshikesan PB, Subramanya P, Nidhi R. Yoga Practice for Reducing the Male Obesity and Weight Related Psychological Difficulties-A Randomized Controlled Trial. *J Clin Diagn Res* 2016;10:OC22-OC28.
 18. Cramer H, Thoms MS, Anheyer D, Lauche R, Dobos G. Yoga in Women With Abdominal Obesity: A Randomized Controlled Trial. *Dtsch Arztebl Int* 2016 30;113:645-52.
 19. Rogers JM, Ferrari M, Mosely K, Lang CP, Brennan L. Mindfulness-based interventions for adults who are overweight or obese: A meta-analysis of physical and psychological health outcomes. *Obes Rev* 2017;18:51-67.
 20. Ruffault A, Carette C, Lurbe I, Puerto K. Randomized controlled trial of a 12-month computerized mindfulness-based intervention for obese patients with binge eating disorder: The MindOb study protocol. *Contemp Clin Trials* 2016;49:126-33.
 21. Yadav R, Yadav RK, Pandey RM, Kochar KP. Effect of a Short-Term Yoga-Based Lifestyle Intervention on Health-Related Quality of Life in Overweight and Obese Subjects. *J Altern Complement Med* 2016;22:443-9.
 22. Klok MD, Jakobsdottir S, Drent ML. The role of leptin and ghrelin in the regulation of food intake and body weight in humans: A review. *Obes Rev* 2007;8:21-34.
 23. Krawczewski Carhuatanta KA1, Demuro G, Tschöp MH, Pfluger PT, Benoit SC, Obici S. Voluntary exercise improves high-fat diet-induced leptin resistance independent of adiposity. *Endocrinology* 2011;152:2655-64.
 24. Moreira H, Canavarro MC. Is body shame a significant mediator of the relationship between mindfulness skills and the quality of life of treatment-seeking children and adolescents with overweight and obesity. *Body Image* 2017;20:49-57.
 25. Felver JC, Butzer B, Olson KJ, Smith IM, Khalsa SBS. Yoga in public school improves adolescent mood and affect. *Contemp Sch Psychol* 2015;19:184-92.
 26. Bhardwaj PR, Mookherjee R, Abhishek KBhardwaj. Self-Adjustment in School Going Adolescents Following Three Months of Comprehensive Yoga Program. *OJMR* 2015;1:14-21.
 27. Global Harmonization Task Force - Quality Management Systems - Process Validation Guidance. *GHTF/SG3/N99-10:2004;2:3*.
 28. Rosmond R, Dallman MF, Björntorp P. Stress-related cortisol secretion in men: Relationships with abdominal obesity and endocrine, metabolic and haemodynamic abnormalities. *J Clin Endocrinol Metab* 1998;83:1853-9.
 29. Locci A, Pinna G. Neurosteroid biosynthesis downregulation and changes in GABAA receptor subunit composition: A biomarker axis in stress-induced cognitive and emotional impairment. *Br J Pharmacol* 2017;174:3226-41.
 30. Nagarathna R, Nagendra HR. *Yoga for Obesity*. First edition, Bengaluru: Swami Vivekananda Yoga Prakashana. 2014. p.26.
 31. Werthmann J, Jansen A, Roefs A. Make up your mind about food: A healthy mindset attenuates attention for high-calorie food in restrained eaters. *Appetite* 2016;105:53-9.
 32. Sarvananda S. *Taittiriyaopanisad*. Ch. 2:1-6. Chennai: Mylapore, Shree Ramakrishna Math Publication; 2008. p. 88-134.
 33. Svatmarama. *Hatha Yoga Pradipika of Svatmarama*. 4th ed. Madras: Adyar Library and Research Centre; 1994.
 34. Digambarji S, Gharote ML. *Gheranda Samhita*. 1st ed. Lonavala: Kaivalyadhama S.M.Y.M Samiti; 1978.
 35. Lawshe CH. A quantitative approach to content validity. *Pers Psychol* 1975;28:563-75.
 36. Global Harmonization Task Force – Quality Management Systems – Process Validation Guidance. Vol. 2. *GHTF/SG3/N99-10:2004; 2004*. p. 3.
 37. Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television viewing as a cause of increasing obesity among children in the United States, 1986-1990. *Arch Pediatr Adolesc Med* 1996;150:356-62.
 38. Robinson TN. Reducing children's television viewing to prevent obesity: A randomized controlled trial. *JAMA* 1999;282:1561-7.
 39. Epstein LH, Saelens BE. Behavioral economics of obesity: food intake and energy expenditure. In: Bickel WK, Vuchinich RE, editors. *Reframing health behavior change with behavioral economics*. Mahwah, NJ: Lawrence Erlbaum Associates; 2000.
 40. Lin BH, Guthrie J, Frazao E, editors. *Nutrient contribution of food away from home. America's Eating Habits: Changes and Consequences*. Agriculture Information Bulletin No. 750. Economic Research Service Report. Researchgate net 1999. p. 213-39.
 41. Pereira MA, Kartashov AI, Ebbeling CB, Van Horn L, Slattery ML, Jacobs DR, Jr, *et al.* Fast food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet* 2005;365:36.
 42. Taimni IK. *The Science of Yoga: A Commentary on the Yoga Sutras of Patanjali in the Light of Modern Thought*. 5th ed. Illinois: Theosophical Publishing House; 1992.