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Original Article

Intervention on depression and insomnia symptoms during the COVID-19 pandemic

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ABSTRACT

Objectives: The COVID-19 pandemic has created significant psychological challenges globally. Evidence has been mounting of greater emotional distress and possible worsening of underlying psychiatric disorders, due to repercussions of COVID-19. In addition, the pandemic has created barriers to access for help, due to social distancing and travel restrictions. Thus, creating a major need for effective interventions that can be accessed safely from home and provide coping tools which can be learned and practiced while in isolation. An App based Yoga of Immortals (YOI) program is one such strategy to help cope with stressful situations. The objective of this study was to investigate if the YOI program can provide significant benefit for depressive and insomnia symptoms.

Material and Methods: Participants in this study were asked to complete two brief online but well validated mental health screening tools before intervention. This was followed by a 7-week long YOI intervention. Following the intervention, participants were once again asked to complete the online validated questionnaires. The survey questionnaires included baseline demographic data and validated scales for measuring insomnia severity Insomnia severity Index (ISI) and levels of depression symptoms patient health questionnaire-8, (PHQ-8). All statistical analysis was performed using the Statistical Package for the Social Science.

Results: SY YOI intervention of 7 weeks significantly improved the ISI scores as well as PHQ-8 scores in the study population ($P < 0.0001$ in all comparisons).

Conclusion: YOI intervention is an effective intervention strategy for decreasing insomnia and depression symptoms, even during the pandemic.

Keywords: COVID-19, Mindfulness, Insomnia, Depression, Psychiatric disorders, Meditation, ShivYog

INTRODUCTION

Evidence is mounting that the COVID-19 pandemic has created significant psychological challenges globally. The Kaiser Family Foundation conducted a poll, which suggested that the pandemic had negatively affected the mental health of 56% of adults in the US.[1] This is consistent with research findings from the UK[2] and China.[3] In addition, the pandemic has created barriers to access for help, due to social distancing and travel restrictions. Not just access to professional mental health services, but access to family and social supports, religious and spiritual supports,

and workplace supports has all been drastically limited. Thus, there is a major need for effective interventions that can be accessed safely from home and that can provide coping tools which can be learned and practiced in isolation.

Yoga of Immortals (YOI) is a comprehensive program developed by ShivYog, an organization that teaches practices based on ancient yogic teachings. Much of today's practices of yoga, meditation, and mindfulness are derived from these ancient yogic teachings. The ShivYog leaders have, for centuries taught their practices only through in-person meetings. However, a structured YOI program was developed for a mobile platform before the pandemic onset, a platform that is increasingly utilized and accepted in today's technological society. Mobile platforms have the potential to deliver on-demand and as needed assessment and interventions, helping to address barriers such as time constraints, costs, and accessibility problems. The YOI program is delivered through an app available on smartphones and tablets, thus easily accessible to much of the population.

This study attempts to investigate if the mobile app based YOI program can provide significant benefit for depressive and insomnia symptoms, in the background of an international pandemic that has caused greater population distress and simultaneous disruption of access to care. For this study, the focus was on depressive and insomnia symptoms because of the high frequency of these symptoms in general, and that both symptoms saw increases during the pandemic.[1,2]

MATERIAL AND METHODS

Study population

The study was conducted using an online survey in a worldwide population. Study participants were recruited through a link distributed through common social media platforms – Facebook and Twitter. Interested participants were sent a link to download the YOI application onto their mobile device. The study design was thus based on a convenience sample – all interested potential participants were sent the link and data were collected as participants completed the intervention and filled out the questionnaires. All materials and assessments related to the study were provided to participants through the mobile application. Before the intervention, all participants were asked to complete online, both the Insomnia Severity Index (ISI) and the Patient Health Questionnaire-8 (PHQ-8). Both are well validated screening tools, used for population screening of insomnia and depressive symptoms, respectively. The participants were then asked to complete both questionnaires 3 more times over the 7 weeks course of the study. Baseline assessment also included demographic variables including age, race/ethnicity, marital and employment status, education, and occupation. Furthermore, all participants were also asked to report if they had a diagnosis of any underlying psychiatric disorder and use of mental health services including psychotherapy and/or use of medications (e.g. antidepressants or other psychotropic medications).

Intervention

All participants were invited to complete the YOI app-based intervention, which consisted of 98 sessions over the course of 7 weeks. The sessions changed weekly. Before beginning of each week, participants were asked to read and watch the associated instruction in preparation for the weekly sessions. These video instructions were provided by the app, which could be downloaded through the link sent to all participants. In this initial study, self-reports were used to confirm participation and completion of the YOI modules. Each individual session lasted for 30 min. The protocol included two sessions a day – in the morning and evening. The morning sessions included a combination of whole-body movements, postures, and yogic breathwork (cyclical controlled breathing practices including abdominal breathing) synchronized with meditation and chants.

The evening sessions included slow yet deep yogic breathwork and meditations. With each week, the sessions became more advanced, building on the work of prior weeks.

In addition, during the intervention period, all participants were sent regular videos from instructors providing more in depth training and instruction.

After completion of the last session, all participants were asked to complete the two screening questionnaires for the fourth and final time. The participants were required to complete their study surveys within 24 h. To ensure data quality, human verification and attention checks were implemented throughout the survey; the data were further inspected visually for response irregularities suspicious for bots.

Eligibility criteria included (i) age 18 years or older and (ii) able to read and understand English. A total of 1505 participants enrolled in the study. However, 422 enrollees failed to complete the post-intervention questionnaires, resulting in 1083 participants available for analysis [Figure 1].

Assessment scales

The following assessment scales were used in the study:

ISI

The ISI is an instrument posing seven questions to assess current (i.e. preceding 2 weeks) sleep characteristics. The first three items pose questions related to sleep onset, sleep

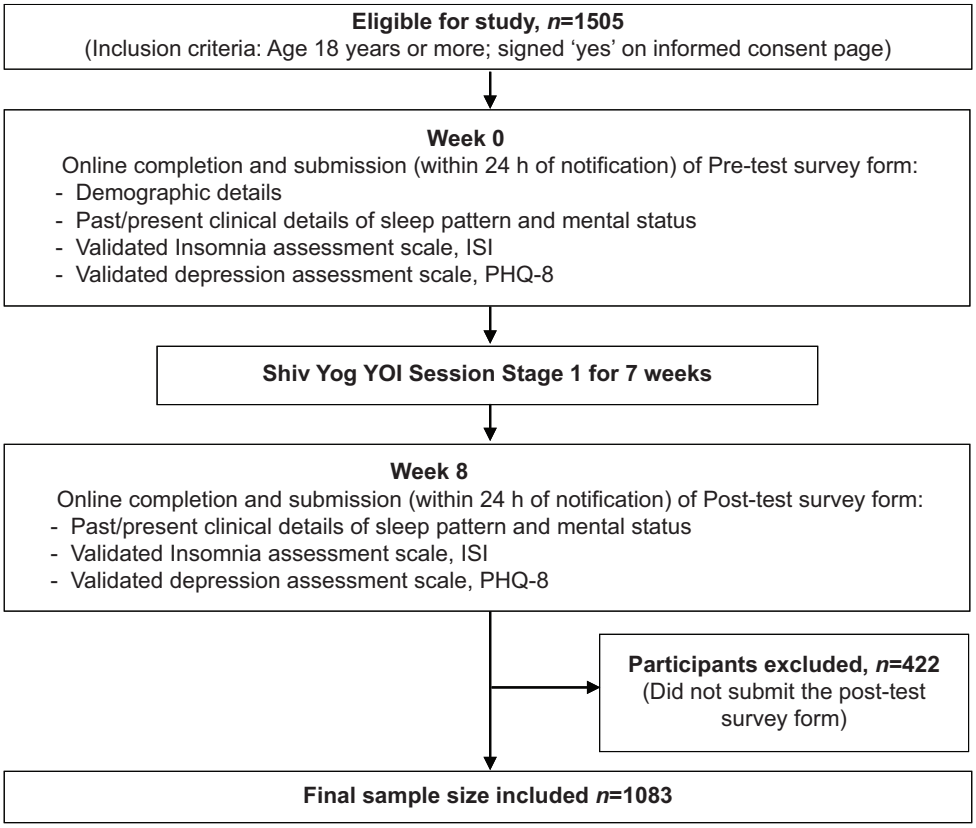

Figure 1: Outline of sample size and study design.

maintenance, and early morning awakening. Subsequent items assess the degree of satisfaction or dissatisfaction with the current sleep pattern, how the current sleep pattern interferes with daily functioning, how noticeable the impairment attributed to the sleep problem is, and how worrisome the current sleep problem is. Items were rated on a five-point Likert scale ("0" representing none or not at all and "4" representing very much). Total scores ranged from 0 to 28, with higher combined scores indicating worse insomnia severity.[4] Participants were placed in total score groups as follows: 0–7= no clinically significant insomnia; 8–14= subthreshold insomnia; 15–21= clinically significant insomnia (moderate); and 22–28= clinically significant insomnia (severe).

PHQ-8

Symptoms of depression were assessed using the 8-item version of the PHQ-(PHQ-8[5]). The PHQ-8 versions used was the standardized and modified response set of Kroenke *et al*.[5] (A four-point Likert scale from 0 to 3; 0 to 1 day= "not at all," 2 to 6 days = "several days," 7 to 11 days= "more than half the days," and 12 to 14 days="nearly every day,"). The scores for each item were summed to produce a total score between 0 and 24 points. The ranges of total scores are categorized as follows: 0–4= no significant depressive symptoms; 5–9= mild depressive symptoms; 10–14= moderate; 15–19= moderately severe; and 20–24= severe. Current depression symptoms were defined as a PHQ-8 score of ≥10[5] which, regardless of diagnostic status, typically correlate with clinically significant depression.[5,6]

Statistical analysis

All statistical analysis was performed using the Statistical Package for the Social Science. Both parametric and non-parametric tests were performed. For demographic parameters, descriptive statistics were used to express results as numbers and percentages. For ISI and PHQ8, data were expressed as mean ± standard error of mean (SEM). Paired *t*-test was applied for within group comparison. A two-sided $P < 0.05$ was considered statistically significant. Chi-squared test was applied for comparison of percentage scores between pre- and post-YOI intervention scales. $P < 0.05$ was considered statistically significant.

Institutional review board approval

The study was approved by the Institutional Review Board, University of Cincinnati. Informed consent was obtained from all participants included in this study.

RESULTS

Demographic data

Details of demographic data are depicted in Figure 2 and Table 1. Participants represented a total of 30 nations [Figure 2]. There was a fair distribution among both genders and maximum participants were concentrated in the ages 26–58 years. Other demographic details are depicted in Table 1. The mean total ISI scores and mean total PHQ8 scores as well as the results of two-tailed paired *t*-test of these means for week 8 versus week 0 for the demographic parameters are shown in Table 2.

ISI

The mean total ISI score at week 0 (n = 1083) was 6.72 with a SEM of 0.23. At week 8 (n = 1083), the mean total ISI score was 3.26 with a SEM of 0.15. The two-tailed P value in the paired *t*-test for the 2 time periods was in the extremely significant range [$P < 0.0001$, Table 3]. The difference in the means of the time periods was 3.46 (95% CI for difference in means was 3.09–3.83). The frequency distribution in the different total ISI score ranges for the pre-test and post-test surveys is shown in Figure 3. There was a greater percentage of participants with lower ISI scores and lesser percentage with higher ISI scores at week 8 as compared to week 0. Considering the number of individuals in each ISI score range [Table 3, first 4 rows], at week 0 there were 714 individuals in the "0-7" ISI score range (no clinically significant insomnia), 193 individuals in the "8-14" ISI score range (sub-threshold insomnia), 107 individuals in the "15-21" ISI score range (clinically significant moderate insomnia), and 69 individuals in the "22-28" ISI score range (clinically significant severe insomnia). At week 8 [Table 3, first 4 rows, right hand columns], the numbers changed to 214, 90, 67, and 57 in the "0-7," "8-14," "15-21," and "22-28" ISI score range groups, respectively. The decrease in numbers in each of the insomnia-affected ISI score range groups reflected as an increase in numbers in the "0-7" ISI score range. Individuals who were no longer in the "8-14," "15-21," or "22-28" ISI score range groups at week 8, were all in the "0-7" (no clinically insignificant insomnia) ISI score range group. When we expressed the difference in numbers between week 0 and week 8 for the "8-14," "15-21," or "22-28" ISI score range groups as percentage of individuals at week 0, the results indicated that 46.63% of individuals in "8-14" group, 62.62% of individuals in the "15-21" group, and 82.61% of individuals in the "22-28" group had ISI scores that decreased to the "no clinically significant insomnia" range [Table 3a].

All the above results indicated that the YOI intervention of 7 weeks improved the ISI scores and sleep patterns in the study population in general, as well as within the different total ISI score ranges.

Depression symptom severity assessment

In the PHQ-8 assessment scale, the mean total score for the week 0, pre-test survey (n = 1083) was 6.5 with a SEM of 0.18. At week 8, for the post-test survey, the mean total was 3.4 with a SEM of 0.14. The difference in results between 2 time periods was statistically significant in the paired *t*-test (two-tailed $P < 0.0001$). The difference in the means of the 2 time periods was 3.1 (95% CI for difference in means was 2.81–3.39). The frequency distribution in the different PHQ-8 groups for the pre-test and post-test surveys is shown in

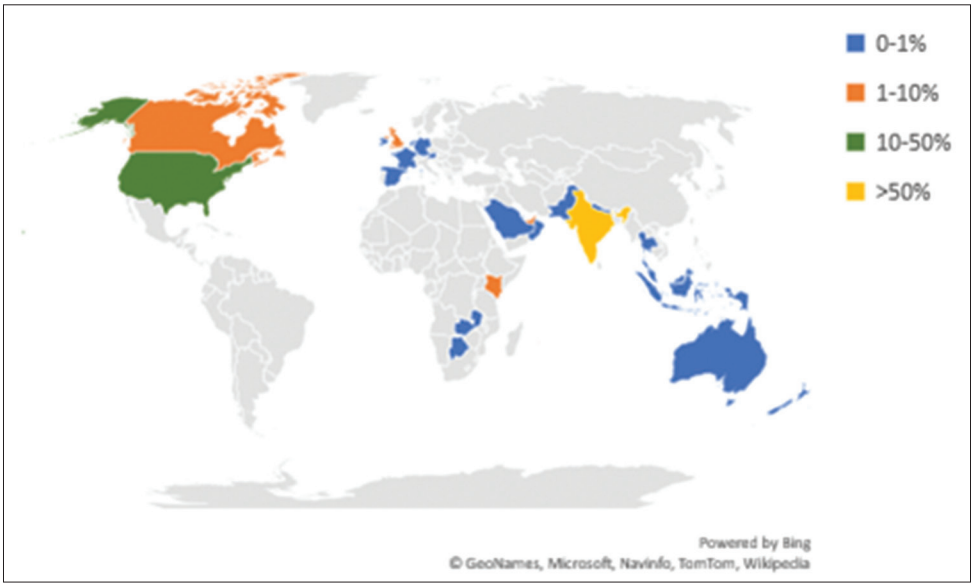

Figure 2: Distribution of participants across nations (n = 1083; values are expressed as percentage ranges).

Table 1: Demographic details of the study population in numbers as well as percentage.

Parameters	Categories	Numbers (total 1083)	Percentage
Age	18–25 years	67	6.19
	26–36 years	325	30.01
	37–47 years	336	31.02
	48–58 years	254	23.45
	59–69 years	92	8.49
	70–80 years	9	0.83
Gender	Male	590	54.48
	Female	490	45.24
	Prefer not to say	3	0.28
Race and ethnicity	American Indian or Alaska Native	5	0.46
	Asian	959	88.55
	Black or African American	1	0.09
	Native Hawaiian or Other Pacific Islander	1	0.09
	White	10	0.92
	Other	107	9.88
Highest level of education	High School or Lower	139	12.83
	Bachelor's degree	511	47.18
	Master's degree	359	33.15
	Medical Doctor	53	4.89
	PHD	21	1.94
Self-reported history of psychiatric disorders	Bipolar disorders	2	0.18
	Eating disorders	13	1.2
	Generalized anxiety disorders	28	2.59
	Major depression	19	1.75
	More than one mental health disorder	71	6.56
	Post-traumatic stress disorders (PTSD)	5	0.46
	Psychotic disorders (including schizophrenia)	3	0.28
	Obsessive compulsive disorder (OCD)	4	0.37
	Other, not listed above, mental health disorder	70	6.46
	No history of mental health disorder	868	80.15

Figure 3. There was a greater percentage of participants with lower PHQ-8 scores and lesser percentage with higher PHQ-8 scores in week 8 as compared to week 0.

Evaluation of PHQ-8 scale at week 0 [Table 3a, bottom four rows] demonstrated 512 individuals in the "0-4" PHQ-8 score range (no significant depressive symptoms), 295 individuals in the "5-9" PHQ-8 score range (mild depressive symptoms), 152 individuals in the "10-14" PHQ-8 score range (moderate depression), 74 individuals in the "15-19" PHQ-8 score range

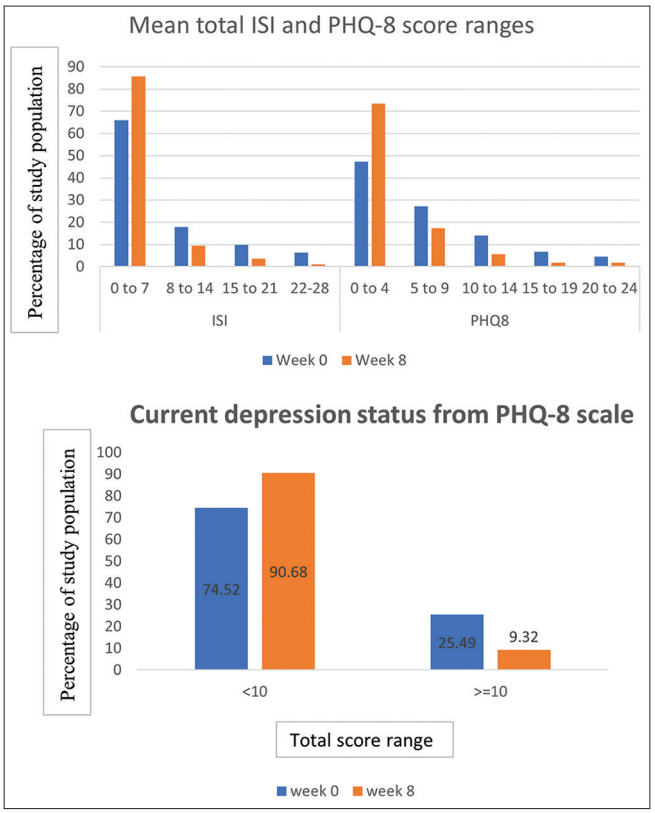

Figure 3: Total ISI scores, total PHQ-8 scores and current depression status at week 0 and week 8 (n = 1083 for all. All values are in percentage. ***P<0.0001 vs. week 0 in the Chi-square test. df: Degree of freedom).

(moderately severe depression), and 50 individuals in the "20-24" PHQ-8 score range (severe depression). At week 8, the numbers changed to 795, 187, 62, 20, and 19 in the "0-4," "5-9," "10-14," "15-19," and "20-24" PHQ-8 score range groups, respectively. The decrease in numbers in each of the depression-affected PHQ-8 score range groups reflected as an increase in numbers in the "0-4" PHQ8 score range (no significant depressive symptoms). This reflected the individuals who were no longer in the "5-9," "10-14" or "15-19" or "20-24" PHQ-8 score range groups at week 8, and had moved into the "0-4" (no significant depressive symptoms) PHQ-8 score range group. When we expressed the difference in numbers between week 0 and week 8 for the "5-9," "10-14" or "15-19" or "20-24" PHQ-8 score range groups as percentage of individuals in week 0, the results indicated that 36.61% of individuals in "5-9" group, 59.21% of individuals in the "10-14" group, 72.97% of individuals in the "15-19" group, and 62% in the "20-24" group had PHQ-8 scores that decreased to the "no significant depressive symptoms" range [Table 3a].

Figure 3 displays PHQ-8 depressive symptoms based on the cutoff total score of 10. At week 0, 74.52% of the study population had a PHQ8 total score of <10 and 25.48% had

Table 2: Mean total ISI scores and mean total PHQ8 scores (mean ± SEM) at week 0 and week 8.

Parameters	Categoriesw	Mean total ISI ± SEM		Mean total PHQ8 ± SEM	
		Week 0	Week 8	Week 0	Week 8
Age	18–25 years	10.15±0.97	4.49±0.61***	8.61±0.65	4.3±0.48***
	26–36 years	8.56±0.45	4.21±0.34***	8.5±0.35	4.34±0.29***
	37–47 years	6.75±0.41	3.31±0.25***	6.53±0.33	3.6±0.23***
	48–58 years	4.8±0.37	2.2±0.21***	4.64±0.28	2.26±0.22***
	59–69 years	3.32±0.55	1.9±0.35***	3.41±0.49	2.12±0.45***
	70–80 years	2.89±0.81	2.11±1.41	1.33±0.5	0.67-0.24
Gender	Male	6.65±0.33	3.11±0.23***	6.7±0.28	3.49±0.21***
	Female	6.81±0.31	3.4±0.19***	6.36±0.24	3.34±0.18***
	Prefer not to say	Statistics not done due to too few numbers			
Highest level of education	High School or Lower	5.36±0.55	3.41±0.46***	6.27±0.49	3.85±0.41***
	Bachelor's degree	6.86±0.33	3.15±0.2***	6.49±0.26	3.35±0.19***
	Master's degree	7.45±0.41	3.58±0.28***	7.03±0.33	3.51±0.25***
	Medical Doctor	4.66±0.96	1.83±0.38***	4.09±0.68	2.23±0.48**
	PHD	5.19±1.25	3.29±0.96	5.14±0.94	2.62±0.82*
Self-reported history of psychiatric disorders	Bipolar disorders	4±3	4.5±0.5	6.5±6.5	3±1***
	Eating disorders	7.62±2.7	2.62±1.2***	8.92±1.72	4.69±0.94***
	Generalized anxiety disorders	12.14±1.51	5.93±0.93***	11.61±1.45	5.57±0.92***
	Major depression	6.95±1.51	4.63±1.19***	8.32±1.12	5.26±1.27***
	More than one disorder	15.04±1.03	7.93±0.87***	12.24±0.79	7.49±0.79***
	Post-traumatic stress disorders (PTSD)	6±2.47	2.2±1.24***	5.4±1.81	1.6±1.36***
	Psychotic disorders (including schizophrenia)	12±6.11	5.67±4.18***	17±2.52	8±4***
	Obsessive compulsive disorder (OCD)	25.25±3.33	14.5±6.64***	18.5±3.3	12±6.35***
	Other, not listed above, mental health disorder	8.03±0.9	5.46±0.73***	8.14±0.77	5.59±0.66***
	No history of mental health disorder	5.67±0.23	2.54±0.14***	5.57±0.18	2.72±0.13***

Two-tailed paired *t*-test: *P<0.05, **P<0.01, ***P<0.001 versus week 0 within the same parameter

a PHQ-8 total score ≥10. However, at week 7, an increased percentage of the population fell in the <10 total score category (90.68%) and lesser number (9.32%) in the ≥10 category indicating that current depression was resolved in most of the participants after 7 weeks of YOI intervention.

The above results indicated that the depression severity had decreased following 7-weeks of YOI intervention in the general study population as well as in the sub-populations belonging to different total score ranges of PHQ-8

Clinical history of underlying mental health disorders and ISI, PHQ-8 scores

Of the 1083 participants in the study, 215 (19.85%) reported being clinically treated for underlying psychiatric disorders and remaining 868 (80.15%) individuals reported no pre-existing mental health disorder.

The 19.85% participants with self-reported psychiatric disorder demonstrated a mean ISI score of 11.05 (subthreshold insomnia) and mean total PHQ-8 score of 10.25 (moderate depressive symptoms) at week 0. At week 8, the total mean ISI score decreased to 6.18 (no clinically significant insomnia) and the total PHQ-8 score improved to 6.17 (mild depressive symptoms).

Table 2 shows the mean ISI and PHQ-8 scores of the pre-test (week 0) and post-test (week 8). Both ISI and PHQ-8 scores numerically improved in all categories at week 8. Furthermore, participants with self-reported diagnoses of obsessive compulsive disorder, psychotic disorder, more than one disorder (combination of two or more disorders listed on the questionnaire), or "other" underlying mental health disorder (non-specified on the questionnaire) who had "clinically significant insomnia" at week 0, had fallen in the "no clinically significant insomnia" or "subthreshold insomnia" range. Likewise, general anxiety disorders, psychotic disorders, obsessive compulsive disorders or more than one disorder (combination of two or more disorders listed on the questionnaire) that had PHQ-8 scores greater

Table 3a: Number of individuals in each of the ISI and PHQ8 score ranges at week 0 and week 8 (total *n*=1083); the difference in numbers in the affected groups and the percentage in difference (expressed as percentage of week 0 individuals).

Parameters	Score range	Number of individuals		δ	δ as % of week 0
		Week 0	Week 8		
ISI	No CS Insomnia (0–7)	714	928	214	NA
	Mild (8–14)	193	103	90	46.63%
	Moderate (15–21)	107	40	67	62.62%
	Severe (22-28)	69	12	57	82.61%
PHQ-8	No significant depressive symptoms (0–4)	512	795	283	NA
	Mild (5–9)	295	187	108	36.61%
	Moderate (10–14)	152	62	90	59.21%
	Moderate to Severe (15–19)	74	20	54	72.97%
	Severe (20–24)	50	19	31	62%

NA: Not applicable, δ: Difference in numbers between week 0 and week 8

Table 3b: Number of Individuals with underlying psychiatric disorders in each of the ISI and PHQ8 score ranges at week 0 and week 8 (total *n*=215)**.**

Parameters	Score range	Number of individuals		δ	δ as % of week 0
		Week 0	Week 8		
ISI	No CS insomnia (0–7)	89	147	58	NA
	Mild (8–14)	57	41	16	28.07
	Moderate (15–21)	35	18	17	48.57
	Severe (22–28)	34	9	25	73.53
PHQ-8	No significant depressive symptoms (0–4)	55	107	52	NA
	Mild (5–9)	54	58	4	7.41
	Moderate (10–14)	48	29	19	39.58
	Moderate to Severe (15–19)	32	7	25	78.13
	Severe (20–24)	26	14	12	46.15

NA: Not applicable, δ: Difference in numbers between week 0 and week 8

than 10 at week 0 showed PHQ-8 < 10 at week 8. In addition, interesting correlations were seen between the lowering of PHQ-8 and ISI scores, demonstrating a strong link between depression symptoms and insomnia.

Table 3b, shows sub categorization of 215 participants with self-reported psychiatric disorders, based on total ISI and PHQ8 score ranges. Taking into account the number of individuals in each ISI score range [Table 3b, first four rows], at week 0 there were 89 individuals in the "0-7" ISI score range (no clinically significant insomnia), 57 individuals in the "8-14" ISI score range (sub-threshold insomnia), 35 individuals in the "15-21" ISI score range (clinically significant moderate insomnia), and 34 individuals in the "22-28" ISI score range (clinically significant severe insomnia). In week 8, the numbers decreased to 147, 41, 18, and 9 in the "0-7," "8-14," "15-21," and "22-28" ISI score range groups, respectively. The decrease in numbers in each of the insomnia-affected ISI score range groups reflected as an increase in numbers in the "0-7" ISI score range. Individuals who were no longer in the "8-14," "15-21," or "22-28" ISI score range groups at week 8, were all in the "0-7" (no clinically insignificant insomnia) ISI score range group. When we expressed the difference in numbers between week 0 and week 8 for the "8-14," "15-21," or "22-28" ISI score range groups as percentage of individuals in week 0, the results indicated that 28.07% of individuals in "8-14" group, 48.57% of individuals in the "15-21" group, and 73.53% of individuals in the "22-28" group had ISI score reduction to the "no clinically significant insomnia" range.

Evaluation of PHQ-8 scale at week 0 demonstrated 55 individuals in the "0-4" PHQ-8 score range (no significant depressive symptoms), 54 individuals in the "5-9" PHQ-8 score range (mild depressive symptoms), 48 individuals in the "10-14" PHQ-8 score range (moderate depression), 32 individuals in the "15-19" PHQ-8 score range (moderately severe depression), and 26 individuals in the "20-24" PHQ-8 score range (severe depression). At week 8, the numbers marked decreased to 107, 58, 29, 7 and 14 in the "0-4," "5-9," "10-14," "15-19," and "20-24" PHQ-8 score ranges.

These results indicate that the YOI intervention improved the ISI as well as PHQ-8 scores in the general study population as well as in participants who reported being treated for underlying psychiatric disorders.

DISCUSSION

The YOI mobile app-based intervention showed effectiveness in reducing symptom severity in both the ISI and the PHQ8, over a 7-week period. In the PHQ-8 assessment scale, the difference in mean total score between pre- and post-intervention was statistically significant (95% CI 2.81–3.39, $P < 0.0001$) with a greater than 70% reduction in the

pre-intervention moderate to severe score subgroup. This finding was evident even in participants with self- reported psychiatric disorders currently on pharmacologic treatment. The ISI assessment scale also demonstrated a statistically significant decrease in symptom severity (95% CI 3.09–3.83, $P < 0.0001$) with 80% reduction in severe insomnia symptoms in the participants with self- reported psychiatric disorders. In addition, the effect was demonstrated within every stratified severity subcategory of both scales.

This is the first known study of YOI, a program that is a unique combination of aspects of yoga practice. Thus, finding comparison studies of similar programs have been challenging. The literature thus far has focused on specific yoga practices done in isolation or use a mix of yoga and mindfulness. Some studies investigated purely yoga while others have evaluated various mindfulness meditations. A systematic review of yoga for major depressive disorder that evaluated seven randomized control studies, yielded inconclusive results for use of yoga as an adjunct treatment.[7] Although, systematic reviews of mindfulness-based interventions have shown some benefit in insomnia,[8] reviews that evaluated pure mindfulness-based interventions indicated low yield results for depression.[9] Nevertheless, a body of evidence has developed over the past two decades that show some evidence for positive effects beyond placebo as an adjunct treatment for clinical depression and sleep disorders.[10,11] In addition, meditative movement type interventions such as Tai chi and Qigong have demonstrated some benefit in randomized control trials[12-14] for depression and insomnia. Although YOI is fundamentally different from Tai chi and Qigong, it also utilizes some meditative movements and breathes regulation.

One of the core features of YOI protocol is breath work, including abdominal breathing. Some studies have shown that abdominal breathing could decrease depressive symptoms and reduce cortisol levels.[15] Abdominal breathing may serve as a bridge linking the autonomic nervous system and the central nervous system to mobilize vagal activation of GABA (gamma-aminobutyric acid) pathways from the prefrontal cortex and insula, and to inhibit amygdala overactivity,[16] leading to decreased depressive symptoms.

Therefore, several of the components or practices similar to that used in the YOI intervention have been studied and shown some benefit. Therefore, the literature, in part, justifies the study of a program that combines deliberate breath work, physical movements, and postures included in the YOI program.

Several limitations are evident and, therefore, interpretations of this data must be used with caution. A potential drawback is self-selection bias, whereby certain traits and characteristics may motivate people to participate in YOI type courses. Alternatively, the subjects may have been exhibiting evaluation apprehension,[17] a response bias whereby self-report items are rated according to their perceived social desirability.

Furthermore, the absence of an active control group makes it impossible to control for the expectation effects of the intervention. Future studies could bolster our data by providing an active control comparison group. Although all subjects were encouraged to practice the morning and evening YOI sessions for 30 min daily, our study did not prospectively evaluate compliance to this practice. While it would be difficult to objectively measure compliance, as participant observation was not possible, including a component of self-reported compliance perhaps would have helped to better interpret the significance of the results. Furthermore, it may have helped predict the usability of the intervention within the general population. Finally, follow-up beyond the 2 months after completing the YOI course would provide more information on long-term efficacy.

The goal of the current study was to perform an initial study as a proof-of-concept that the YOI intervention had a detectable effect on symptoms of depression and disordered sleep. Since the study relied on self-reports and self-monitoring, a large fraction of the recruited subjects did not complete all the sections of the study or did not answer both questionnaires. The study was intended to be a convenience design with the goal of demonstrating an overall effect of the YOI intervention in a broad group of subjects.

Future studies should attempt to engage a more representative population of those who experience depression and insomnia symptoms, to assess whether there is broader applicability of the intervention. In addition, future studies should attempt to investigate if YOI has benefit for specific psychiatric disorders, using validated, structured diagnostic tools. Investigation for effectiveness in anxiety disorders should also be considered, given clinical overlap with depression and sleep disorders as well as known benefit of breathing techniques in reducing anxiety symptoms.

CONCLUSION

The study confirms the potential benefits of a mobile app based YOI intervention as an effective tool for decreasing moderate to severe depressive and insomnia symptoms in the general population and suggests some benefit as well in individuals who self-reported psychiatric disorders. In the current COVID-19 induced environment of social distancing and the need for more remotely based help, YOI offers a promising solution.

Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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