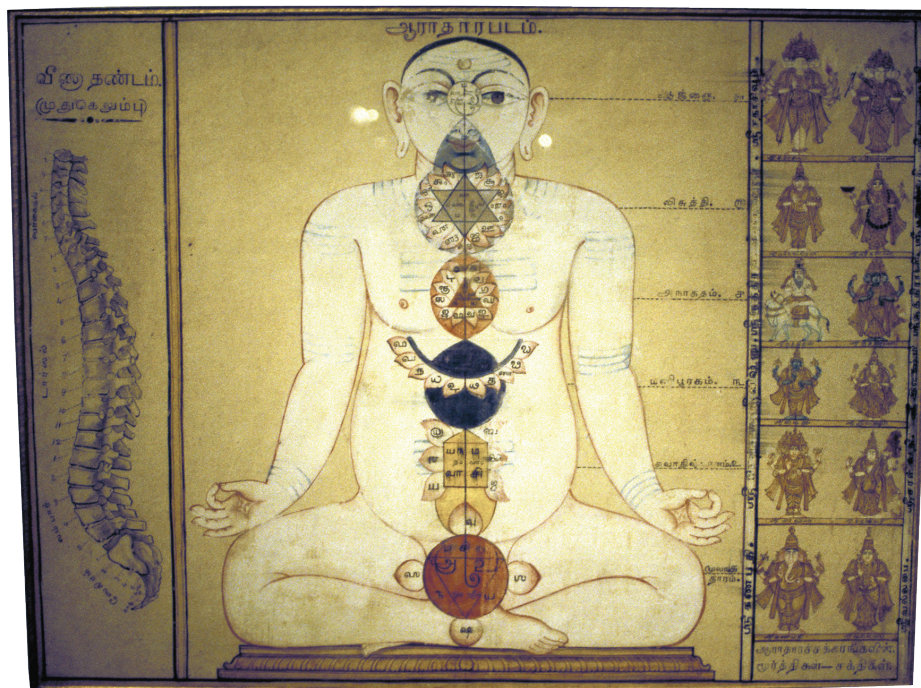




## Assessing Depression Following Two Ancient Indian Interventions

### *Effects of Yoga and Ayurveda on Older Adults in a Residential Home*

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#### ABSTRACT

The effects of yoga and ayurveda on geriatric depression were evaluated in 69 persons older than 60 who were living in a residential home. Participants were stratified by age and gender and randomly allocated to three groups: Yoga, Ayurveda, or Wait-list Control. The 15-item Geriatric Depression Scale was used to assess depressive symptoms prior to the in-

tervention, and after 3 months and 6 months post-intervention. Participation in one of the three groups lasted 24 weeks. The yoga program (7 hours 30 minutes per week) included physical postures, relaxation techniques, regulated breathing, devotional songs, and lectures. The Ayurveda Group received an herbal preparation twice daily for the whole period. The depression symptom scores of the

Yoga Group at both 3 and 6 months decreased significantly, from a group average baseline of 10.6 to 8.1 and 6.7, respectively ( $p < .001$ , paired  $t$ -test). The other groups showed no change. Hence, an integrated approach of yoga including the mental and philosophical aspects in addition to the physical practices was useful for institutionalized older persons.

Although depression is not a natural part of aging (Nelson, 2001), more cases of late-life depression are likely to occur as the population of individuals older than 65 increases. Depression is associated with increased risk for mortality among institutionalized individuals older than 60 (Kasl-Godley, Gatz, & Fiske, 1998).

Antidepressant treatment may cause undesirable side effects in older persons, such as confusion, agitation (Daurel-Receveur et al., 2005), falls (Landi et al., 2005), psychomotor performance deficits, dysphoric mood, impaired intellectual functioning, and day time sleepiness (Engle-Friedman & Bootzin, 1991).

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Perhaps because of this, there has been an increased use and satisfaction with herbal or homeopathic remedies, acupuncture, and relaxation techniques for older adults with self-perceived psychological symptoms, particularly depressive disorders (Dello Buono, Urciuoli, Marietta, Padoani, & De Leo, 2001).

Among such alternate interventions, yoga is an ancient Indian science and way of life that induces relaxation and a “balanced” mental state (Taimini, 1986). Yoga techniques include physical postures (asanas), voluntarily regulated breathing (pranayamas), meditation, and philosophy. Normal (i.e., physically and mentally healthy) volunteers were shown to have a better sense of well-being following 10 months of yoga practicing physical postures (Ray et al., 2001).

The antidepressant effect of rhythmic hyperventilation at different rates of breathing (Sudarshan Kriya Yoga or SKY) was studied in a prospective, open, clinical trial (Janakiramaiah, Gangadhar, Nagavenkatesha-Murthy, Harish, Subbukrishna, & Vedamurthachar, 2000). This study compared the benefits of SKY with two standard treatments, namely electroconvulsive therapy and imipramine (an antidepressant), on adults with untreated depression (even though it is not possible to conduct a double blind trial using yoga as one of the interventions) (Singh, Wisniewski, Britton, & Tattersfield, 1990). Though SKY produced lesser benefits than electroconvulsive therapy, it could be considered a potential alternative to medication when treating depression because the benefits were the same as imipramine but less than electroconvulsive therapy.

Exercise has also been evaluated for its psychological benefits. The long-term effects of exercise on psychological functioning in older men and women were evaluated in a longitudinal semi-crossover randomized controlled trial (Blu-

menthal et al., 1991). For the first 4 months of the study, 101 older men and women were randomly assigned to one of three conditions—aerobic exercise, yoga, and a wait-list control group. After 4 months of the individual interventions, all participants completed 4 months of aerobic exercise and were then given the option of an additional 6 months of aerobic exercise. Assessments were made initially, after 4 months, after 8 months, and at the end of 14 months. Before and after the intervention, all participants completed a comprehensive assessment battery including measures of mood and cognitive functioning.

The results of the Blumenthal et al. (1991) study suggested that all three groups experienced reductions in scores on the obsessive-compulsive and psychoticism subscales while only men in the aerobic exercise group showed a significant reduction in depression scores. It was concluded that exercise training may produce greater improvements among elderly persons with concomitant physical and emotional impairments.

In another study, older adults with major or minor depression (based on their Beck Depression Inventory scores) were randomized into a Progressive Resistance Training (PRT) group and an Attention-control group (Singh, Clements, & Singh, 2001). The PRT group showed a decrease in depression and improved strength, morale, and better quality of life. These studies suggest that physical activity has a positive effect on the psychological functioning of elderly persons.

Apart from the benefits of practicing yoga and the benefits of exercise, there appears to be a rationale for the use of ayurveda in depression, though this has not been proven. Ayurveda is also an ancient Indian discipline. In the definition of ayurveda, *ayus* means “life” and *veda* means “knowledge” or “science,” the literal meaning of ayurveda in Sanskrit is “the sci-

ence of life” (Chauhan, 2000). Life is used to include the body, mind, senses, and soul. It is apparent from this definition of life that ayurveda is a medical discipline not limited to the physical body alone. It provides comprehensive knowledge about diverse aspects of health (Dev, 1999; Sharma & Dash, 1983).

Wide ranges of health measures are covered including massage and herbal preparations. The latter are used for healthy persons (rejuvenating preparations or *rasayanas*) and for therapy. A particular rejuvenating preparation (*Rasayana Kalpa*) is believed to promote positive health in older persons and contains, among other constituents, the roots of *Withania somnifera* (Sharma & Dash, 1983). The roots of *Withania somnifera* are traditionally used to promote physical and mental health, to provide defense against disease and adverse environmental factors, and to arrest aging (Bhattacharya, Bhattacharya, Sairam, & Ghosal, 2000). *Withania somnifera* is also used to stabilize mood in persons with behavioral disturbances. Based on this, the anxiolytic and antidepressive effects of the bioactive glycowithanolides isolated from *Withania somnifera* roots were compared with those of the benzodiazepine, lorazepam, and the tricyclic antidepressant imipramine, respectively, in rats (Bhattacharya et al., 2000). The herbal preparation exhibited an antidepressant effect comparable with that induced by imipramine, supporting the use of this preparation as a mood stabilizer.

Because yoga practice has been shown to improve the sense of well-being, and is comparable to medication in the management of depression, the authors felt it would be interesting to evaluate the possible use of yoga for treating depression in community-dwelling older adults. Also, because ayurveda is an allied ancient Indian science which appears to have therapeutic benefits in individuals with depression, it was considered

worthwhile to allocate one group of community-dwelling older adults to this intervention to objectively evaluate its therapeutic usefulness.

This study was planned to test the hypothesis that yoga and ayurveda would be useful in reducing depression in community-dwelling older adults. This comparison of the effects of two related disciplines was planned to understand their effects individually, so as to use them with better efficiency as complementary treatments, which is how they have been traditionally described (Sharma & Dash, 1983).

The study was intended to evaluate the effects of a yoga program (including physical postures and regulated breathing in addition to other techniques) and an ayurveda herbal preparation (Rasayana Kalpa) on scores in the short version of the Geriatric Depression Scale (GDS-S) (Sheikh, Yesavage, Raret, & Lum, 1986) during a 6-month period for older persons in an institution. Scores from 0 to 5 are rated as normal, 5 to 10 as mildly depressed, and 10 to 15 as severely depressed.

## METHOD

### Participants

The participants were men and women who were older than 60 and living in a residential home for the aged in Bangalore City, South India. Most of the residents had been displaced from their homes and had no or inadequate resources, and would stay in the home for the rest of their lives. The total number of residents was 120. Thirty of them were ill or bed-ridden. The remaining 90 persons were told about the trial and random selection to a single group, and all expressed their willingness to participate. The project was approved by the ethical committee of the institution and the signed informed consent of each participant was obtained.

Participants were screened for their general health using an electrocardiogram (all leads), fasting blood glucose level, and blood pressure

measurements, and a detailed clinical examination. Participants with the following health problems were excluded from the study: uncontrolled diabetes (7 participants), uncontrolled hypertension (4), neurological disorders (3), dementia (1), hearing impairment (5), and a detected case of non-infectious Hansen's disease. Sixty-nine participants were included for the study after this screening. None of the participants were using any medication.

intervals (i.e., ages 60 to 65 were the lower limit, and ages 90 to 95 were the upper limit). Within a particular 5-year age range, participants of each gender, separately, were randomized to three groups by the investigator (i.e., Groups 1, 2, and 3) using a standard random number table. Allocation of a group to a particular intervention was conducted by the lottery method—the three interventions (Yoga, Ayurveda, or Wait-list control) were written on

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### Setting

The residential home for the aged from where the participants were recruited does not require residents to pay for their stay or other care including medical checkups and treatment. A clinic is attached to the home and a nurse lives within the campus. A physician visits once a week and is available for emergencies. The home has two residential areas, one for active, healthy persons and one for those who are ill or bedridden. The participants of the present study were from the residential area where the active, healthy persons resided. Men and women live separately in shared accommodation with 10 adults in a room that is approximately 60-feet long and 25-feet wide. The dining room is also shared. Recreation and leisure activities consist of watching television (group viewing), using the library in the home, playing indoor games, or attending organized lectures. The residents who were active (approximately 60%) also go to shops or to a nearby temple.

### Randomization

The 69 participants were stratified according to age in 5-year

three similar pieces of paper and then folded. A person who had no other part in the trial picked up and opened the folded papers. The first intervention was assigned to Group 1, and accordingly for Groups 2 and 3. Following stratified sampling and random allocation, each group had 23 participants (including seven men in the Yoga Group and six men each in Ayurveda and Wait-list Control Groups) with average ages of 70.1 ( $SD \pm 8.3$ ), 72.1 ( $SD \pm 9.0$ ), and 72.3 ( $SD \pm 7.4$ ) years, respectively.

### Measurement

All three groups were assessed at baseline, and after 3 and 6 months of the interventions using the short version of the GDS. The original version of the GDS has 30 items (Segal, Coolidge, & Hersen, 1998). The short version of the GDS (which has 15 items) was evaluated for validity (de Craen, Heeren, & Gussekloo, 2003) and was shown to detect longitudinal changes in symptoms of depression (Vinkers, Gussekloo, Stek, Westendorp, & Van Der Mast, 2004). Because long detailed interviews and testing batteries are not tolerated well by many older adults because of fatigue (Segal et al.,



TABLE

**THE DEPRESSION SCORES AT BASELINE AND AFTER 3 AND 6 MONTHS FOR YOGA, AYURVEDA, AND WAIT-LIST CONTROL GROUPS**

	N	Baseline mean (SD)	3 months mean (SD)	6 months mean (SD)
Yoga	18	10.6 (± 2.1)	8.1* (± 2.6)	6.7* (± 2.4)
Ayurveda	12	10.6 (± 2.4)	9.8 (± 2.3)	10.4 (± 2.4)
Wait-list Control	20	9.9 (± 3.4)	10.6 (± 2.4)	10.2 (± 3.1)

\*p < .001, two tailed, paired t-test, comparing the mean values of three months and six months versus the baseline values, respectively.

1998), the short version of the GDS was preferred for use in the present study. The GDS-S has been used to assess depression in older adults with normal health (T'Sjoen et al., 2005). However one report mentioned that in old-old individuals (i.e., older than 75), the GDS-S has a 60% sensitivity to detect major depression (as was seen in the present study) in healthy older adults (Watson, Lewis, Kistler, Amick, & Boustani, 2004).

In the current study, the GDS-S was administered to 1,554 mostly illiterate individuals older than 55 in northern India who were Hindi-speaking (Ganguli et al., 1999). A Hindi version of the scale was developed (GDS-H). The GDS-H had high internal consistency and the factor structure was comparable to that of the original version in English. This Hindi version was considered suitably reliable and valid. However, for the present study, it was not considered necessary to use the GDS-H because the group of community-dwelling older adults who participated in the study were all literate and were able to understand spoken and written English. This was first verified in all participants before administering the questionnaire, which was possible because the questionnaire was administered on an individual basis.

The questionnaire consisted of 15 dichotomous questions (Yes/No). Yes was scored as 1 and No was

scored as 0. Based on the scores, participants were classified into three categories: scores between 0 to 5 were normal, 5 to 10 indicated mild depression, and 10 to 15 indicated severe depression.

## INTERVENTIONS

### Ayurveda

The Ayurveda Group received a herbal preparation, or a "rejuvenating tonic" (Rasayana Kalpa) consisting of 50 grams of *Emblica officinalis* (fresh fruit), 12.5 grams of *Sida cordifolia* (coarse powder of the root), and 12.5 grams of *Terminalia arjuna* (fine powder of the dry fruit) heated with 500 milliliters of water and allowed to boil for 15 minutes. The mixture of *Sida cordifolia* and *Terminalia arjuna* was kept aside while the *Emblica officinalis* fruit were removed, mashed, seeded, sieved in a muslin cloth to drain water, and then heated with 50 grams of clarified butter for 5 minutes. Two hundred grams of sugar was added to the mixture of *Sida cordifolia* and *Terminalia arjuna*. This mixture and the *Emblica officinalis* were mixed together. Finally 100 grams of *Withania somnifera* (fine powder of the root) and 25 grams of *Piper longum* (fine powder) were added. Once the preparation reached room temperature, 100 grams of honey was added. Separate batches of 500 grams of the preparation were made as and when they were required.

Ten grams of this preparation consisted of the following herbs (the Sanskrit names are given in parenthesis): *Withania somnifera* (ashwagandha roots, 2 g), *Emblica officinalis* (amalaki, 1 g), *Sida cordifolia* (bala, 0.25 g), *Terminalia arjuna* (arjuna, 0.25 g), *Piper longum* (pip-pali, 0.5 g). The other contents were sugar (4 g), honey (2 g), water, and clarified butter (ghee) in the amount required to get the correct semi-solid consistency. The participants were given 10 grams (1 tablespoon, approximately) twice a day, once in the morning (6 a.m.) and again in the evening (6 p.m.) for 24 weeks. After both doses, they were asked to drink 200 milliliters of skimmed milk, as is prescribed in ayurveda texts (Sharma & Dash, 1983).

The dose (10 g twice a day) was decided in consultation with experts from a local ayurveda medical college and from the Ministry of Health and Family Welfare, Government of India. The dose customarily prescribed for individuals of all ages is 48 grams per day, though this may be varied based on the health status and "personality type" (according to ayurveda texts) of the individual (Shastri, 1985). The herbal preparation was made by an expert in ayurveda (i.e., a person who had undergone 10 years of pre- and doctoral training in ayurveda). Regarding the quality control, ayurveda preparations manufactured for sale are required to fulfill norms prescribed by the Drug Licensing Authority, Government of India. In the case of the study preparation (which was made especially for the participants) it was not possible to use the same method of testing. However the ayurveda expert verified, based on her experience and ayurveda texts (Hiremath, 2000), that the constituents were unadulterated and that the method of preparation of the compound was correct. The Rasayana Kalpa was given to the participants by a volunteer in the home who had no other part in the trial.

## Yoga Training

The yoga session was planned to include physical activity, relaxation, regulated breathing, and philosophical aspects of yoga. This was an integrated approach of yoga, derived from principles in ancient yoga texts emphasizing that yoga should promote health at all levels (Gambhirananda, 1986). The yoga sessions were 75 minutes daily, 6 days a week, for 24 weeks. Participants practiced

- Breathing exercises (10 minutes).
- Loosening exercises (sithilikarana vyama, 5 minutes).
- Physical postures (asanas, which included standing, supine, prone and sitting postures; 20 minutes).
- Voluntarily regulated breathing (pranayama, 10 minutes).
- Yoga-based guided relaxation (15 minutes), which has been described elsewhere (Vempati & Telles, 2002).
- Devotional songs (bhajans, 15 minutes).

## Control Group

The Wait-list Control Group was not given any intervention but was told that they could receive either yoga or ayurveda after the trial.

## Treatment Fidelity

Participants had agreed to receive whichever treatment was allotted to them, and this was one of the criteria for them to be included in the trial. Yoga was practiced in a group. The intervention leader was a trained yoga instructor who had no other part in the trial. The yoga instructor monitored the residents' attendance for the sessions, as well as the correctness of their practice and their involvement in it.

The Ayurveda Group was given the herbal preparation in another room. Their participation in the program was also monitored and their treatment fidelity was also checked. During the rest of the day,

there was no chance for participants of one group to practice or receive the program of another group.

## DATA ANALYSIS

Data were analyzed using a statistical package (SPSS Version 10.0). The data at baseline, 3 months, and 6 months of all three groups were assessed with tests for normal distribution using both graphic presentations (box-plot and stem-and-leaf plot) as well as the Shapiro-Wilk test. One way analysis of variance (ANOVA) was used to compare the data of the three groups at baseline. Repeated-measures ANOVA was performed with one within-subjects factor, Time (baseline, 3 months, 6 months) and one between-subjects factor, Groups (Yoga, Ayurveda, Wait-list), where the test for a Time by Group interaction provided a global test for an intervention effect. Paired t-tests were used to compare data at 3 months and 6 months with those at baseline for each group, separately.

## RESULTS

The data at baseline, 3 months, and 6 months of all three groups were found to be normally distributed and not of unequal variance. The data of the three groups were not significantly different at baseline based on one-way ANOVA ( $F [2, 68] = .55, p = .57$ ).

The repeated-measures ANOVA showed a statistically significant Time by Group interaction ( $F [3.925, 92.245] = 8.625, p < .001$ ), indicating that the pattern of change in assessments over time differed among the groups. Degrees of freedom were adjusted using the Greenhouse-Geisser epsilon (true experimental error = .981) due to violation of the sphericity assumption.

The Yoga Group showed a significant decrease in the geriatric depression scores at 3 months ( $t [19] = 4.295, p < .001$ ), and at 6 months ( $t [17] = 6.022, p < .001$ ).

The Ayurveda Group and the Wait-list Control Group showed no significant change ( $p > .05$ ). The Table shows the group mean values and standard deviations of the depression symptom scores at baseline and after 3 months and 6 months.

## DISCUSSION

Sixty nine persons older than 60 and living in an institution were randomly assigned to three groups. Two of the groups received interventions (yoga or ayurveda), and the third was a Wait-list Control Group. The 15-item, GDS-S was administered at baseline and after 3 and 6 months. Participants in the three groups had no significant difference in baseline scores. The group average baseline scores were Yoga, 10.6; Ayurveda, 10.6; and Wait-list Control, 9.9. These scores suggested that the participants in all three groups had severe depression because scores were between 10 and 15 (Sheikh et al., 1986).

The study participants all lived in an institution for older adults where their contact with family and friends was infrequent. Data collected from a study on 1,386 older men showed that those with high support from family and friends had the highest level of well-being (DuPertuis, Aldwin, & Bosse, 2001). Also those with low support from both sources had higher levels of depressive symptoms. This factor could be one of the reasons for scores suggestive of severe depression in the group of 69 older participants in this study.

Only the Yoga Group showed a significant decrease in mean scores from a group average of 10.6 at baseline to 8.1 at 3 months, with a further decrease to 6.7 at 6 months. The two other groups showed no significant change. A decrease in depression scores following yoga is similar to previous reports of an improved sense of well-being following yoga (Ray et al., 2001), as well as the antidepressant effect

of yoga-based rhythmic hyperventilation or Sudarshan Kriya yoga (Janakiramaiah et al., 2000).

### Benefits of Yoga

Yoga practice has several aspects:

- Physical activity.
- Relaxation.
- Awareness of breathing.
- Detached observation.

A 10-week exercise program was more effective than health education lectures in reducing depression in

### Drop Out Conditions

The absence of change in the Ayurveda Group may be related to the fact that the number of participants at 6 months was reduced to 12, versus 18 in the Yoga Group and 20 in the Wait-list Control Group. The main reason participants dropped out was that the preparation was followed by milk (as prescribed in ayurveda texts) and as a result, they no longer wanted their customary intake of coffee.

## Older adults can learn to perform the intervention practices anywhere on their own with no special equipment.

older adults with depressive disorder (Mather, Rodriguez, Guthrie, McHarg, Reid, & McMurdo, 2002). These results suggested the importance of older adults with depressive disorder participating in group exercise activities.

Among the various yogic practices used in this study, the subjective assessment of the participants was that the session of devotional songs was the most enjoyable part of the yoga program. This devotion was not deity specific, but constitutes bhakti Yoga, or the science of emotion culture (Nagendra, 2000).

Bhakti Yoga teaches (Sivananda, 1997):

by attaining divine love one does not desire anything else, neither grieves (over any loss or death of dear ones) nor hates anything, does not indulge in sensual pleasures, nor does one feel any urge for the acquisition of material things (Yatprapya na kincidvanchati, na socati, na dvesti, na ramate, nostahi bhavati, in Sanskrit)

Hence this component may have been able to give participants a group experience of expressing emotions, as well as a better acceptance of themselves.

Participants gave up coffee on their own accord and not for any medical reasons (such as fluid restriction or the effect of caffeine on the program). The Ayurveda Group participants were required to drink a glass of skimmed milk after taking the preparation. They reported that they were full and did not want to drink coffee after drinking milk. Even though they chose to avoid drinking coffee, they missed it. They preferred to drop out and resume drinking coffee. These observations show that compliance with taking an herbal preparation has specific difficulties.

It is well recognized that the longer a trial occurs, the more likely study participants are to drop out, though they generally do not drop out at random (Bender et al., 1997). One response to this problem of differential drop-outs is the intention-to-treat approach to analysis (Newell, 1992). In this approach, the analyst attributes unchanged outcome scores to the drop-out subjects (Stommel & Wills, 2003).

When an intention-to-treat analysis was adopted in the current study using baseline (i.e., pre-in-

tervention) scores for drop-out subjects, there was no difference in the results. However, there was a difference in the level of significance at 3 months because the decrease in scores in the Yoga Group was at the  $p < .01$  level instead of  $p < .001$  level seen with the conventional analysis. Also, the magnitude of change seen was different. For example, in the Yoga Group at 3 months, the GDS scores were reduced by 20% as opposed to 24% using conventional analysis. At 6 months, the decrease was 28% as opposed to 37% using conventional analysis. Hence, even with the intention-to-treat analysis, there were no changes in the Ayurveda and Wait-list Control Groups at 3 and 6 months. However it is essential to remember that the intention-to-treat analysis may not be entirely accurate because the values used are essentially pre-intervention values.

### Limitations

An integrated approach of yoga, including the mental and philosophical aspects in addition to the physical, was especially useful in improving older adults' psychological functioning. However the following factors may influence the generalizability of the results:

- Small sample size.
- Conducting the study with only Indian individuals may reflect cross-cultural differences.
- Participants lived in a residential home, were not financially independent, and had no chronic health problems.

Future studies across cultures would provide further insight. Further studies with individuals in the community who are financially independent would provide more information on the possible benefits of yoga in a broader category of older adults.

### Practical Implications

Older adults can learn to perform the intervention practices anywhere



on their own with no special equipment. For example, the breathing exercises simply require participants to synchronize their breathing with their body movements. This can be performed even while a person is sitting in a chair. Participants in the current study practiced 12 types or breathing exercises.

Participants especially enjoyed the devotional sessions. These sessions are not specific to any deity, but foster feelings of involvement, group activity, singing, and an idea of surrendering to a Supreme Force (as a part of Bhakti yoga).

This study has definite practical implications. Older adults (whether in an institution or in a hospital) often feel depressed because of loneliness and vulnerability. The yoga program, in particular, is easy to practice and rapidly induces perceptible physical and mental benefits. As participants get involved, they feel more self-reliant and confident.

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