



OPEN Iyengar yoga and health education interventions for prolonged grief disorder in later life: feasibility of a randomized controlled pilot trial

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Mind body therapies, particularly yoga, may offer a simple, scalable, and effective intervention for prolonged grief disorder (PGD) in older adults. This pilot randomized controlled trial (RCT) compared Iyengar Yoga (IY) with Health Education (HE), an active control, assessing feasibility, safety, and clinical effects in those with probable PGD in later life. Thirty-nine bereaved adults (median age: 62.0 years) with probable PGD were randomized to IY (n = 19) or HE (n = 20). Participants attended 60-min weekly group sessions for 10 weeks. Feasibility, safety, IY instructor fidelity, and grief and depressive symptoms were assessed over time, with effect sizes (Hedges' g) calculated to explore within-group and between-group clinical changes. Retention was 84.6%, with 100% of participants attending at least one session. Among completers (n = 33), 90.9% attended at least 80% of sessions. IY completers submitted an average of 8.65 weekly homework logs, and 82% practiced yoga at home for 60+ minutes weekly. All randomly selected IY classes met instructor fidelity. Participants in both groups reported high satisfaction; IY participants endorsed greater perceived benefits. No serious adverse events occurred. Both groups showed clinical improvements, with mean effect sizes ranging from 0.69 to 1.28 (medium to large) for overall grief and depressive symptoms, and 0.28 to 0.88 (small to large) for grief-specific symptoms. Between-group effect sizes for clinical outcomes were small. An IY and HE group intervention trial is feasible, safe, and acceptable for adults with PGD in later life. A larger, adequately powered RCT is needed to establish clinical efficacy of these interventions for late-life PGD.

Trial registration. The trial is registered at ClinicalTrials.gov (NCT05026827, 08/30/2021).

Keywords Bereavement, Grief, Older adults, Yoga, Iyengar yoga, Health education, Active control, Prolonged grief, Depression, Aging

Approximately 7–10% of older adults experiencing acute grief develop Prolonged Grief Disorder (PGD), recognized in both DSM-5-TR and the International Classification of Diseases, 11th Revision (ICD-11)^{1–4}. A notable subset also develops subsyndromal PGD, which can evolve to full-blown PGD or persist as debilitating grief that impairs daily functioning⁵. Probable Prolonged Grief Disorder (PGD), encompassing both subsyndromal and syndromal symptoms, poses significant public health risks, impacting physical health, cognition, and quality of life, and increasing the risk of premature mortality and suicide⁶. Fortunately, grief-focused psychotherapies have demonstrated efficacy in treating PGD^{7–10}.

PGD psychotherapy has shown superior efficacy over citalopram and interpersonal psychotherapy in treating PGD⁸. Grief-focused cognitive behavioral therapy also appears to outperform mindfulness-based therapy in alleviating prolonged grief symptoms⁹. However, access to these therapies is limited. Many PGD patients decline them even when available, partly due to their focus on imaginal revisiting the death, confronting painful

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reminders, and communicating with the deceased—processes that can evoke significant distress^{7,11}. Between 20 and 30% of those starting these treatments fail to complete them^{8–10}, often citing emotional discomfort¹². Furthermore, some may not respond to these treatments due to maladaptive coping strategies like avoidance¹³. Therefore, exploring simple, accessible interventions that avoid triggering distressing memories and engage different mechanisms may offer promising alternatives to ease the suffering of those living with PGD.

Mind-body interventions, particularly yoga, are increasingly popular among older adults due to their accessibility, safety, and ease of practice. Yoga presents a favorable side effect profile, high adherence, and low dropout rates, while conferring significant clinical benefits, especially in older adults^{14–19}. Research suggests comparable efficacy across different yoga styles, allowing the choice based on personal preference, availability, and individual characteristics^{20,21}.

Iyengar Yoga (IY), developed by B.K.S. Iyengar, emphasizes precise alignment in postures, and is particularly suited for older adults with weakened or deconditioned muscles, disabilities, or chronic medical conditions²². IY involves slow, gentle movements using “props” (e.g., mats) to support therapeutic poses, with an emphasis on alignment and joint protection. This approach compensates for limitations in strength, flexibility, and mobility, enhancing both safety and user-friendliness. IY also incorporates breathing practices and mindfulness meditation, and it can be tailored to the needs of older individuals based on their medical and psychiatric conditions. Notably, IY avoids vigorous activity, heated environments, intense breathing exercises, and complex instructions – components that are not recommended in yoga interventions for mental disorders^{15,23,24}.

Preliminary evidence suggests IY can reduce depressive and anxiety symptoms, improve sleep, and mitigate suicidal ideation in those with major depressive disorder (MDD)^{25,26}. Yoga protocols incorporating IY components also show promise in alleviating late-life depression, worry and anxiety, improving cognitive functions, and achieving high adherence among older adults^{19,27}. Bereaved mothers after stillbirth showed reduced depressive and post-traumatic stress symptoms following an online yoga intervention comprised of IY components²⁸. However, evidence on the feasibility of IY for PGD remains unclear. Given that PGD often co-occurs with Late-Life Depression (LLD) and considering the efficacy of IY for treating common mental disorders, its potential clinical utility for PGD warrants exploration.

Therefore, the objective was to conduct a 10-week pilot randomized controlled trial (RCT) comparing in-person IY with Health Education (HE), a socialization active control, both delivered in group formats, in a predominantly older sample with PGD. The study aimed to examine feasibility, safety, and IY instructor fidelity, while exploring the clinical effects of IY and HE on improving overall grief and depressive symptoms, as well as grief-specific symptoms (yearning, intrusions, avoidance, loneliness) in PGD.

Methods

Study participants

This single-site RCT recruited 39 community-dwelling participants at the Medical College of Wisconsin (Milwaukee, Wis.) between October 2021 and December 2023, as part of a mechanistic feasibility trial titled “Iyengar Yoga to probe PGD neurobiology” (ClinicalTrials.gov #NCT05026827).

Inclusion criteria included individuals aged ≥ 40 years who had experienced the death of a loved one at least 6 months prior to enrollment and scored 25 or higher on the Inventory of Complicated Grief (ICG) scale²⁹.

Exclusion criteria included a lifetime history of bipolar, psychotic, or neurological disorders (e.g., stroke, dementia, severe head injury), acute suicidality (assessed using Columbia Suicide Severity Rating Scale or clinician judgement), substance use disorders in the past three years, MRI contraindications, delirium/unstable medical conditions (i.e., Cumulative Illness Rating Scale – Geriatrics version (CIRS-G) score of 4 in any organ category), serious back, joint, or neck injuries within the past 3 months, or current yoga practice. All participants had intact basic and instrumental activities of daily living and at least ten years of formal education.

Comorbid depression, anxiety, and trauma- and stressor-related disorders were not exclusions. Antidepressants, low-dose benzodiazepines, and psychotherapy were allowed, provided they were stable for at least 4 weeks prior to enrollment and during the study.

All participants provided written informed consent. The study was approved by the MCW Institutional Review Board (IRB) and registered with ClinicalTrials.gov (Identifier: NCT05026827) before recruitment began. All methods were performed in accordance with the MCW IRB guidelines and regulations.

Study procedures

Phone screen

Potential bereaved participants were initially phone screened for general inclusion/exclusion criteria. Those who scored 3 or more on the Brief Grief Questionnaire (BGQ)³⁰ were scheduled for the study baseline visit.

Study baseline visit

All eligible participants were assessed for their capacity to consent using the UCSD Brief Assessment of Capacity to Consent³¹ adapted for this study.

After providing written informed consent, participants completed a comprehensive clinical assessment, including sociodemographic, medical, psychiatric, and medication histories, a neurological examination, a thorough assessment of inclusion/exclusion criteria, and the Structured Clinical Interview for DSM-5 Research Version³². According to DSM-5-TR, a diagnosis of PGD requires that the bereavement occurred at least 12 months prior to assessment. Thirty-six of the 39 participants met this duration criterion and were administered the Structured Clinical Interview for Complicated Grief (SCI-CG) to assess PGD diagnosis³³.

Participants completed self-report clinical scales, including the 19-item Inventory of Complicated Grief (ICG) scale²⁹ for overall grief, the Patient Health Questionnaire-9 (PHQ-9)³⁴ for depressive symptoms, and the 21-item Yearning in Situations of Loss (YSL)-Bereaved³⁵, the Impact of Event Scale-Revised (IES-R)³⁶, Grief-

Related Avoidance Questionnaire (GRAQ)³⁷ and 20-item UCLA loneliness scale-version 3 (UCLA-3)³⁸ for grief-specific symptoms.

Additionally, study personnel administered the Montreal Cognitive Assessment (MoCA)³⁹, and CIRS-G⁴⁰. The relationship of the deceased and time since the loss (TSL) were collected, and psychotropic medication use and psychotherapy attendance were documented using the Antidepressant Treatment History Form (ATHF)⁴¹. Participants also completed the Duke Social Support Inventory⁴², Lubben Social Network⁴³, and Community Health Activities Model Program for Seniors (CHAMPS)⁴⁴ physical activity questionnaires.

Randomization

After baseline assessments, eligible participants were randomly assigned to either IY or HE group interventions using a computer-generated randomization scheme with block randomization to assign participants to a group (i.e., 2:2 or 3:3 ratio to a group) ensuring an equal number of participants in each group. See supplement for details.

IY intervention

Participants attended 60-min classes held once weekly for 10 weeks. Classes were taught by expert IY instructors (LM, KC) with certification by the IY National Association of the United States and > 10 years of experience teaching IY, including to older adults. Each wave comprised of 10 classes; each 60-min class included (1) breathing practices (pranayama) (~ 5-min), (2) gentle postures (asana) (~ 40-min), (3) mindfulness meditation (~ 10-min), concluding with (4) seated centering (5-min). After each class, participants were given home poses to practice over the following week. The participants were asked to practice breathing exercises and poses for at least 15 min, five days a week, and asked to record their home practice duration. IY instructors also completed weekly attendance and fidelity logs.

Health education (socialization active control) group

HE sessions were held weekly for 10 weeks. Each session consisted of a 50–55-min video viewing (two ~ 25–30-min videos from the Great Courses lectures, used with permission under a group viewing site license for academic purposes; see supplementary methods S2 and Table S1), followed by ~ 5–10 min discussion facilitated by a study team member (KRH or AW). All waves viewed the same 20 videos of lectures in the same sequence. All videos were thoroughly vetted by the study team prior to use, to ensure that the lectures did not include information relevant to the active intervention arm (IY components) or information regarding grief, exercise, or depression. The individual lectures included were from the following courses: (1) The Aging Brain, (2) Lifelong Health: Achieving Optimum Health at Any Age, (3) Your best brain, and (4) Sensation, perception, and the aging process^{45–48}.

Longitudinal assessments

After randomization, participants completed the ICG, PHQ-9, and YSL once every 2 weeks for 10 weeks. Self-report (IES-R, GRAQ, UCLA-3) and clinician-administered (CIRS-G, ATHF) scales were completed at weeks 4 and 10.

Outcomes

See supplement (Methods S3) for details on feasibility and yoga fidelity assessments.

IY instructor fidelity

Two certified IY instructors (LM and KC) taught all classes. The PI (JSG) and co-investigator (KRH) briefed the instructors regarding PGD, the study design, and the IY intervention before the first wave. IY classes were videotaped, and 10% of the recordings were randomly selected and evaluated by an outside expert using a fidelity checklist. The IY instructors also met with a study investigator (JSG or KRH) at least once a month to ensure consistency across classes.

Other feasibility measures

Retention and attendance Session participation in both groups was documented. Weekly attendance logs (for both IY and HE) and IY home practice logs were collected after each class.

Satisfaction Participant satisfaction (enjoyment, perceived benefit, instructor quality, getting to know peers, common bond with peers) was assessed at week 10 using a Likert scale from 0 (not satisfied) to 10 (most satisfied)¹⁶.

Expectancy The Opinions About Treatment (OAT) rating scale^{15,49} was adapted to gauge expectancy for the two interventions and completed at baseline. Participants self-rated four items on a 7-point scale. Summing the ratings on IY and on HE produced two scores (ranging from 4 to 28) per participant, corresponding to IY and HE intervention expectancy, respectively. Higher scores indicated greater expectations of treatment benefit (see supplementary material for details).

Safety monitoring

Adverse events (AEs) were documented weekly using an AE form, with each event evaluated by the PI. If a participant endorsed a possible serious adverse event (SAE) or needed immediate intervention (e.g., suicidal ideation), staff immediately contacted the PI.

Clinical

The primary outcomes were changes in ICG and PHQ-9 scores over 10 weeks. Secondary outcomes included changes in YSL, IES-R intrusion subscale, GRAQ, and UCLA-3 scores. Additionally, response (defined as $\geq 30\%$ reduction in ICG score) and remission (ICG score < 20 at week 10) were documented.

Statistical analysis

Descriptive statistics, means and standard deviations for quantitative measures or frequencies and percentages for each level of nominal characteristics, are calculated for each intervention group (IY, $n = 19$ and HE, $n = 20$) using the study baseline data. Two-sided t -tests for quantitative data and Fisher's exact tests for categorical or nominal data are calculated to determine whether the IY and HE groups were dissimilar at baseline. Participant satisfaction and expectancy rating scales were compared between groups (i.e., IY vs. HE) using the two-sample t -test, and behavior modification at week 10 with Fisher's exact tests.

For clinical outcomes, mean changes (i.e., baseline—Week 10) and 95% confidence intervals are calculated separately for each intervention group. The difference in mean changes between the two groups (IY vs. HE) are also calculated, along with its 95% confidence interval. Hedges' g effect size is calculated to quantify the magnitude of change within each intervention group and between groups.

Results

The CONSORT flowchart is shown in Fig. 1. A total of 183 potential participants were phone screened, and 61 signed consent. After excluding 22 ineligible individuals or those who declined participation, 39 PGD participants were randomized into either the IY ($n = 19$) or the HE ($n = 20$) group.

Demographics and clinical characteristics

Table 1 summarizes the baseline demographic and clinical characteristics. Most participants were aged 55 years or older ($n = 30$, 76.9%). The groups did not differ in demographics, days since loss, relationship of the deceased, ATHE, MoCA, physical activity frequency, perceived social support, social network scores, antidepressant use, or most outcome variables, including psychiatric comorbidities and antidepressant use. The HE group had a higher medical illness burden and ICG total scores, whereas the IY group endorsed higher total caloric expenditure. 64% of participants met a more stringent PGD criterion (ICG ≥ 30 , days since loss > 365 days, and SCI-CG positive; IY: $n = 11$, HE: $n = 14$).

IY fidelity

Two female IY instructors taught a combined total of 80 classes, with video recordings available for 75. Eight videos (4 from each instructor) were reviewed for fidelity. 100% of classes met all fidelity benchmarks.

Other feasibility assessments

Retention Of the 39 participants, 33 (84.6%) completed the 10-week trial, with six participants (2 in IY, and 4 in HE; $p = 0.66$) dropping out either due to new health concerns unrelated to the study ($n = 3$) or were lost to follow-up or withdrew without providing reasons ($n = 3$).

Attendance All participants (100%) attended at least one session. Of the 33 completers, 90.9% (IY: $n = 15/17$, HE: $n = 15/16$) completed at least 80% of the sessions. Two IY participants attended 70% of sessions, and one HE participant attended 60%.

Homework logs The mean (SD) number of weekly homework logs (out of 9) submitted by IY completers ($n = 17$) was 8.65 (2.40). Fourteen of 17 completers (82%) practiced IY at home an average of at least 60 min weekly, with 11 of 17 (65%) practicing for at least 75 min weekly.

Satisfaction Study completers reported high satisfaction in both groups, with those in the IY group endorsing greater perceived benefit ($t = 3.28$, $p = 0.003$) from study participation compared to the HE group. Those in the IY group endorsed a change in exercise habits at week 10 (82% vs. 38%, $p = 0.01$) (Table 2, Fig. 2a,b).

Expectancy The modified OAT scale was only available for 27 of the 39 participants as it was introduced mid-study. No significant differences were observed between groups (Table 2).

Safety assessment

No SAEs were reported. A total of 19 (IY: $n = 13$, HE: $n = 6$) AEs occurred.

In the IY group, AEs included anxiety during breathing exercises ($n = 1$), dizziness during class ($n = 1$), and a fall during home practice ($n = 1$). Other possible AEs included pain ($n = 1$), and unrelated AEs included pain not limiting home practice/attendance ($n = 5$), non-urgent incidental findings on brain MRI ($n = 2$), fall during non-study-related activities ($n = 1$), and COVID positivity ($n = 1$).

In the HE group, unrelated AEs included wrist fracture ($n = 1$), acute stroke leading to study discontinuation ($n = 1$), pain ($n = 2$), and acute sinusitis ($n = 1$). One participant in the HE group consistently scored 1 on C-SSRS category 1 (wish to be dead) throughout the study.

No participants in either group endorsed new onset or worsening suicidal ideation.

Clinical outcomes (Table 3)

The mean ICG scores decreased by 12.2 points (95% CI 8.2, 16.2; $p = 0.001$) in the IY group and 14.8 points (95% CI 8.6, 20.9; $p = 0.001$) in the HE group. The effect sizes (Hedges' g) were 1.28 (95% CI 0.64, 1.91) for IY and 1.16

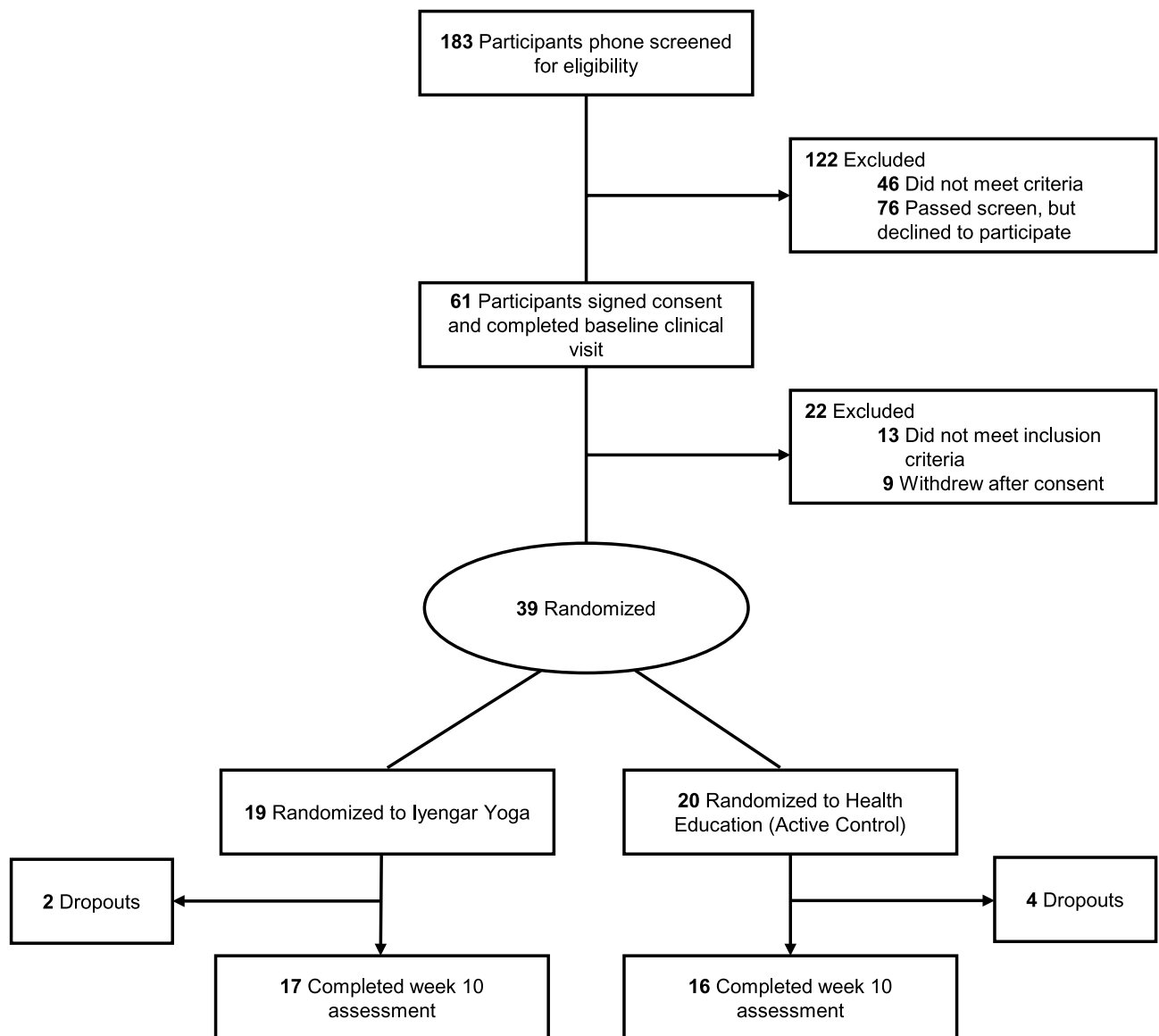


Fig. 1. CONSORT flowchart.

(95% CI 0.50, 1.82) for HE (Fig. 3a). Similarly, PHQ-9 scores improved in both groups: the mean PHQ-9 scores decreased by 2.9 points (95% CI 1.5, 4.2; $p=0.001$) in the IY group and 4.4 points (95% CI 1.5, 7.4; $p=0.005$) in the HE group, with effect sizes of 0.69 (95% CI 0.28, 1.10) for IY and 0.91 (95% CI 0.21, 1.61) for HE (Fig. 3b). Between-group differences (i.e., IY – HE) in improvement in overall grief (Hedges' $g = -0.25$; 95% CI -0.92, 0.40; $p=0.47$) and depressive symptoms (Hedges' $g = -0.36$; 95% CI -1.03, 0.32; $p=0.31$) were non-significant.

Improvements in grief-specific symptoms (yearning, intrusion, avoidance, and loneliness) were observed in both groups (all $p < 0.05$), with effect sizes ranging from 0.27 to 0.88 (Table 3, Fig. S1a–d). Between-group differences in improvement in symptoms were non-significant, with improvement favoring the HE group for yearning (effect size = -0.45; $p=0.20$), and the IY group for loneliness (effect size = 0.34; $p=0.32$). Post hoc power analyses indicated low power to detect a difference between groups in mean change from baseline, ranging from 0.05 to 0.22.

Among completers, ICG response (i.e., 30% reduction) was seen in 10 (59%) IY and 10 (62%) HE participants at week 10. Remission was observed in 6 (35%) IY and 7 (44%) HE participants (Table S2). Figure S2a displays raw ICG score change for all participants.

Qualitative data is included in the supplement.

Discussion

This pilot RCT comparing IY and HE group interventions for a predominantly older sample with PGD revealed that the study design was feasible and acceptable, with high recruitment, retention, and attendance rates in both groups. Participants endorsed high satisfaction, and IY participants exhibited high adherence to home yoga

Variable	Health education (n = 20) Mean (SD) or n (%)	Iyengar yoga (n = 19) Mean (SD) or n (%)	Mean difference (IY–HE) or odds ratio (IY/HE)	95% confidence interval	Statistic t or Fisher exact test	p
Demographics						
Age	61.1 (9.3)	61.5 (8.40)	−0.4	−6.1, 5.4	t = −.13	.90
Sex (Female), n (%)	19 (95%)	16 (84%)	OR = 3.6	0.3, 37.7	Fisher	.34
Education in years	15.8 (2.1)	16.1 (1.9)	−0.3	−1.6, 1.0	t = −0.47	.64
Days since loss	1359 (1090)	1310 (2021)	49	−1025, 1123	t = .09	.93
Relationship of deceased, n (%)					Fisher	.65
Spouse or significant other	9 (45%)	12 (63%)	OR = 0.48	0.13, 1.72		
Parent	3 (15%)	3 (16%)	OR = 0.94	0.16, 5.55		
Child	4 (20%)	2 (10%)	OR = 0.47	0.34, 13.16		
Sibling/Nephew	4 (20%)	2 (10%)	OR = 0.47	0.34, 13.16		
Outcomes						
ICG	39.2 (9.9)	33.8 (6.7)	5.4	−0.1, 10.9	t = 2.01	.05
PHQ-9	10.9 (4.4)	9.0 (4.6)	1.9	−1.0, 4.8	t = 1.31	.20
YSL	71.3 (11.2)	66.6 (14.6)	4.7	−3.8, 13.2	t = 1.13	.27
IES—intrusion	14.5 (7.6)	13.0 (6.7)	1.5	−3.2, 6.2	t = 0.65	.52
GRAQ	19.2 (11.7)	17.3 (11.6)	2.0	−5.6, 9.6	t = 0.53	.60
UCLA—loneliness	48.3 (10.8)	48.6 (9.5)	−0.3	−6.9, 6.3	t = −0.10	.92
Other variables						
ATHF	2.5 (2.9)	2.7 (3.5)	−0.2	−2.3, 1.9	t = −0.18	.86
CIRS-G	6.7 (3.0)	4.7 (3.4)	2.1	−0.0, 4.2	t = 1.99	.05
MOCA	26.9 (2.2)	26.9 (2.1)	0.005	−1.40, 1.41	t = 0.01	.99
DSSI	23.5 (4.7)	23.4 (5.2)	0.1	−3.1, 3.3	t = 0.08	.94
Lubben	13.1 (6.0)	14.5 (6.7)	−1.4	−5.5, 2.8	t = −0.67	.50
CHAMPS frequency	15.4 (10.5)	17.8 (11.3)	−2.3	−9.4, 4.7	t = −0.7	.51
CHAMPS caloric expenditure total	2535 (2041)	4632 (4478)	−2098	−4413, 218	t = 1.9	.07
Psychiatric comorbidities ¹						
Major depressive disorder, n (%)	10 (50%)	8 (42%)	OR = 1.4	0.4, 4.9	Fisher	.75
PTSD, n (%)	5 (25%)	3 (15.8%)	OR = 1.8	0.4, 8.8	Fisher	.69
Any anxiety disorder, n (%)	3 (15%)	6 (31.6%)	OR = 0.4	0.1, 1.8	Fisher	.27
Antidepressant use						
None, n	9	11	OR = 0.6	0.2, 2.1	Fisher	.53
Monotherapy, n	8	5	OR = 1.9	0.5, 7.3	Fisher	.50
Combination, n	3	3	OR = 0.9	0.2, 5.4	Fisher	1.00

Table 1. Study baseline demographic and clinical characteristics. *ICG* Inventory of complicated grief, *PHQ-9* Patient health questionnaire, *YSL* Yearning in situations of loss-bereaved, *IES-Intrusion* Intrusion subscale of Impact of Event Scale, *GRAQ* Grief-related avoidance questionnaire, *UCLA-3* 20-item UCLA loneliness scale, *ATHF* Antidepressant treatment history form, *CIRS-G* Cumulative illness rating scale-geriatric, *MOCA* Montreal cognitive assessment, *DSSI* Duke social support index, *Lubben* Lubben social network scale, *CHAMPS* Community health activities model program for seniors physical activity questionnaire, *PTSD* Post-traumatic stress disorder. Significant values are in bold ($p < 0.05$).

practice and weekly log completion. Both interventions were well tolerated and safe, with no protocol-related SAEs. IY instructors maintained treatment fidelity by following intervention components, discussing home practices, and recording sessions while ensuring confidentiality. Clinical outcomes suggested improvements in overall grief, depressive symptoms, and specific grief symptoms (yearning, intrusion, avoidance, and loneliness) in both groups. However, as the study was primarily designed to assess feasibility and had a modest sample size, it was not powered to assess clinical efficacy.

Recruitment began during the COVID-19 pandemic, limiting in-person activities. To comply with physical distancing, class sizes were capped at four participants, a practice maintained even after restrictions were lifted to ensure consistency and minimize potential impacts on feasibility and clinical outcomes. Despite these challenges, enrollment goals were met, with roughly 85% of PGD participants completing the study, and over 90% of completers attending at least 80% of sessions. Retention rates were similar to or exceeded those in previous aging studies involving yoga or HE^{16,18,19,50}.

Attendance among IY completers was approximately 86%, comparable to or surpassing previous yoga studies involving older adults^{14,16,18,19,51}. While some earlier studies included twice-weekly yoga classes^{14,16,19}, ours featured once-weekly in-person group sessions, which participants found manageable, possibly boosting adherence. The HE group also had a high attendance rate of over 90% among completers, significantly

Variable		HE (n = 16)	IY (n = 17)	Mean difference (IY–HE) or odds ratio (IY/HE)	95% confidence interval	t test or Fisher exact test	df	p
		Mean (SD) or n (%)	Mean (SD) or n (%)					
Satisfaction ratings ^a								
Enjoyment in the study		8.4 (1.3)	9.1 (0.9)	0.7	–0.1, 1.5	t = 1.75	26	.09
Benefitted from the study		7.1 (2.2)	9.1 (1.2)	2.0	0.8, 3.4	t = 3.28	24	.003
Quality of the instructor		9.2 (1.0)	9.7 (0.8)	0.5	–0.2, 1.1	t = 1.41	30	.17
Got to know others in the study		5.8 (3.1)	6.5 (1.8)	0.7	–1.1, 2.6	t = .77	23	.45
Common bond with others in the study		5.6 (3.4)	7.5 (2.6)	1.9	–0.3, 4.1	t = 1.79	26	.08
Behavioral change ^a								
Did you change your eating, n (%)	Yes	8 (50%)	4 (24%)	OR = 0.3	0.7, 1.4	Fisher	na	.16
Did you change your exercising, n (%)	Yes	6 (38%)	14 (82%)	OR = 7.8	1.6, 38.8	Fisher	na	.01
Did you change your intake of vitamins, n (%)	Yes	2 (13%)	2 (12%)	OR = 0.9	0.1, 7.6	Fisher	na	1.00
Expectancy ^b								
OAT for Iyengar Yoga (n = 27)		21.6 (4.5)	23.0 (3.7)	1.4	–1.9, 4.6	t = .87	24	.39
OAT for health education (n = 27)		20.1 (5.7)	21.0 (5.1)	0.9	–3.4, 5.3	t = .45	24	.66

Table 2. Comparison of participant satisfaction ratings and behavioral changes and expectancy scores.

^aSatisfaction and Behavioral changes were assessed at week 10 (study endpoint); ^bExpectancy was assessed at week 0 (study baseline clinical screening visit); ^cDegrees of freedom for t-test with equal variances not assumed. HE Health education (active control), IY Iyengar yoga, OAT Opinions about treatment. Significant values are in bold ($p < 0.05$).

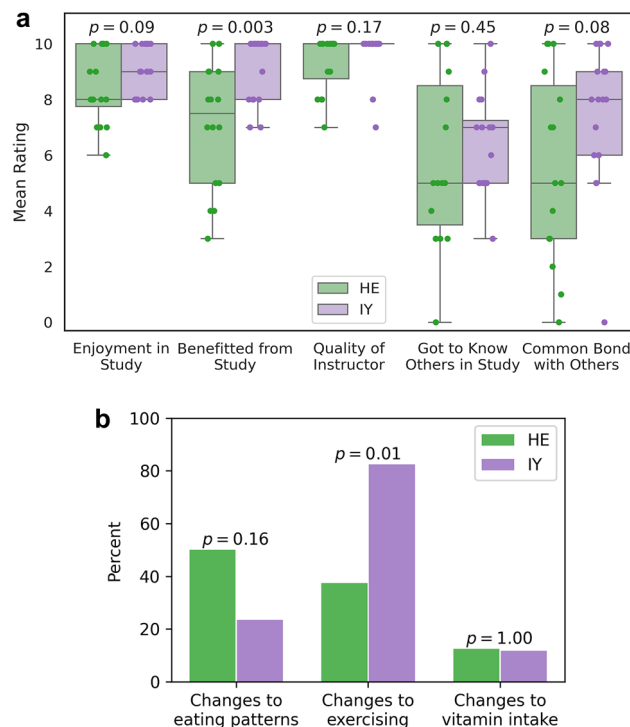


Fig. 2. Participant satisfaction and changes in behaviors at week 10. **(a)** Participant satisfaction ratings. **(b)** Percentages of participants who report changes in behavior at week 10. HE Health education (active control), IY Iyengar yoga.

surpassing the 60% attendance reported in prior research¹⁶. This difference may stem from demographic and clinical differences of the samples, and session formats. Groessl et al.¹⁶ found that older age correlated with lower attendance among sedentary older adults at risk for mobility limitations. Their weekly HE sessions were 90 min long, while ours were 60 min. Qualitative feedback suggested that our study participants found the video length adequate, content informative, instructor quality excellent, and peer and staff interactions beneficial, likely contributing to higher adherence.

	HE (n = 16)					IY (n = 17)					Between group comparison
	Baseline	Week 10	Baseline-week 10	Hedges' g within ^c	p	Baseline	Week 10	Baseline-week 10	Hedges' g within ^c	p	Hedges' g between ^d
Outcome	Mean (SD)	Mean (SD)	Mean (95% CI)	Effect size		Mean (SD)	Mean (SD)	Mean (95% CI)	Effect size		Effect size
ICG ^a	38.7 (10.1)	23.9 (13.4)	14.8 (8.6, 20.9)	1.16 (.50, 1.82)	.001	33.7 (6.5)	21.5 (10.1)	12.2 (8.2, 16.2)	1.28 (.64, 1.91)	.001	-.25 (-.92, .40)
YSL ^a	69.6 (8.3)	54.8 (17.7)	14.8 (7.0, 22.5)	.88 (.30, 1.46)	.001	65.6 (15.1)	56.9 (12.9)	8.6 (2.5, 14.8)	.58 (.11, 1.04)	.009	-.45 (-1.12, 0.23)
IES-R intrusion ^b	14.2 (7.5)	9.8 (8.5)	4.4 (.2, 8.5)	.52 (-.02, 1.05)	.041	12.5 (6.4)	8.4 (4.6)	4.1 (1.2, 7.1)	.68 (.13, 1.23)	.009	-.04 (-.70, .63)
GRAQ ^b	18.0 (12.0)	11.9 (13.7)	6.1 (2.6, 9.7)	.44 (.13, .74)	.002	16.6 (12.0)	11.3 (10.8)	5.3 (.6, 10.0)	.44 (.02, .86)	.029	-.10 (-.77, .57)
UCLA-3 ^b	48.4 (11.5)	44.6 (13.1)	3.8 (.9, 6.6)	.27 (.04, .51)	.012	48.7 (9.1)	42.5 (10.2)	6.2 (1.8, 10.6)	.61 (.12, 1.10)	.008	.34 (-.34, 1.01)

Table 3. Clinical outcome changes in Iyengar yoga and health education groups. Change in Clinical Outcome Scores Over Time, by Intervention Group, in probable PGD participants receiving Iyengar Yoga or Health Education Active Control. ICG Inventory of complicated grief, PHQ-9 Patient health questionnaire, YSL Yearning in situations of loss-bereaved, IES-Intrusion Intrusion subscale of impact of event scale, GRAQ Grief-related avoidance questionnaire, UCLA-3 20-item UCLA loneliness scale. ^a Clinical outcome measure data available at study baseline, and weeks 2, 4, 6, 8, and 10 visits; ^b Study baseline, and weeks 4 and 10 visits; ^c Hedges' g effect size for the within differences (Baseline – Week 10 measurements) adjusted by the correlation between measures; ^d Hedges' g effect size for the between group Baseline – Week 10 differences (i.e., mean within difference for the IY group minus mean within difference for the HE group).

Homework completion rates were notably high, exceeding those in other yoga studies^{16,28}. In a 12-week online yoga trial for mothers grieving stillbirth²⁸, attendance was lower and dropout rates higher, with participants indicating they would have remained engaged if online social support groups had been included. Social support can enhance retention, adherence, and alleviate anxiety, depression, and PTSD symptoms in grieving individuals^{28,52,53}. While our modest sample size limited exploration of the social connections' moderating effects, qualitative feedback suggested that in-person social engagement during group sessions improved adherence and participation, including homework completion.

No SAEs were reported, consistent with prior yoga aging studies^{16,19}. Mild side effects from IY, such as dizziness, pain, and anxiety, were reported, but none hindered participation or triggered discontinuation. This underscores the importance of practicing IY under trained instructors to ensure safety and effectiveness, which aligns with higher satisfaction as endorsed by our participants.

Both groups reported high satisfaction, with IY participants reporting greater enjoyment and perceived benefits, citing a stronger sense of peer connection than those in HE, consistent with prior research^{16,54}. Women grieving stillbirth also reported the online yoga intervention enjoyable and helpful for grief coping^{28,54}. However, both groups rated the item on “getting to know others” lower, likely due to small class sizes, physical distancing, limited peer interactions during COVID, and a lack of built-in socialization time – issues that future studies could address. Over 80% of IY participants reported increased exercise habits, compared to fewer than 40% in the HE group, which is unsurprising considering the high rate of home yoga practice among IY participants.

Clinical outcome data showed that both IY and HE groups improved in overall grief and depression, with moderate to large effect sizes. Specific grief symptoms (yearning, intrusion, avoidance, and loneliness) also improved in both groups, with effect sizes ranging from small to large. However, between-group differences were small, with the 95% CIs for all clinical measures including zero. Notably, although attrition rates were low, HE group participants who dropped out tended to be younger, less educated, and had higher baseline psychopathology than IY group dropouts (Table S3), which may have influenced the observed between-group differences.

The similar rates of clinical improvement in both groups suggest that intervention components, non-specific effects of the group format, or a combination of these factors may have driven the positive outcomes. Exit survey data (see supplement) suggested that both IY and HE group formats provided a supportive environment for confronting grief, fostering social re-engagement, peer bonding, and social support. Participant feedback suggested that common elements, such as compassionate communication (i.e., empathic presence from staff and therapeutic 1:1 session with the study clinician), a sense of purpose from participating in the study to honor the deceased, and increased awareness of community grief resources and the grieving process, may have also contributed to the observed clinical benefits.

This pilot trial suggests the feasibility of conducting longitudinal clinical assessments in PGD patients without exacerbating distress. However, it was not powered to detect the clinical benefits of IY or HE interventions. While limited research suggests that yoga may alleviate depressive symptoms in younger bereaved women²⁸, evidence supporting yoga's efficacy in PGD remains scarce. Nevertheless, existing studies show that yoga holds promise for reducing late-life depression, worry and anxiety^{19,27}. Future studies should investigate the effects of diverse physical activities, including mind-body therapies like yoga, on grief outcomes⁵⁵.

The strengths, limitations, and future directions are summarized in Table 4.

In conclusion, our preliminary data support the feasibility, acceptability, and favorable side effect profile of IY and HE group interventions for PGD in later life. Both intervention groups showed improvements in grief and depression, with moderate to large effect sizes. These pilot findings suggest that an adequately powered RCT

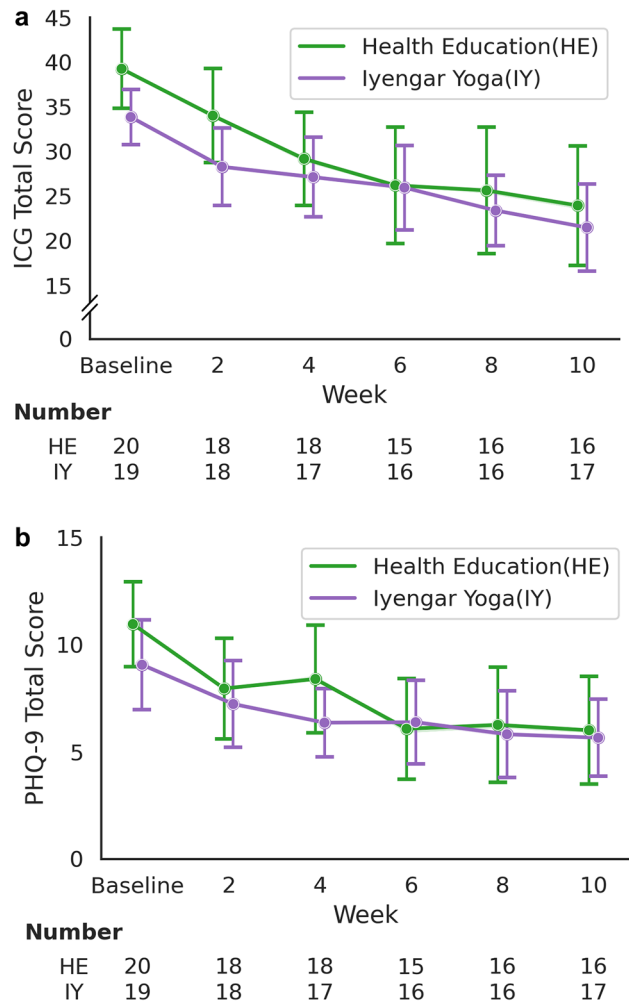


Fig. 3. Change in clinical outcome scores over time in participants randomized to Iyengar yoga and health education. **(a)** ICG total score over time by intervention group. **(b)** PHQ-9 total score over time by intervention group. Mean scores, with bars showing standard error. *HE* Health education (active control), *IY* Iyengar yoga, *ICG* Inventory of complicated grief, *PHQ-9* Patient health questionnaire.

Strengths	Limitations	Future directions
• The randomized controlled trial (RCT) study design • Determined the feasibility of conducting a RCT of Iyengar Yoga (IY) versus Health Education (HE) in an older sample of probable PGD patients • Inclusion of a socialization active control (Health Education) arm • Conducting systematic longitudinal assessments of various feasibility measures and clinical outcomes in both groups, and IY instructor fidelity • Meeting the recruitment, retention, and adherence rates in both groups • Appropriate safety monitoring, including serial suicidality assessments	• Sample: Modest sample size, predominantly female and white, which limits the generalizability of the current findings	• Enroll a larger, demographically heterogeneous clinical sample
	• PGD diagnosis: Probable PGD was defined using an ICG cutoff of 25 or more. Also, a semi-structured interview, the Structured Clinical Interview of Complicated Grief, was used	• PGD should be diagnosed using state-of-the-art diagnostic tools, like the Structured Clinical Interview for Prolonged Grief and the Prolonged Grief-13-Revised scale
	• Clinical outcomes: This pilot trial was not powered to assess clinical efficacy • It remains unclear whether the clinical improvements observed were due to the interventions themselves, regression to the mean, non-specific effects of group format or natural progression with the passage of time	• Conduct a larger, adequately powered randomized controlled trial to determine the clinical efficacy of IY and HE group interventions in older adults with PGD • Inclusion of a passive control (e.g., waitlist) group for reference
	• Delivery of yoga: IY group sessions were delivered by two experienced instructors in an academic setting	• Implement IY group sessions in real-world settings (e.g., yoga studios), with multiple certified instructors from diverse backgrounds
	• Sustainability: Whether the observed clinical improvements are sustainable post-trial remains unclear, though Fig. S2b shows that most participants who returned for a follow-up visit (n = 19) maintained or showed further clinical improvement	• Conduct post-trial assessment (e.g., 6 months post-trial) to document sustainability is suggested

Table 4. Strengths, limitations, and future directions.

is warranted to assess the clinical benefits of IY versus HE group interventions and to evaluate the long-term sustainability of their positive effects in late-life PGD.

Data availability

The datasets generated and/or analyzed during the current study are not publicly available because we are in the process of analyzing and reporting both the biological and clinical study results. The de-identified data supporting the conclusion of this study are available from the corresponding author on reasonable request.

Received: 11 July 2025; Accepted: 10 November 2025

Published online: 24 December 2025

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Acknowledgements

The authors thank Brynn LiaBraaten, B.A. for compiling the qualitative feedback and partly assisting with the feasibility data.

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Funding

This work was supported by the National Institute of Mental Health grant R01 MH122490, Advancing a Healthier Wisconsin Endowment grant 00003864, the Costigan Foundation, the Sexton Family Foundation, and the National Center for Advancing Translational Sciences, National Institutes of Health, Award Number UL1 TR001436.

Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

The study was registered with ClinicalTrials.gov (#NCT05026827) and the study protocol was reviewed and approved by the Medical College of Wisconsin Human Research Protection Program (MCW PRO00041199). Participation did not include any changes to the standard of care. All study participants provided written informed consent.

Previous presentation

The data was previously presented, in part, as a poster at the 2024 Virtual Annual Scientific Meeting of the American Geriatrics Society.

Additional information

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1038/s41598-025-28397-5>

[0.1038/s41598-025-28397-5](https://doi.org/10.1038/s41598-025-28397-5).

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