

Harnessing Peer Support in an Online Intervention for Older Adults with Depression

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Objective: This pilot study evaluated the feasibility and efficacy of two methods of delivering a cognitive behaviorally informed Internet intervention for depression for adults 65 years and older. **Methods:** Forty-seven participants were enrolled and assigned to receive one of two versions of the Internet intervention, either delivered individually (III) or with peer support (II+PS), or to a wait list control group (WLC). Primary outcomes included change in depressive symptoms from baseline to post-intervention (week 8), site use, self-reported usability, and coach time. Secondary outcomes included measures of social support and isolation and anxiety. **Results:** Follow-up data were provided by 85.1% (40 of 47) of enrolled participants. There were significant differences in depression change across groups ($F_{(2,37)} = 3.81, p = 0.03$). Greater reductions in depressive symptoms were found for the III ($p = 0.02$) and II+PS ($p = 0.03$) compared with WLC, and significantly less coach time was required in the II+PS ($p = 0.003$). **Conclusions:** These results highlight the potential of cognitive-behaviorally informed Internet interventions for older adults with depression, and indicate that peer-supported programs are both acceptable and equivalent to individually delivered Internet interventions. Including peer support may be a viable and potentially more cost-effective option for disseminating online treatments for depression for older adults. (Am J Geriatr Psychiatry 2017; 25:1109–1119)

Key Words: Depression, internet interventions, peer support, online, technology

Depression in later life is common and undertreated,¹ and is associated with decreased quality of life and increased rates of disability,² morbidity, and mortality.³ Untreated depression is burdensome for society, substantially increasing healthcare utilization and costs.^{4,5} Despite numerous evidence-based interventions shown to effectively

reduce late-life depression,⁶ many older adults experience barriers that limit access to care.^{7,8}

The Internet offers opportunities for depression treatment that could dramatically impact older adults' access to care.⁹ Programs delivered online have several advantages, as they remove restrictions imposed by clinics, such as hours, clinician availability, and geographical

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restrictions, thus resolving transportation and mobility related barriers. Internet interventions also offer access to care from anywhere with a working Internet connection, at any time, and as often as needed. This enhanced accessibility offers a more private, and potentially more comfortable, treatment option.

Many Internet interventions that target behavior change and symptom reduction are based on cognitive behavioral therapy (CBT), and such interventions have been developed for a wide range of mental health problems. The efficacy of CBT-based Internet interventions for treating depression in younger and middle-aged adults is well established.^{10,11} Although older adults have historically been underrepresented in this research,¹² emerging evidence supports the efficacy and acceptability of CBT-based Internet interventions for reducing symptoms of depression and anxiety in adults aged over 60 years.^{13–17}

Despite these positive results, self-guided Internet interventions tend to see high rates of dropout and poor adherence.¹⁸ Human support can reduce problems with attrition and engagement, and most studies demonstrate that Internet interventions provided with support produce better outcomes.¹⁹ The inclusion of human supporters, however, reduces intervention scalability because of the cost of providing care and the limited availability of supporters.²⁰ Thus, the need for innovative solutions to improve engagement and manage attrition has been voiced.²¹

Peer support could potentially promote engagement while decreasing costs and increasing reach by reducing the need for professional support. To date, few researchers have attempted to harness peer support in online interventions for depression. There has been some evidence that peer support can improve adherence to Internet interventions and reduce depression,²² although a large trial found that peer support reduced adherence to Internet training relative to Internet training alone.²³

The aim of this study was to explore the feasibility of using peer support to reduce the coach time required for an Internet intervention for depressed older adults. The intervention was delivered either individually (individual Internet intervention; III) or with peer support (Internet intervention with peer support; II+PS), relative to a waitlist control (WLC). Primary outcomes included change in depression, use, self-reported usability, and coach time; secondary outcomes included self-reported social support and isolation, and

anxiety. We hypothesized that greater symptom reduction would be observed for III and II+PS relative to WLC, that II+PS would require less coach time, and that both III and II+PS would demonstrate feasibility and acceptability as evaluated by site use and usability ratings.

METHODS

Participants

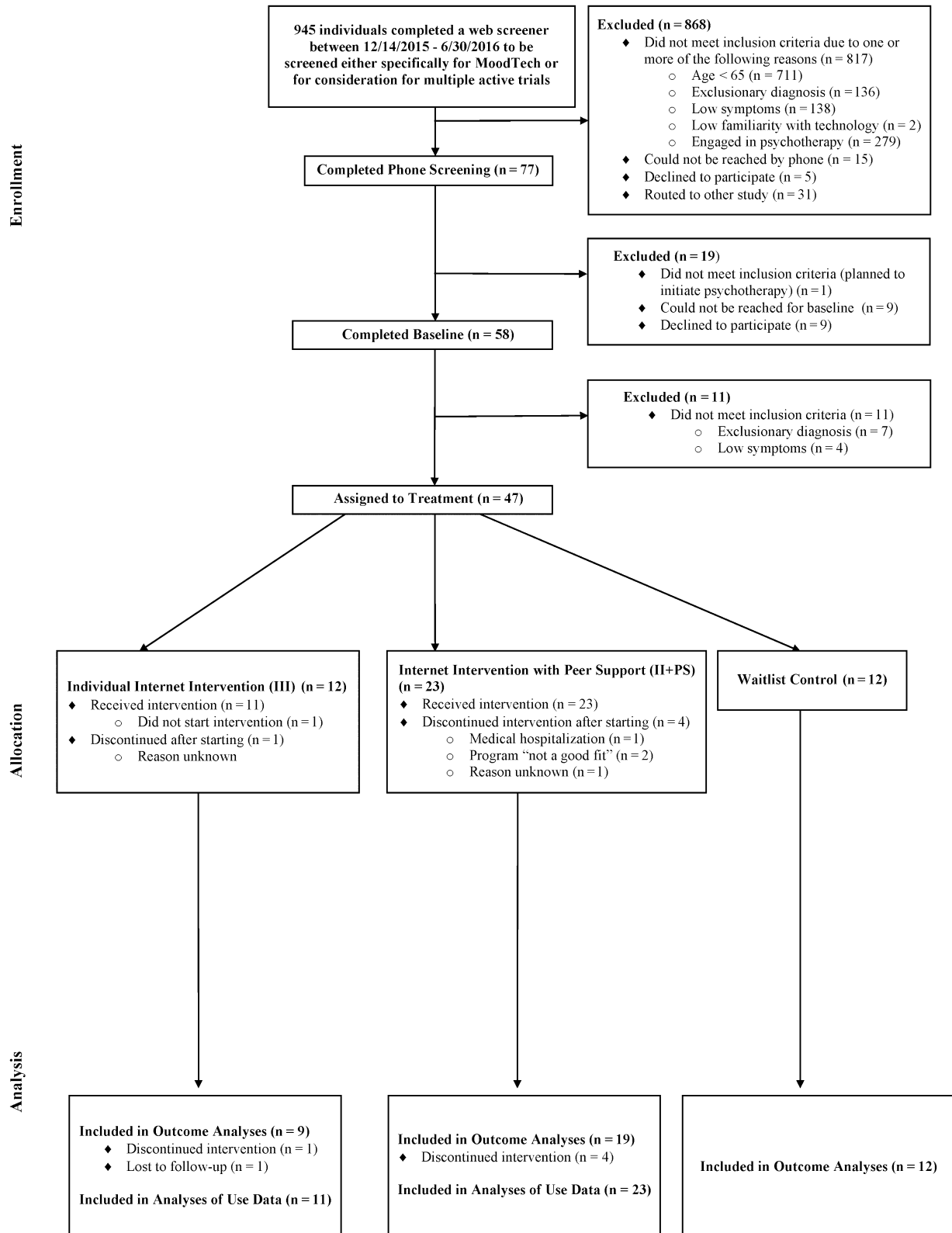
Participants were recruited from clinical research registries, online and community advertisements, and clinic referral. Participants needed to read and speak English, be at least 65 years old, have elevated depressive symptoms at screening (score of ≥ 8 on the Patient Health Questionnaire-8 or score of >7 on the Geriatric Depression Scale-15), have a telephone, e-mail address, basic Internet skills, and Internet access. Participants were excluded if they were receiving or planning to receive psychotherapy during the trial or if they met criteria for a diagnosis for which participation could be inappropriate (e.g., psychotic disorder, cognitive impairment).

Procedures

This study was approved by the Northwestern University institutional review board, registered on the Clinical Trials Registry as NCT02841787. [Figure 1](#) shows participant flow and allocation. Potential participants were directed to a Web site to complete a general screener used for multiple trials. Individuals who indicated interest in this study specifically or agreed to be screened for all studies and who met preliminary screening criteria were contacted to complete phone screening. Participants meeting eligibility after screening were invited to complete informed consent and a baseline eligibility assessment including online questionnaires and telephone administration of the Mini International Neuropsychiatric Interview²⁴ and the Telephone Interview of Cognitive Symptoms.²⁵ Participants who remained eligible were invited to participate.

Because participants assigned to the II+PS progressed through the program as a group, proper randomization would require recruiting a participant pool large enough to be randomized to all three

FIGURE 1. Participant flow through the study.



arms, all eligible on the same day. As this was a small pilot, this was not feasible. Therefore, group assignment was performed in blocks of 10 to 12, and assignment order was pre-specified as follows: II+PS, WLC, II+PS, III. Two groups were allocated to II+PS to provide additional experience with this novel intervention component. WLC participants received access to III following the 8-week waiting period. Assessments were administered online at baseline (≤ 2 weeks prior to intervention start) and week 8 via REDCap.²⁶ Participants could earn up to \$155 for completing research assessments. Compensation was not dependent on participation in the intervention or coaching.

Intervention

MoodTech is an 8-week online intervention for depression based on CBT principles developed for adults aged 65 years and older. It was built on the ThinkFeelDo platform²⁷ and was accessible via computers, tablets, and mobile phones. There were 16 lessons (two per week) that included didactic content and followed two character storylines (see Table, Supplemental Digital Content 1). Each lesson ended with directions to practice skills using program tools. Tools focused on core skills: 1) cognitive restructuring (Think); 2) mood and emotion monitoring (Feel); 3) behavioral activation (Do); 4) relaxation/mindfulness (Relax); and 5) goal setting (Achieve).

Peer support features were designed to promote social engagement and adherence via accountability.²⁸ Features included profiles and an “activity feed” that displayed lesson completion, “status” posts, and participant-selected tool content. Participants interacted by “liking” or “commenting” on the activity feed, and through a “nudge” feature that sent an automated e-mail to another participant. These features aimed to support the development of bond (e.g., profiles, “status”, “likes”) and accountability (e.g., “likes”, “comments”, and “nudges”).

Coaching and Group Moderation

Individual coaching and group moderation were provided by two clinical psychologists (KNT, JH) and were based on the Efficiency Model of Support.²⁹ Individual coaching was provided via phone calls and

messages. Coaches used a dashboard to view participant activity and responses to a weekly symptom questionnaire, and to send and receive messages.

For both III and II+PS, participants had an orientation call with their coach on the first day of the program to establish goals and set expectations for contact. Coaches were instructed to keep this call to 45 minutes or less. For III, coaches provided weekly coaching to all participants via brief (10–15 minute) calls and messages, depending on participant’s preference. In these interactions, coaches were instructed to reinforce progress and address problems that could interfere with benefit (i.e., failure points) by helping participants overcome technical problems (usability), encouraging use (engagement), answering conceptual questions (knowledge) and supporting skill application to specific problems (fit, implementation).²⁹ Coaches also responded to all participant messages, and outreached when participants were unresponsive for more than 1 week. Coaches tracked all time spent on phone and message communications.

For II+PS, coaches primarily interacted with participants through group moderation. Moderation involved daily (weekday) review of the feed to monitor safety, identify unanswered questions, and reinforce use. Templated discussion questions and group use statistics (e.g., percent lessons completed) were posted weekly. Individual coaching was provided in two cases: upon request, or when the moderator determined that outreach was indicated (e.g., if a participant failed to login for more than 1 week; a question to the group went unanswered for more than 48 hours; use of site features in a manner that could negatively impact others). Moderators tracked all time spent on individual coaching. Group moderation time was not formally tracked as it was a high frequency/low time activity, and was estimated at 2 minutes per weekday.

Measures

Clinical and social outcomes were assessed using self-report questionnaires. The Patient Health Questionnaire 9-item (PHQ-9)³⁰ and the Generalized Anxiety Disorder 7-item (GAD-7)³¹ measured depression and anxiety, respectively. The Patient Reported Outcome Measurement Information System (PROMIS) Social Isolation 6-items evaluated social isolation, including feelings of being avoided, excluded, detached, or

disconnected from others.³² The Social Provisions Scale (SPS)³³ measured social support, providing a total score and six subscales (attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance). MoodTech usability, acceptability, and satisfaction were assessed using the System Usability Scale (SUS),³⁴ which provides a measure of overall usability, and the USE questionnaire,³⁵ which measures usability dimensions (usefulness, satisfaction, ease of use, ease of learning).

Use was examined using sessions, lesson completion, and use of peer support features. A session was defined as a sequence of user-initiated actions separated by less than 10 minutes between events. Sessions were examined rather than logins to provide a more accurate understanding of use (e.g., connectivity problems can cause logins without user actions, artificially inflating use).

Statistical Analysis

Descriptive statistics were computed for demographic, clinical characteristics, and social outcome measures. Differences in baseline characteristics between groups were compared using a one-way analysis of variance (ANOVA) for age, the nonparametric Kruskal-Wallis tests for all other continuous characteristics, and χ^2 or Fisher's exact test for categorical variables. Associations between clinical characteristics and change in outcome measures were assessed using Spearman correlation coefficients for continuous variables and either two-sample *t* tests for two-group categorical variables or one-way ANOVAs for categorical variables with three groups. Differences in coaching time, program use (e.g., sessions), and usability ratings were calculated using two-sample *t* tests; differences in weekly lesson completion were compared using Fisher's exact tests. One-way ANOVAs evaluated group differences in change in clinical outcomes from baseline to week 8. Pairwise comparisons for significant omnibus tests were conducted using two-sample *t* tests. Within-group differences between baseline and week 8 outcomes were evaluated using paired *t* tests. Unless otherwise specified, $\alpha = 0.05$ for two-sided tests were used to determine statistical significance. All analyses were performed using SAS, version 9.4 (Cary, NC).

RESULTS

Participants

Forty-seven participants were enrolled and assigned to one of three groups: II +PS (N = 23), WLC (N = 12), or III (N = 12). Baseline characteristics are presented in Table 1. Tests of baseline characteristics between groups did not indicate any significant differences (all *p* values >0.10). Flow through the study is depicted in Figure 1. Participants were included in outcome analyses if they completed assessments at both baseline and week 8; 85.1% (40 of 47) met this criterion. Because this was a small pilot study with very low rates of missing data, intent-to-treat analyses were not conducted.

Primary Outcomes

Depression

Reductions in depression were significant for III and II+PS groups, but not for WLC (see Table 2). Significant differences were found in depression change between groups ($F_{(2,37)} = 3.81$, $p = 0.03$). Pairwise comparisons revealed differences in depression change between III and WLC ($t_{(19)} = 2.5$, $p = 0.02$) and between II+PS and WLC ($t_{(29)} = 2.22$, $p = 0.03$). No significant differences in depression change were found between III and II+PS ($t_{(28)} = 0.41$, $p = 0.68$).

Attrition and Site Use

Two of 11 participants who initiated III (18%) and 4 of 23 participants who initiated II+PS (17%) withdrew (see Figure 1). Mean number of sessions across the 8-week intervention was 45.6 (SD: 24.9) for III (N = 11) and 49.1 (SD: 35.8) for II+PS (N = 23); differences were not significant ($p > 0.50$). Average number of lessons completed (III, M: 11.7, SD: 3.8; II+PS, M: 11.3, SD: 4.5; $p > 0.50$) was not significantly different between groups ($p > 0.50$). Table 3 displays weekly sessions and lesson completion; no significant differences were found between groups for any week (all *p* values >0.10). Use of peer support features was generally high, though variability was observed across participants (M: 48.8, SD: 85.8, range: 0–392). Nearly all II+PS participants (22 of 23) used at least one peer support feature (see Table 4). “Comment” and “like” features were used

TABLE 1. Sample Demographic Characteristics

Variable	N (%) or Median (IQR)			
	Total N = 47	III N = 12	II + PS N = 23	WLC N = 12
Age (years), mean \pm SD	69.6 \pm 4.1	69.2 \pm 3.4	69.5 \pm 4.3	70 \pm 4.7
Sex				
Female	32 (68.1)	8 (66.7)	16 (69.6)	8 (66.7)
Male	15 (31.9)	4 (33.3)	7 (30.4)	4 (33.3)
Ethnicity				
Not Hispanic or Latino	46 (97.9)	12 (100)	22 (95.7)	12 (100)
Hispanic or Latino	1 (2.1)	0 (0)	1 (4.4)	0 (0)
Race				
Black/African American	2 (4.3)	0 (0)	1 (4.4)	1 (8.3)
White	41 (87.2)	11 (91.7)	19 (82.6)	11 (91.7)
More than one race	3 (6.4)	1 (8.3)	2 (8.7)	0 (0)
Declined to report	1 (2.1)	0 (0)	1 (4.4)	0 (0)
Annual gross household income (x1000)	41 (29-50)	37.5 (33-45)	37 (22.2-50)	50 (34-115)
Marital status				
No partner	29 (61.7)	8 (66.7)	16 (69.6)	5 (41.7)
Partner	18 (38.3)	4 (33.3)	7 (30.4)	7 (58.3)
Education				
Some high school	1 (2.1)	0 (0)	0 (0)	1 (8.3)
Some college	7 (14.9)	1 (8.3)	5 (21.7)	1 (8.3)
2-yr college (Associate's)	7 (14.9)	0 (0)	5 (21.7)	2 (16.7)
4-yr college (Bachelor's)	13 (27.7)	3 (25)	6 (26.1)	4 (33.3)
Master's degree	12 (25.5)	5 (41.7)	5 (21.7)	2 (16.7)
Doctoral degree (PhD, MD, JD)	7 (14.9)	3 (25)	2 (8.7)	2 (16.7)
Employment status				
Employed	10 (21.3)	3 (25)	4 (17.4)	3 (25)
Retired	34 (72.3)	9 (75)	18 (78.3)	7 (58.3)
Unemployed/disability	3 (6.4)	0 (0)	1 (4.4)	2 (16.7)
Insured	46 (100)	12 (100)	22 (100)	12 (100)
Medicare	40 (87)	10 (83.3)	19 (86.4)	11 (91.7)
Medicaid	4 (8.7)	1 (8.3)	3 (13.6)	0 (0)
Taking antidepressant medication				
No	31 (67.4)	7 (58.3)	17 (77.3)	7 (58.3)
Yes	15 (32.6)	5 (41.7)	5 (22.7)	5 (41.7)

Notes: Tests of baseline characteristics between groups were conducted using a one-way ANOVA for age, the nonparametric Kruskal-Wallis tests for all other continuous characteristics, and χ^2 or Fisher's exact test for categorical variables. No significant differences were found between groups for any baseline characteristic (all p values >0.10).

III: individual Internet intervention; II+PS: Internet intervention with peer support; WLC: wait list control.

TABLE 2. Within-group Differences for PHQ-9 and GAD-7

Group	Measure	Baseline	Week 8	Difference	t	df	Cohen's d	p
III (N = 9)	PHQ-9	10.6 \pm 3.2	5.1 \pm 2.8	-5.4 \pm 2.4	6.8	8	2.27	<0.001
	GAD-7	6.1 \pm 2.1	2.3 \pm 1.9	-3.8 \pm 2.8	4.09	8	1.36	<0.01
II+PS (N = 19)	PHQ-9	11.2 \pm 5.4	6.4 \pm 4.2	-4.8 \pm 4.4	4.77	18	1.09	<.0001
	GAD-7	6.7 \pm 4.8	4.7 \pm 3.5	-2 \pm 4.4	1.95	17	0.46	0.07
WLC (N = 12)	PHQ-9	9.3 \pm 3.7	8.2 \pm 5.7	-1.1 \pm 4.7	.79	11	0.23	0.44
	GAD-7	5.8 \pm 4	7.2 \pm 4.7	1.3 \pm 2.3	-1.97	11	-0.57	0.08

Notes: Possible range of scores for the PHQ-9 was 0-27 and for the GAD-7 was 0-21. Scores are reported as means and standard deviations. Mean differences were evaluated using paired t tests for each group separately. **Bold** values indicate within-group change. PHQ-9: Patient Health Questionnaire, 9-items; GAD-7: Generalized Anxiety Disorder Scale, 7 items; III: individual Internet intervention; II+PS: Internet intervention with peer support; WLC: wait list control; df: degrees of freedom.

TABLE 3. Use of the MoodTech intervention: Weekly Site Sessions and Lesson Completion

Site Sessions			Lesson Completion		
Week	M ± SD	M ± SD	Lesson	N, %	N, %
	III N = 11	II+PS N = 23		III N = 11	II+PS N = 23
1	9.2 ± 4.4	11 ± 6.8	1	10, 91	22, 96
2	7 ± 4.1	7.5 ± 6.2	2	11, 100	20, 87
3	6.2 ± 4.5	7.2 ± 6.1	3	11, 100	21, 91
4	5.8 ± 4.8	5.7 ± 6.5	4	9, 82	17, 74
5	5.1 ± 4.6	5.4 ± 5.1	5	10, 91	19, 83
6	4.4 ± 3.4	4.6 ± 5.1	6	9, 82	13, 56
7	4.2 ± 2.9	3.4 ± 3.2	7	9, 83	17, 74
8	4.4 ± 3.6	4.2 ± 3.6	8	8, 73	16, 70
			9	9, 82	16, 70
			10	7, 63	18, 78
			11	8, 73	17, 74
			12	4, 36	11, 48
			13	5, 45	14, 61
			14	5, 45	11, 48
			15	8, 73	14, 61
			16	6, 55	14, 61

Notes: Two-sample t tests comparing site sessions were not significant for any week (all p values <0.10). Fisher's exact tests comparing groups on lesson completion were not significant for any week (all p values >0.20).

M: Mean; SD: standard deviation; III: individual Internet intervention; II+PS: Internet intervention with peer support.

TABLE 4. Use of Peer Support Features

Feature	Participants	Min	Max	M	SD
	N, %	# of times used			
Like	19, 82.6%	1	227	25.7	52
Comment	19, 82.6%	1	96	20.3	23.6
Nudge	9, 39.1%	1	24	5.7	8.2
Status	10, 43.5%	2	48	19.7	16.6

Notes: N represents the participants who use the specified tool once or more. Descriptives include only participants who used the specified tool at least once. Min: minimum; Max: maximum; M: mean; SD: standard deviation. Number of times used represents total 8-week trial.

by most participants (83%) at least once; less than half used "status" or "nudge" features (44% and 39%, respectively).

Usability and Acceptability

Per industry standards, a SUS score of 68 is average and scores greater than 70 are considered "acceptable," with higher scores indicating more positive attitudes.³⁶ At week 8, III participants' (N = 9) overall

usability ratings were average (M: 68.75, SD: 16.09), whereas II+PS ratings (N = 21) were below average (M: 60.5, SD: 16.69), but not significantly different from III. Scores on USE subscales ranged from 0 (strongly disagree) to 7 (strongly agree), and fell in the average to below average range for both groups. III participants' (N = 9) mean scores were 4.39 (SD: 1.45) for usefulness, 3.82 (SD: 1.34) for ease of use, 4.48 (SD: 1.8) for ease of learning, and 4.48 (SD: 1.8) for satisfaction. II+PS participants' (N = 21) mean scores were 4.05 (SD: 1.3) for usefulness, 3.55 (SD: 1.28) for ease of use, 3.46 (SD: 1.53) for ease of learning, and 3.52 (SD: 1.31) for satisfaction. No significant differences were found between groups on any subscale (all p values >0.10).

Coaching

Average number of and time spent on messages and calls and group moderation were examined. Significant differences were found between III and II+PS (see Table 5). Total coaching minutes was significantly greater for III compared with II+PS ($t_{(26)} = 3.32$, $p = 0.003$). Compared with II+PS participants, III participants received nearly twice the messages ($t_{(26)} = 4.70$, $p < 0.001$) and coaches spent more than twice the time on average messaging III participants ($t_{(26)} = 3.56$, $p = 0.001$). Differences in number of calls and call time were not significant (all p values >0.05).

Secondary Outcomes

Anxiety

Change in anxiety was significantly different between groups ($F_{(2,36)} = 5.96$, $p = 0.006$; see Table 2). Pairwise comparisons indicated significant differences comparing III and WLC ($t_{(19)} = 4.58$, $p < 0.001$) and II+PS and WLC ($t_{(29)} = 2.39$, $p = 0.03$), but differences between III and II+PS were not significant ($t_{(26)} = 1.12$, $p = 0.28$). Table 2 presents means and SDs and t tests of within-group differences for each group.

Social Support and Isolation

Social isolation scores were converted to T-scores. Baseline scores fell in the average range (33) for all groups (III, M: 55.9, SD: 4.8; II+PS, M: 57.4, SD: 6.3; WLC, M: 54, SD: 6.7). Change in social isolation was not significantly different between groups ($p > 0.10$),

TABLE 5. Average Coaching Time per Participant by Group

	N	Messages		Calls		Moderation	Total Time
		M ± SD	M ± SD	M ± SD	M ± SD	M	M ± SD
		Minutes	Number	Minutes	Number	Minutes	Minutes
III	9	65.22 ± 29.92	14.78 ± 2.11	69.11 ± 22.35	2.33 ± 1.00	na	134.33 ± 28.43
II + PS	19	31.74 ± 19.60	7.58 ± 4.32	53.74 ± 18.44	1.84 ± .83	6.96	92.43 ± 32.36

Notes: Two-sample t tests were used to compare group differences. df = 26. **Bold** values indicate significant differences. Minutes on group moderation are estimated; see Methods section for more information.

M: mean; SD: standard deviation; III: individual Internet intervention; II+PS: Internet intervention with peer support.

and change was not significant within each group (all p values >0.10).

No significant differences were found between groups on change in total SPS ($p > 0.10$), or any subscale (all p values >0.10). Significant change was observed within the II+PS group on SPS total score ($t_{(18)} = -2.26$, $p = 0.04$), and guidance ($t_{(18)} = -2.36$, $p = 0.04$) and reliable alliance ($t_{(18)} = -2.15$, $p = 0.03$) subscales. Examination of within-group change was not significant for III and WLC for SPS total score or subscales (all p values >0.05).

DISCUSSION

This pilot study demonstrates the feasibility and preliminary efficacy of MoodTech, and indicates that adults aged 65 years and older will use and can benefit from coached Internet interventions for depression delivered individually and with peer support. Compared with a WLC, reductions in depression were observed for all participants who received MoodTech, with an average drop of 5 points on the PHQ-9. The present findings are consistent with reductions in depression observed in the only prior randomized controlled trial (RCT)¹⁷ to evaluate the efficacy of a guided Internet intervention for depressed adults aged 60 years and older, and extends these findings to a slightly older sample (M: 69.6 years, SD: 4.1, range: 65–83). Program usage was high, with an average of 45 sessions for III and 49 for II+PS, and retention was good for both groups (approximately 80%). Retention and usage are similar to other trials of Internet interventions with older adults^{15–17} and higher relative to trials with younger adults (<65 years).³⁷

Significantly less time was spent coaching participants when peer support was included, suggesting that

embedding peer support in Internet interventions could reduce coach time, thus increasing cost-effectiveness. Notably, compared with coach time reported in the previously mentioned RCT (M: 45.07 minutes, SD: 32.51 minutes),¹⁷ coach time in the present study was about 89 minutes more for III and 47 minutes more for II+PS. Our procedures included an initial 45-minute orientation call, which significantly increased coach time per person for both methods of delivery. Reducing or eliminating this call, or conducting this call with groups of participants, could result in coach times comparable to the RCT for II+PS. Coach time in III could be further reduced by altering coach guidelines regarding the maximum coach minutes per week to align with guidelines from the prior RCT (≤ 10 minutes/week).

Usability scores indicate that MoodTech is acceptable and generally satisfactory in its current form, without significant usability issues. Nevertheless, overall average and neutral ratings suggest that there is room for improvement. Uptake of peer support features was high, suggesting that participants were motivated to interact with and support each other, yet usability ratings were lower for II+PS, possibly due to frustration with the design of peer support features. Although all but one participant used either the “like” or “comment” features at least once, several participants expressed confusion about how and where to view “likes” and “comments” and less than half used the “status” or “nudge” features. Further, although instructions regarding use of peer support features were provided during the orientation call and within the program, coach feedback indicated that there was confusion regarding the location and function of the “status” feature, as well as the function of the “nudge” feature, which participants ultimately used to deepen established connections with other group members (i.e., reinforce bond) rather than to engage disengaged

participants (i.e., accountability). Coaches also received negative feedback about the location and functionality of the activity feed, with some participants expressing disappointment regarding the feed functionality and how this limited their ability to connect with others.

Low-average usability ratings, combined with feedback from coaches, point to various design improvements that should be considered for future iterations. First, while font size could be manually increased for lessons, this was not possible for other aspects of the program (e.g., tools), which was problematic. To increase accessibility and satisfaction, the size of all aspects of the program should be adjustable. Second, coaches noted that some participants struggled to complete the practice assignments because the instructions were embedded in lessons. Incorporating interactive tools into the lessons, or featuring practice assignments on the homepage, could resolve this issue. Third, for II+PS, the activity feed should be displayed somewhere prominent. Last, because certain activities were automatically posted to the feed, participant posts were quickly buried, and interacting with peers required motivation, patience, and solid understanding of feed functionality. Thus, the design of the activity feed should be altered to support (versus thwart) peer interactions (e.g., specific types of posts “pop to the top”).

Finally, although no significant differences were seen between groups on change in social support, significant increases on overall support and subscales of guidance and reliable alliance were observed for II+PS, suggesting that peer support adds unique benefits that could confer larger protective benefits.^{38,39} Because of limited follow-up, we cannot know the nature of these increases in social support. They may be temporary, reflecting the tangible increase in peer support from the intervention. Alternatively, perhaps they reflect a perspective shift—for example, due to social learning/comparison that changed participants’ willingness to utilize existing support.⁴⁰

This study had several strengths, including the fact that participants were older (M: 69 years) than prior trials of Internet interventions. Additionally, to our knowledge, this was the first Internet intervention for depressed older adults to embed peer support. Peer support has previously been provided separately from online interventions,²³ requiring extra effort from participants to complete both. This study demonstrates the

potential benefits of embedding peer support, including improved adherence compared with a prior trial²³ and reduced burden on participants.

Several limitations should be considered. First, this field trial used blocked, non-random enrollment. It is possible that unmeasured differences across the treatment arms (e.g., participants who enrolled early in the recruitment period may have been more motivated than those who enrolled later) account for these findings. Findings should therefore be interpreted as supporting further investigation rather than encouraging implementation. The sample size was relatively small, and was primarily non-Hispanic white and highly educated. Although this sample was somewhat representative of individuals who historically participate in online interventions, the feasibility and acceptability of this program remains unknown for more diverse samples, and for those who do not have pre-existing familiarity with the Internet and would not volunteer to participate. Finally, it was not possible to blind coaches to intervention condition, which could have biased time spent coaching.

Conclusions

This study demonstrated feasibility, acceptability, and preliminary efficacy of MoodTech and highlights the potential benefits of including peer support in online interventions for older adults with depression. User feedback and usability data suggest that further design work is required to develop a technology platform that more fully meets the needs of older adults. Further examination of the role of individual coaching and group moderation is also warranted, such as testing differences in outcome in response to systematic variation in the amount and type of human support. These basic design questions notwithstanding, this study supports the conduct of larger-scale RCTs to validate the use of peer support in Internet interventions for older adults, and extending this work to evaluate long-term effects.

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APPENDIX: SUPPLEMENTARY MATERIAL

Supplementary data to this article can be found online at [doi:10.1016/j.jagp.2017.04.015](https://doi.org/10.1016/j.jagp.2017.04.015).

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