

Intervention Research

Results of a Randomized Trial Testing the Efficacy of Tele-Savvy, an Online Synchronous/Asynchronous Psychoeducation Program for Family Caregivers of Persons Living with Dementia

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Abstract

Background and Objectives: Family caregivers will grow in number as dementia prevalence increases, underscoring the continued importance of equipping these individuals for their new roles and ameliorating the adverse effects of caregiving.

Research Design and Methods: A three-armed, waitlist, randomized trial design tested Tele-Savvy, an online adaptation of a successful in-person psychoeducation program, the Savvy Caregiver. Tele-Savvy is delivered over 43 days to groups of 6–8 caregivers in 7 weekly synchronous sessions accompanied by 36 brief asynchronous video lessons. We enrolled 23 cohorts of 15 eligible caregivers ($N = 261$), randomized 2:2:1 to active, attention control, and usual care arms. We assessed caregiver psychological well-being and caregiving mastery at baseline and 3, 6, 9, and 12 months. Multilevel linear models assessed outcomes over the 3 time points examined. The trial was slightly truncated, with Data and Safety Monitoring Board approval, because of the apparent confounding psychological effects of coronavirus disease 2019 restrictions.

Results: Study findings indicate statistically and clinically significant benefits to Tele-Savvy arm caregivers (with moderate to large effect sizes) in the areas of depression, perceived stress, reaction to care recipients' behaviors, and enhancement of caregiver mastery. Expected benefits for caregiver burden and anxiety were not found.

Discussion and Implications: Findings attest to program efficacy and the viability of employing distance means to improve family caregivers' emotional well-being and sense of mastery in the caregiving role over a 6-month period. Next steps entail finding alternate ways to deliver the program to those with connectivity and/or time constraint problems.

Keywords: Alzheimer's disease, Caregiver stress, Mastery

Background and Objectives

It is well established that caregivers for community-dwelling persons living with Alzheimer's disease and related dementias (ADRD) perform this role at no small cost to their own well-being (AARP, 2020; Kiecolt-Glaser et al., 1991; Pinguart & Sörensen, 2003; Schulz & Beach, 1999; Schulz & Sherwood, 2008). Over the past three decades, many interventions have demonstrated small-to-moderate positive effects on caregiver well-being (Bass et al., 2013; Belle et al., 2006; Cheng et al., 2020; Coon et al., 2003; Gallagher-Thompson & Steffen, 1994; Gitlin et al., 2003, 2008; Jütten et al., 2018; Leng et al., 2020; Mittelman et al., 2004; Walter & Pinguart, 2020; Williams et al., 2019; Zhao et al., 2019). These programs, all psychoeducational, have employed a variety of mechanisms of action, many clustering around Social Cognitive Theory as a conceptual base (Bandura, 1977, 1989; Folkman, 1984; Folkman et al., 1986; Pearlin & Schooler, 1978). All had their beginnings in the small group, in-person format. One such program, the Savvy Caregiver, significantly reduced caregiver distress and significantly enhanced caregiver mastery in a variety of trials and with diverse caregiver groups (Brewster et al., 2020; Hepburn et al., 2003; Kally et al., 2014). Because of challenges with in-person attendance at group interventions, a number of investigators have successfully deployed distance means for delivering their interventions (Blom et al., 2015; Cristancho-Lacroix et al., 2015; Czaja et al., 2013; Glueckauf et al., 2012; Hayden et al., 2012; Kajiyama et al., 2013; Leng et al., 2020; Winter & Gitlin, 2006).

This article reports on the results of a truncated trial of the Tele-Savvy program, a fully online adaptation of the Savvy Caregiver (Griffiths et al., 2016, 2018). The trial, supported by the National Institute on Aging (NIA; RO1AG054079), tested two main outcomes: the program's effect on caregiver well-being and its ability to enhance caregiver mastery (Griffiths et al., 2016, 2018; Kovaleva et al., 2018). The study began in May 2017, with the first cohort launched in August 2017, and was originally scheduled to end in November 2020. However, in late February 2020, the project's research interviewers and Tele-Savvy facilitators began to report spikes in study participants' levels of distress apparently produced by growing fears of coronavirus disease 2019 (COVID-19) infection and the pressures of sheltering in place and longer days of caregiving associated with pandemic-based restrictions and shutdowns. We became concerned that the pandemic and the variety of restrictions linked to it would exogenously affect measures of caregiver well-being. Given this concern, and that we had very nearly achieved our power-based subject recruitment goal, we sought the concurrence of our Data and Safety Monitoring Board to conduct the main study analysis on baseline-to-6-month data collected up to March 18,

2020, the date on which multiple states imposed COVID-19-related restrictions. Thus, the results reported here are of the baseline-to-6-month data from the first 23 of a projected 26-cohort study.

Research Design and Methods

Design

The Tele-Savvy study employed a 12-month longitudinal randomized three-group cohort design including an active intervention group that participated immediately in the Tele-Savvy intervention; an attention control group, described below, of a similar length and format to Tele-Savvy; and a usual community care group. Participants were allocated to groups in a 2:2:1 randomization scheme, once cohorts of 15 participants were formed. Active control and usual care participants were invited to take part in Tele-Savvy after they completed their 6-month interviews.

Conceptual Framework

Tele-Savvy, like its in-person precursor the Savvy Caregiver, makes three fundamental assertions about dementia caregiving. The first is that dementia caregiving is a new role for which few are prepared; thus, Tele-Savvy is a caregiver training program. The second is that "success" in the role involves the capacity to guide the care recipient's behavior effectively; this entails both the management of the behavioral and psychological symptoms of dementia and the ability to promote the care recipient's engaged involvement in daily living and free-time tasks and activities. The third assertion is that in order to perform effectively in the role, one has to acquire a sense of mastery, a sense of self-affirmed confidence in one's capacity to do so. This concept of mastery is aligned with the notion of efficacy expectation, which Social Cognitive Theory conceptualizes as promoting positive outcomes in a stressful situation (Bandura, 1977, 1989). Both Savvy and Tele-Savvy employ active participation as the mechanism that promotes mastery in behavior guidance. The programs expect participants to deploy in their own home caregiving models of behavior guidance that are taught in the program. The models provide caregivers with what Bandura terms "anticipated outcomes" (p. 7); the efforts to enact these anticipated outcomes in the home environment are intended to strengthen caregivers' "foresightful behavior" (p. 7) and their efficacy expectations for more competent caregiving (Bandura, 2001). Both programs devote substantial portions of time in sessions to participants' reports on their home efforts. Such reporting reinforces successes, allows corrective instruction by the program leader as needed, and allows participants to observe others' efforts and successes; these three activities are fundamental to the strengthening of efficacy expectations (Bandura, 1977, 1989).

Active intervention and attention control conditions

Tele-Savvy was designed to replicate and simulate the key elements of the participant experience of the Savvy Caregiver program. The in-person Savvy Caregiver program is typically delivered to groups of 8–12 family caregivers in six 2-h weekly sessions led by one or two trained facilitators. Savvy's principal focus is on strengthening caregivers' mastery of behavior guidance skills through brief talks, in-session active exercises, assigned home activities, and in-session coaching and debriefing. The program emphasizes caregiver self-care through identifying and altering the frequent negative emotions associated with caregiving; it also provides strategies for strengthening family and community resources for caregiving. The core Savvy program curriculum, the focus on active learning, and the small group nature of the program remained unchanged in Tele-Savvy, which was delivered in a synchronous/asynchronous online format.

Tele-Savvy is anchored around seven weekly 75- to 90-min synchronous Zoom-based meetings of small groups of caregivers (targeted at six in the study's randomization scheme) and a facilitator with prior experience leading the in-person Savvy program. Between the synchronous sessions, participants received daily "video lessons," all drawn from the Savvy curriculum, plus six additional lessons centered on mindful self-care, that they could watch asynchronously whenever and as often as they wished. The synchronous sessions and the video lessons presented participants with exercises to implement at home the Savvy strategies and principles being taught in both formats. The online group sessions provided opportunities for debriefing and coaching related to these exercises. These segments allowed participants to acknowledge their own and other group members' efforts and successes in skilled caregiving (key components in enhancing participants' secondary appraisal of their caregiving mastery).

To provide a robust test of the intervention, we created an attention control condition structured to mimic the format of Tele-Savvy. This program provided information and instruction of interest and importance to caregivers, but intentionally not focused on any of the emotional, psychological, or mastery targets of the Tele-Savvy program. This condition, Healthy Living, drew on available resources from the National Institute on Aging (G4Life), the National Council on Aging, and the Centers for Disease Control and Prevention. The condition was fully parallel to Tele-Savvy: seven weekly small group ($N = 6$) professionally led online synchronous sessions, daily video lessons, and active coaching of home exercises provided by the program. "Navigators" attended all active and attention control online group sessions to assist with technical difficulties, unobtrusively observe each session, and take notes on the fidelity of program delivery and participant engagement.

Sample and Recruitment

The study recruited individuals actively involved in providing day-to-day care for community-dwelling persons living with ADRD for whom there were no active plans for institutionalization within the next 6 months. Eligible individuals had to have access to the means to participate in the synchronous and asynchronous components of the program and be able to read and understand spoken English. Those with prior participation in the in-person Savvy program or comparable psychoeducation programs were excluded from the study. In accordance with the Emory Institutional Review Board (IRB)-approved protocol, all participants were informed about the study's procedures and risks and provided documented verbal consent, using an IRB-approved format.

The study was conducted collaboratively by four NIA Alzheimer's Disease Centers at Emory University, Northwestern University, Oregon Health and Science University, and Rush University Medical Center (with Emory as the coordinating study site). The Outreach, Recruitment, and Engagement Core directors and study coordinators at each site drew on their respective center's research registries as a main source of recruitment. The trial was listed in ClinicalTrials.gov and in the Alzheimer's Association Trials Match database. Organizations that had implemented the in-person Savvy Caregiver program were contacted and asked to inform their constituents of the trial. Efforts were likewise made to use Facebook as a means of recruitment.

Procedures

Both the active intervention and the attention control condition involved slotting participants into synchronous small groups. In practical terms, we had to be able to assemble cohorts of 15 consented caregivers, all of whose time availability would enable them to participate in a synchronous group. This task was complicated by the fact that we were recruiting across five time zones and that a sizeable minority of those recruited were still working. In practice, the very wide range of availabilities meant building some cohorts that had weekend or evening meeting times in addition to those with regular working day meeting times. Once we could construct such a cohort, baseline interview and randomization procedures could ensue.

Data Gathering Procedures

We gathered data at baseline, prior to study group participation, and 3, 6, 9, and 12 months thereafter. Data were collected by distance means, usually Zoom-based video-conference, by trained interviewers blinded to participants' study condition. Interviewers were trained to observe for participant fatigue and/or distress and could, as needed, provide a break or offer to continue the interview in

a follow-up call. Typically, the interviews lasted an hour; participants received \$25 gift cards for each interview to compensate for their time. The interview responses and pertinent comments were gathered in paper and pencil format. The interviewer and another interviewer or a student assistant then independently entered those responses into a REDCap database. REDCap generated reports about any discrepancies between the two entries, and those discrepancies were resolved by a review of the original questionnaire by the program manager and one of the investigators.

Study Measures

In addition to a study-designed demographic questionnaire administered at baseline, a battery of well-established instruments was used to gather information pertinent to the study aims; these same measures were used in the study of the in-person Savvy program (Table 1).

Analytic Methods

Descriptive statistics were computed for all demographics and final instrument scores at each time point (baseline, 3, and 6 months). Internal consistency reliability was assessed for each instrument by computing Cronbach's alpha for item responses at baseline (Table 1). The proportion of missing data due to attrition was compared between the three groups using a chi-square test. Comparisons between the three groups' demographics and baseline measurements were performed using analysis of variance for continuous measures and chi-square tests for categorical responses. Multilevel linear models (MLMs) were used to model the longitudinal repeated measures over the three time points and test for group, time, and group-by-time effects. These MLMs accounted for covariate-dependent missingness by including time as a predictor in the model to account for the missing data due to attrition. All available data were included with any missing data assumed to be missing at random. The models were followed by post hoc tests performed using Sidak pairwise error rate adjustment (Hedeker & Gibbons, 2006). Participants with any missing data were compared to participants with complete data using *t*-tests to determine whether any baseline measurements or demographics were associated with missingness over time. No significant differences were found.

Given recent communications from the American Statistical Association, *p* values for statistical tests and models are reported; however, the emphasis has been placed on reporting and interpreting effect sizes and clinically descriptive differences (Wasserstein et al., 2019). In addition to performing statistical models and tests with reported *p* values, effect sizes (Cohen's *d*) also were computed based on the change scores from baseline to each follow-up time point (Cohen, 1988) to evaluate small ($d = 0.2$), moderate

($d = 0.5$), and large ($d = 0.8$) effect sizes to help determine clinically meaningful improvements. The percentages of participants whose scores improved from baseline also were calculated. All computations were performed using IBM SPSS Statistics for Windows, version 24.0 (IBM Corp, Armonk, NY).

Results

As Figure 1 indicates, recruitment, eligibility, consenting, and randomization yielded a sample of 261 individuals who completed baseline interviews and began participation in one of the three study groups. Initial screening identified 40.9% of those expressing interest as not eligible, principally because the person living with dementia had been or was soon to be moved to a residential facility or because the individual did not qualify as the main caregiver. Nearly 80% of those determined to be eligible provided consent; the main reason for declining to consent was the unwillingness to take part in the research interview portion of the study. From consent to randomization, we saw a 14% drop-off in participation. Typically, this was the result of delays in fitting individuals into research cohorts; by the time we were able to fit them into a cohort, the person had either died or moved to residential care. The schedules of 28 consented caregivers precluded fitting them into a group, so they did not participate in the study. Of the 23 cohorts on which we are reporting, 15 had synchronous groups held during weekdays, five had groups held on weekday evenings, and three had groups held on the weekend. Of those randomized (343), nearly 25% (85) withdrew or were withdrawn from the study before actual assignment to a study group; again, delays in cohort assignment or changes in the caregiving situation were the principal reasons for this drop-off. The attrition rate from the time of randomization to actual participation in a study group was 23.9%; this was just slightly below the 25% attrition rate we had used in conducting the power calculations in our study protocol. For the 261 participants with baseline data, 197 (75.5%) completed 3 months and 199 (76.2%) completed 6 months. The overall attrition rate by 6 months was 23.8% with rates similar between the three groups (25.0% for active, 27.0% for attention control, and 14.8% for waitlist control; $\chi^2(2) = 3.121, p = .210$).

The demographic profile of the study population is displayed in Table 2. The profile appears quite representative of the broader national profile of dementia family caregivers. The participants are mostly female (70.5%), and there are perhaps more spouses than average (Alzheimer's Association, 2020). The caregivers span an age range from 29 to 89. The care recipients are, on average, older than 75; their age ranges from 50 to 94, reflecting at least a small representation of early-onset cases. By design, the study population reflects the success of our active efforts to engage African American caregivers (21.8% of the sample); however, the study

Table 1. Study Measures

Measure	Instrument	Description	Validity/reliability	Cronbach's alpha
Perceived stress	Perceived Stress Scale (Cohen et al., 1983)	A 14-item Likert-type questionnaire; higher scores reflect higher perceived stress	Internal consistency ranges reported at 0.84 or higher (Alzheimer's Association, 2014)	0.881
Depression	Center for Epidemiological Studies—Depression (Radloff, 1977)	A 20-item Likert scale scored 0–3 with somatic and psychological subscales	Alpha = 0.85 for the general population; validity well-established (Alzheimer's Association, 2014)	0.902
Anxiety	State-Trait Anxiety Inventory (STAI; Spielberger & Sydeman, 1994)	A 20-item, 4-point Likert scale sensitive to changes in transitory anxiety	STAI state sensitive reliability reported at 0.94 (Jennings et al., 2015)	0.949
Burden	The Zarit Burden Inventory (Zarit, 1980)	A 22-item, 4-point Likert scale widely used in caregiving studies	Used in multiple studies with well-established validity (Reuben et al., 2013)	0.906
Caregiver mastery	Pearlin Mastery, Loss, and Competence (Pearlin et al., 1990)	Six brief (three to six items) Likert scales assessing mastery and loss dimensions	Alpha coefficients from 0.71 to 0.92 (Bauer et al., 2014)	Caregiver competence = 0.762 Situation management = 0.446
Behavioral and psychological symptoms in dementia	Revised Memory and Behavior Problem Checklist (Teri, 1992)	A 24-item Likert scale instrument that assesses patient behaviors and caregiver responses to them	Reliabilities of 0.84–0.90 are reported for behavior and reaction (Hinton et al., 2007)	0.883

population seriously underrepresents Hispanic caregivers. Caregiver formal employment (40% of the study population) and care for other family members (42%) mirror the national profile. The large percentage of participants (41.4%) with at least a college degree is somewhat above the national norm. The profile demonstrates the success of randomization in establishing the basic similarity of participants across the three study groups. The only factor in which the groups differed at baseline was in the residential location of the participants; the active group had more suburban and fewer urban than those in the two other groups, although it is expected this difference occurred at random. On all other measures, there were no statistically significant differences across the groups.

Those in the active intervention group, compared to those in the attention control and usual care groups, demonstrated statistically significant group-by-time effects on perceived stress ($p < .001$) and depression ($p = .032$). The clinical importance of these improvements for the active group is reflected in their small-to-moderate effect sizes (Cohen's $d = 0.42$ – 0.45 for stress and $d = 0.31$ – 0.32 for depression). More than 60% of the active group participants improved from baseline to 3 months and 6 months, whereas attention control showed little to no improvements and waitlist control participants worsened over time. While not statistically significant, more than half (>50%) of the participants in the active group did decrease their anxiety scores from baseline to 3 months (52.1%) and to 6 months (58.3%).

The trial did not achieve comparable results on caregiver burden, either in terms of the whole scale or of its subscales. Burden scores were not significantly different among the three groups over time ($p > .10$) although burden did decrease over time with improvements seen for the active group more than for the attention control group, with no improvement or worsening seen in the waitlist control group (Table 3). There were significant group-by-time differences ($p = .031$) in caregivers' reactions to behavioral and psychological symptoms in dementia (BPSD); the active group showed significant reductions in their reactions (with moderate effect size improvements $d = 0.45$ at 3 months and small-to-moderate effect size improvements $d = 0.34$ at 6 months). The frequency of BPSD was not statistically significantly different between the three groups ($p = .282$, not given in Table 3).

The focus of the study's second aim was on TeleSavvy's efficacy in promoting caregivers' sense of caregiving mastery (caregiver competence). Those in the active intervention group, compared to those in the attention control and usual care groups, demonstrated statistically significant group-by-time positive effects on mastery ($p < .001$). The clinical importance of these improvements for the active group is reflected in their large effect sizes (Cohen's $d = -1.39$ at 3 months; $d = -0.97$ at 6 months).

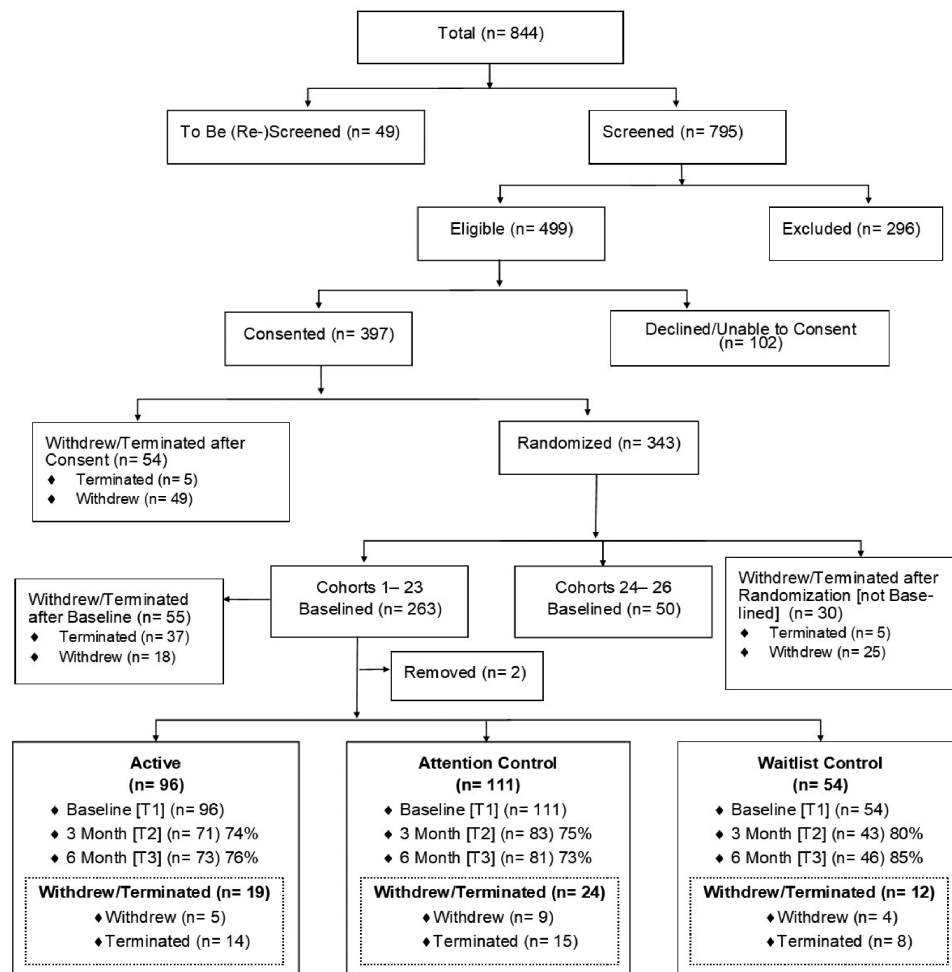


Figure 1. Tele-Savvy Consolidated Standards of Reporting Trials (CONSORT) chart.

Discussion and Implications

These results confirm the efficacy of the Tele-Savvy program in producing positive improvements in dementia family caregivers’ stress and depression. The focus of the study’s first aim was the effect of the Tele-Savvy intervention on the set of psychological outcomes most frequently associated with dementia caregiving. As described above, our theoretical understanding of caregiving is that it is fundamentally a high-stress situation, the unmediated outcome of which is likely to produce negative psychological and emotional consequences. As Table 3 delineates, the program appears to have had a positive impact on the short- and longer-term emotional and psychological well-being of caregivers in the active intervention group. The Tele-Savvy intervention also produced significant reductions in caregiver reactions to the BPSD that are so detrimental to the well-being of caregivers, despite the fact that the behaviors themselves did not diminish. Finally, and of particular importance, Tele-Savvy produced an enhancement in caregivers’ sense of mastery for effectively carrying out the role. These results mirror the findings of our study of the in-person Savvy Caregiver program (Hepburn et al., 2003).

These are clinically important results, in terms of the small-to-moderate effect sizes noted for improvements in caregivers’ psychological well-being but especially in terms of the large effect size noted in enhanced caregiving mastery. The results also confirm earlier pilot findings indicating the preliminary efficacy of Tele-Savvy on caregiver mastery and well-being (Griffiths et al., 2018). These results are directly linked to the study’s overall aims and reaffirm the program’s focus on developing and enhancing caregiver mastery as an appropriate mechanism for fostering/improving caregiver well-being. This focus on mastery development is operationalized in the in-person and online Savvy programs’ assertion that dementia family caregiving is a newly acquired role. Both programs assert that caregiving entails functions and tasks that are separate from those linked to whatever relationship may have propelled the caregiver into the role. The Savvy programs were designed as training programs for work that is technical and clinical in nature. In replicating the results of previous studies of the in-person Savvy Caregiver Program and its precursors, this trial adds Tele-Savvy to the repertoire of evidence-based dementia caregiver psychoeducational programs available for wider implementation.

Table 2. Description of Trial Participants

Measure		Overall	Active	Attention con-	Waitlist con-	<i>p</i> value from ANOVA ^a or chi-square ^b test
		<i>N</i> = 261	<i>N</i> = 96	trol <i>N</i> = 111	trol <i>N</i> = 54	
		Mean (<i>SD</i>) or <i>N</i> (%)	Mean (<i>SD</i>) or <i>n</i> (%)	Mean (<i>SD</i>) or <i>n</i> (%)	Mean (<i>SD</i>) or <i>n</i> (%)	
Age—caregiver		64.6 (11.2) [29–89]	66.0 (10.9)	63.8 (11.6)	63.7 (10.7)	.281
Age—person cared for		74.6 (9.8) [50–94]	75.1 (8.6)	74.4 (10.6)	74.4 (10.3)	.875
Person cared for	Spouse	172 (65.9%)	69 (71.9%)	68 (61.3%)	35 (64.8%)	.270
Caregiver gender	Female	184 (70.5%)	72 (75.0%)	73 (65.8%)	39 (72.2%)	.332
Caregiver race	White	192 (73.6%)	78 (81.3%)	75 (67.6%)	39 (72.2%)	.081
	AA/Black	57 (21.8%)	15 (15.6%)	27 (24.3%)	15 (27.8%)	
	Asian	4 (1.5%)	1 (1.0%)	3 (2.7%)	0 (0%)	
	No answer	1 (0.4%)	0 (0%)	1 (0.9%)	0 (0%)	
	Other	7 (2.7%)	2 (2.1%)	5 (4.5%)	0 (0%)	
Caregiver ethnicity	Non-Hispanic	250 (95.8%)	92 (95.8%)	104 (93.7%)	54 (100%)	
Employed	Yes	100 (38.6%)	34 (35.8%)	45 (40.9%)	21 (38.9%)	.754
Education	≥BA/BS	108 (41.4%)	41 (42.7%)	46 (41.4%)	21 (38.9%)	.901
Area live in	Urban	93 (35.9%)	22 (22.9%)	49 (44.5%)	22 (41.5%)	.013
	Suburban	116 (44.8%)	55 (57.3%)	40 (36.4%)	21 (39.6%)	
	Rural	50 (19.3%)	19 (19.8%)	21 (19.1%)	10 (18.9%)	
Anyone else help?	Yes	151 (57.9%)	60 (62.5%)	59 (53.2%)	32 (59.3%)	.387
How much help from others?	Almost no help	71 (27.3%)	23 (24.0%)	37 (33.3%)	11 (20.8%)	.156
Caring for others in your family?	Yes	110 (42.1%)	47 (49.0%)	45 (40.5%)	18 (33.3%)	.160
Strife added by family/friends	Only helpful	100 (38.8%)	40 (42.1%)	37 (33.6%)	23 (43.4%)	.342

Note: SD = standard deviation; AA = African American; BA/BS = Bachelors of Arts/Bachelors of Science degree.

^aAnalysis of variance (ANOVA) tests were performed to compare continuous numerical age differences between the three randomization groups.

^bChi-square tests of independence were performed to compare proportions of categorical responses between the three randomization groups.

The program's minimal success in reducing caregiver burden is perhaps understandable. Zarit et al. (1980) found that the strongest correlates of caregiver burden were the frequency of family visits and the degree of other social support. While there is content in the Savvy programs on the importance of strengthening family support, it is only a small component of the program. The lack of significant improvements in burden suggests that the program might benefit from strengthening this focus in its future development.

Consistent with its Social Cognitive theoretical foundation, the Savvy programs target caregivers' coping capacities by strengthening their knowledge of the effects of dementia, their skills in designing and guiding the days of those for whom they provide care, and their felt-sense of their own abilities to deal with current and emerging care challenges.

The synchronous and asynchronous elements of Tele-Savvy were designed to take the best advantage of each medium to strengthen caregivers' coping capacities. The asynchronous elements—the 36 video lessons—were principally directed at caregiver knowledge. The videos taught about dementia disorders and their effects on those living

with these disorders. Through mini-lectures and embedded enactments, the videos sought to educate about and illustrate how dementia affects thinking powers and control over one's own emotions and behavior. They also provided instruction in the key caregiving skill of task and activity design. The synchronous portions of the program provided additional instruction and interactive coaching on which the development of caregiving mastery hinged. The positive results related to caregivers' psychological well-being and sense of mastery speak to the program's efficacy in achieving the aimed-for results. The results speak to a successful migration of the Savvy Caregiver program to a synchronous/asynchronous format. In so doing, they are consistent with the results of other online caregiver interventions (Boots et al., 2014; Christie et al., 2018; Egan et al., 2018; Hopwood et al., 2018; Jackson et al., 2016).

The study results are generally consistent with findings from recent meta-analyses and systematic reviews of programs targeted to dementia family caregivers. There were consistent results that the findings from these programs had yielded relatively small effect sizes (Cheng et al., 2020; Jütten et al., 2018; Leng et al., 2020; Walter & Pinquart, 2020; Williams et al., 2019; Zhao et al., 2019). Our study's

Table 3. Multilevel Model Results Comparing the Three Randomization Groups Over Time for Key Outcomes

Measure	Group	Time	N ^a	Change from baseline		Effect size		Multilevel model effect	Effect test	
				Mean (SD)	Mean (SD)	Cohen's <i>d</i>	Number improved from baseline ^b		<i>F</i> (<i>df</i> ₁ , <i>df</i> ₂)	<i>p</i>
Perceived stress	Active	Baseline	96	23.50 (8.93)				Time	<i>F</i> (2, 401.6) = 1.767	.172
		3 months	71	20.77 (6.93)	3.21 (7.20)	0.45	48/71 (67.6%)	Group	<i>F</i> (2, 254.1) = 0.849	.429
	AC	6 months	72	20.72 (7.10)	3.09 (7.36)	0.42	44/72 (61.1%)	Group × Time	<i>F</i> (4, 402.1) = 6.697	<.001
		Baseline	111	22.66 (8.21)						
	WLC	3 months	83	21.24 (7.63)	1.46 (5.58)	0.26	47/83 (56.6%)			
		6 months	80	22.14 (8.08)	0.96 (6.06)	0.16	41/80 (51.3%)			
Depression	Active	Baseline	54	21.73 (7.71)				Time	<i>F</i> (2, 402.4) = 2.058	.129
		3 months	43	23.86 (6.74)	-2.38 (4.80)	-0.50	2/43 (27.9%)	Group	<i>F</i> (2, 254.3) = 0.056	.946
	AC	6 months	46	23.50 (7.36)	-1.81 (5.74)	-0.32	18/46 (39.1%)	Group × Time	<i>F</i> (4, 402.9) = 2.660	.032
		Baseline	96	13.14 (9.98)						
	WLC	3 months	71	10.45 (9.23)	2.63 (8.58)	0.31	45/71 (63.4%)			
		6 months	72	10.51 (8.16)	2.37 (7.47)	0.32	46/72 (63.9%)			
Anxiety	Active	Baseline	111	12.06 (10.09)				Time	<i>F</i> (2, 404.6) = 1.111	.330
		3 months	83	10.52 (9.18)	1.18 (7.36)	0.16	44/83(53.0%)	Group	<i>F</i> (2, 256.0) = 0.159	.853
	AC	6 months	81	11.65 (10.08)	0.48 (8.70)	0.05	35/81 (43.2%)	Group × Time	<i>F</i> (4, 405.0) = 2.111	.079
		Baseline	54	11.08 (8.25)						
	WLC	3 months	43	12.07 (8.60)	-0.67 (6.13)	-0.11	19/43 (44.2%)			
		6 months	46	12.93 (9.28)	-1.82 (6.27)	-0.29	17/46 (37.0%)			
Burden total	Active	Baseline	96	35.07 (11.96)				Time	<i>F</i> (2, 392.9) = 0.316	.729
		3 months	71	32.90 (12.31)	2.30 (9.50)	0.24	37/71 (52.1%)	Group	<i>F</i> (2, 257.5) = 0.261	.770
	AC	6 months	72	31.22 (9.97)	3.22 (11.14)	0.29	42/72 (58.3%)	Group × Time	<i>F</i> (4, 393.2) = 1.711	.147
		Baseline	111	34.61 (13.13)						
	WLC	3 months	83	32.96 (11.50)	1.60 (8.67)	0.18	41/83 (49.4%)			
		6 months	81	34.07 (11.83)	1.12 (9.28)	0.12	35/81 (43.2%)			
Burden total	Active	Baseline	54	33.41 (11.61)				Time	<i>F</i> (2, 392.9) = 0.316	.729
		3 months	43	35.00 (12.15)	-0.91 (9.97)	-0.09	22/43 (51.2%)	Group	<i>F</i> (2, 257.5) = 0.261	.770
	AC	6 months	46	35.41 (12.93)	-1.43 (11.31)	-0.13	20/46 (43.5%)	Group × Time	<i>F</i> (4, 393.2) = 1.711	.147
		Baseline	96	37.34 (13.77)						
	WLC	3 months	69	35.26 (13.03)	2.29 (8.15)	0.28	47/69 (68.1%)			
		6 months	72	35.54 (13.63)	1.43 (9.27)	0.15	42/72 (58.3%)			
Burden total	Active	Baseline	111	35.78 (14.66)				Time	<i>F</i> (2, 392.9) = 0.316	.729
		3 months	83	36.28 (13.49)	0.69 (8.66)	0.08	46/83 (55.4%)	Group	<i>F</i> (2, 257.5) = 0.261	.770
	AC	6 months	80	35.91 (12.96)	1.22 (7.71)	0.16	43/80 (53.8%)	Group × Time	<i>F</i> (4, 393.2) = 1.711	.147
		Baseline	54	35.94 (15.99)						
	WLC	3 months	43	37.82 (15.80)	-1.23 (7.54)	-0.16	17/43 (39.5%)			
		6 months	45	37.48 (17.31)	-1.70 (7.11)	-0.24	19/45 (42.2%)			

Table 3. Continued

Measure	Group	Time	N ^a	Change from baseline		Effect size		Number improved from baseline ^b	Multilevel model effect	Effect test	
				Mean (SD)	Mean (SD)	Cohen's <i>d</i>	<i>F</i> (<i>df</i> ₁ , <i>df</i> ₂)			<i>p</i>	
BPSD reaction	Active	Baseline	96	13.84 (9.78)					Time	<i>F</i> (2, 400.7) = 0.570	.566
		3 months	70	10.36 (7.90)	3.47 (7.77)	0.45	45/68 (66.2%)	Group	<i>F</i> (2, 242.9) = 1.418	.244	
	AC	6 months	70	11.30 (8.26)	2.88 (8.50)	0.34	38/68 (55.9%)	Group × Time	<i>F</i> (4, 381.1) = 2.697	.031	
		Baseline	110	12.34 (11.89)							
	WLC	3 months	79	11.60 (9.01)	0.85 (7.96)	0.11	35/79 (44.3%)				
		6 months	78	12.28 (9.82)	0.22 (8.63)	0.03	34/78 (43.6%)				
Pearlin caregiver competence	Active	Baseline	53	13.47 (12.30)					Time	<i>F</i> (2, 406.2) = 7.790	<.001
		3 months	42	14.50 (10.33)	-1.74 (9.14)	-0.19	13/42 (31.0%)	Group	<i>F</i> (2, 253.4) = 1.806	.166	
	AC	6 months	43	15.00 (12.96)	-1.28 (11.15)	-0.11	16/43 (37.2%)	Group × Time	<i>F</i> (4, 406.8) = 7.129	<.001	
		Baseline	96	12.11 (2.12)							
	WLC	3 months	71	13.21 (1.46)	-1.39 (1.51)	-0.93	54/71 (76.1%)				
		6 months	72	13.07 (1.71)	-0.97 (1.88)	-0.52	38/72 (52.8%)				
Pearlin management of situation	Active	Baseline	111	12.44 (1.94)					Time	<i>F</i> (2, 406.2) = 1.217	.297
		3 months	83	12.49 (1.98)	-0.12 (1.73)	-0.07	30/83 (36.1%)	Group	<i>F</i> (2, 253.4) = 0.464	.629	
	AC	6 months	81	12.62 (2.15)	-0.27 (1.72)	-0.16	30/81 (37.0%)	Group × Time	<i>F</i> (4, 406.7) = 3.963	.004	
		Baseline	54	12.31 (2.14)							
	WLC	3 months	43	11.98 (2.27)	0.26 (1.88)	0.14	16/43 (37.2%)				
		6 months	46	12.52 (2.19)	-0.17 (2.01)	-0.09	19/46 (41.3%)				
Pearlin management of situation	Active	Baseline	96	11.27 (2.12)					Time	<i>F</i> (2, 406.2) = 1.217	.297
		3 months	71	12.03 (2.06)	-0.65 (1.66)	-0.39	39/71 (54.9%)	Group	<i>F</i> (2, 253.4) = 0.464	.629	
	AC	6 months	72	11.93 (2.21)	-0.54 (2.02)	-0.27	37/72 (51.4%)	Group × Time	<i>F</i> (4, 406.7) = 3.963	.004	
		Baseline	111	11.63 (2.00)							
	WLC	3 months	83	11.35 (2.39)	0.27 (2.10)	0.13	32/83 (38.6%)				
		6 months	81	11.78 (1.94)	-0.04 (1.65)	-0.02	28/81 (34.6%)				
WLC	Baseline	54	11.43 (1.93)								
	3 months	43	11.40 (1.56)	-0.26 (1.56)	-0.16	19/43 (44.2%)					
WLC	6 months	46	11.22 (1.59)	0.17 (1.50)	0.12	17/46 (37.0%)					

Note: BPSD = behavioral and psychological symptoms in dementia; SD = standard deviation; AC = attention control; WLC = waitlist control.

^aSome questionnaires with missing or skipped items had missing scores for one to two participants at some time points beyond missing data due to attrition. These additional missing scores were minimal.

^bNegative ranks that indicate improvements from baseline are shown for all measures except for the two Pearlin measures for which positive ranks indicate improvement from baseline.

effect sizes on improvements in caregiver well-being are somewhat, but not strikingly, larger than the mean average effect sizes reported in the meta-analyses. This may be because Tele-Savvy can be classed as a multicomponent psychoeducation program, and such programs appear to be somewhat more effective in improving caregiver well-being (Williams et al., 2019; Walter & Piquart, 2020). The study's large effect on the improvement of caregiver mastery stands in contrast to the findings of Leng et al. (2020) that internet-based caregiver programs had had no impact on measures of caregiver competence.

Several limitations should be noted. First, the internet access requirements excluded many without this technology. Internet coverage is not universal, which limits access for many (Abner et al., 2016; Davis et al., 2011; Morgan et al., 2005; National Advisory Committee on Rural Health and Human Services, 2008). Second, scheduled Zoom sessions with definite beginning and end points do not allow for the kind of rich informal exchanges among participants that typically occur in the times before and after in person programs like Savvy, exchanges that can foster social connectedness and reinforce the mastery development that is occurring. Third, forming study cohorts of 15 consented individuals with aligned schedules to enable synchronous participation meant juggling time availability of consented individuals across multiple time zones. This made scheduling very challenging and caused delays in cohort placement. Some caregivers ($n = 28$) were withdrawn from the study due to scheduling issues. Fourth, the study sample was not as diverse as we had hoped: Participation by Hispanic and Asian caregivers was limited. This reflects the reach of the network of the four collaborating Alzheimer's Disease Centers that drove the majority of recruitment efforts. Fifth, further study will be needed to establish the mediating effect of our focus on mastery development on outcomes of caregiver well-being. Finally, due to the COVID-19 pandemic, caregivers' experiences could not be measured out to 12 months; this will need to be done in the future.

A number of results point to future directions. Although there were no serious technological or logistical problems for those who could participate, future iterations of Tele-Savvy will need to address issues of access. Some technical issues linked to connectivity are likely to be resolved as internet networks evolve and strengthen their bandwidth and as browsers enhance their capacity to host platforms. Still, as the COVID-19 pandemic has taught us, there are many households—urban as well as rural—without internet connectivity, and there are likely many without even more basic forms of connectivity. It is still the case that 27% of those older than 65 do not use the internet (Pew Research Center, 2019) and 38% of those older than 70 do not use smartphones (Kakulla, 2020). Thus, one area of future study will be to identify ways to make a mobile program like Tele-Savvy available to this sizeable portion

of the older population without the receiver capabilities required by the program.

As noted, scheduling excluded 28 consented caregivers. This limitation suggests two possible future research directions. First, embed Tele-Savvy within a health care system or local/regional service agency. This would simplify scheduling (taking multiple time zones out of the picture) and it would enable a test of the program not only in terms of its impact on caregivers but on larger organizational metrics, including those associated with care recipient care and service utilization. Second, a fully asynchronous version of the program, one that would allow self-scheduling, could be developed. Such an adaptation will need to create substitutes for the important interactive group and coaching components of Tele-Savvy and incorporate means of monitoring use and responding to participant concerns and questions. Finally, there are other important facets of the caregiving experience that are not addressed by Tele-Savvy's focus on mastering the role of guiding care recipients' days. Caregivers function, for example, as navigators and surrogates in health care, social service, and legal systems; synchronous/asynchronous psychoeducation programs could be created to develop and enhance caregiving mastery in those domains.

Conclusions

This fully powered trial of Tele-Savvy demonstrated the program's positive effects on dementia family caregivers' emotional well-being and sense of mastery in the caregiving role. The trial confirmed the successful adaptation of the Savvy Caregiver to an online version. Further implementation enhancements could include local and contextual design and other delivery modalities (e.g., through phone and memory sticks) to enable a greater reach to diverse family caregivers.

Findings from meta-analyses and from our own study highlight the holistic and constantly evolving nature of the stresses caregivers face. Any program engages caregivers for a time and may provide benefit for a time (Jütten et al., 2018), but effects can almost certainly be expected to wane over time, and no single program can or will provide a "magic bullet." These findings therefore also underscore the importance of situating programs like these within broader systems of comprehensive dementia care; ideally, policy changes might emerge that support adequate reimbursement for comprehensive care and for the inclusion of caregiver mastery programs within their portfolios. From a research as well as practice perspective, it will be important to find and test ways to package sets of programs in individualized ways and over the course of caregiving.

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Conflict of Interest

None declared.

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