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Innovation Inspired by COVID: A Virtual Treatment Program for Patients With Mild Cognitive Impairment at Mayo Clinic

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Abstract

Limited access to mental health and behavioral interventions is a public health issue that predated and is further worsened by coronavirus disease 2019 (COVID-19) social distancing restrictions. The Healthy Action to Benefit Independence and Thinking (HABIT) program is a cognitive rehabilitation and wellness program for patients with a diagnosis of mild cognitive impairment and their partners that involves groups of up to 32 people (16 dyads) at a time. Thus, the public health recommendation to avoid groups at the start of the COVID-19 pandemic immediately impacted our ability to offer this treatment protocol. This brief report provides patient and partner satisfaction data as well as clinical outcomes with a virtual adaptation of the HABIT program developed because of the COVID-19 pandemic. At the time of their participation, patients who attended in-person sessions had an average age of 74.4 years and those who attended virtual sessions had an average age of 75.4 years (P=.60). Both groups had an average of 16.3 years of education (P=.95). Approximately half of the patients in both groups were male (30 of 57 [53%]), most were White (54 of 57 [95%]) and were accompanied to the program by a spouse (50 of 57 [88%]). Overall, patient and partner satisfaction with the HABIT program remained high, ranging from a mean score of 5.8 to 6.6 on a rating scale of 1 to 7 for patients and partners, and clinical outcomes remained consistent with our face-to-face formatting when compared with pre−COVID pandemic sessions. The most notable changes across both formats were improvements in patient anxiety (Cohen's d=0.25 face-to-face; d=0.39 virtual), partner anxiety (d=0.37 face-to-face; d=0.34 virtual), and partner depression (d=0.37 face-to-face; d=0.35 virtual). This preliminary program evaluation suggests that transitioning the HABIT program to virtual formatting provides high-quality care similar to our in-person care models. Ongoing program evaluation is planned as we continue using virtual treatment for safety. Even after COVID-19 pandemic public health restrictions are lifted, these findings will have continued relevance to ongoing demand for telehealth.

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Since 2008, Mayo Clinic has offered the Healthy Action to Benefit Independence and Thinking (HABIT) cognitive rehabilitation and wellness program for patients with a diagnosis of mild cognitive impairment (MCI) who have a partner. HABIT is a 50-hour, 10-day treatment program that involves 5 components offered in a group-based, in-person setting. The components include memory compensation training, cognitive training, yoga, patient and partner support groups, and wellness intervention.

The HABIT team has evaluated the efficacy of the program and found that (1) our patients with MCI are capable of learning to use a memory support system (MSS) despite their memory loss, but that (2) training with a cognitive rehabilitation specialist is required to do so and (3) use of that MSS improves memory activities of daily living (Cohen's d=0.88) and sense of self-efficacy (d=0.47).[1-3] We have also found that the wellness intervention portion of the program is most impactful on patient quality of life (effect

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size [ES], 0.34) and mood (ES, 0.53) over 12 months when compared with the other interventions, and the mindful movement portion of the HABIT program also has the greatest impact on memory-related activities of daily living at 12 months (ES, 0.43).[4]

We have also reported the benefit of components of the HABIT program to partners. Both the MSS (d=1.45) and cognitive training (d=0.80) help partner mood in comparison to no treatment at all, while cognitive training (d=0.85) helps partner anxiety in comparison to no treatment at all.[5] When comparing the 5 components of the HABIT program to each other, the wellness intervention (ES=0.55) and yoga (ES=0.44) components have the most impact on partner anxiety, yoga has the strongest benefit on partner physical mobility at 12 months (ES=0.39), and there are trends for yoga to have the strongest benefit on partner burden (ES=0.32) and mood (ES=0.36).[6,7]

Mild cognitive impairment is often a progressive disorder with 7% of patients with MCI experiencing progression to a diagnosis of Alzheimer dementia and 2% to a diagnosis of vascular dementia each year.[8] In addition, prior research has found the HABIT program to be most successful when delivered earlier in the progression of cognitive loss.[9] Therefore, implementation of cognitive rehabilitation and health-behavior changes to promote optimal daily functioning and maximal brain health in a timely manner is crucial. With onset of the coronavirus disease 2019 (COVID-19) pandemic, the HABIT team was challenged to innovate quickly in order to keep our vulnerable older adult population safe while not delaying intervention. The goal of this brief report is to offer a program evaluation comparison of our pre-COVID face-to-face treatment model with our COVID-inspired group-based virtual model. It was our hypothesis that patient satisfaction and program efficacy would be consistent with that found in our face-to-face treatment model.

PATIENTS AND METHODS

Program Description

Further description of the HABIT program can be found online.[10] In brief, the face-to-face HABIT program involves 50 hours of treatment over the course of 10 days. The components include cognitive rehabilitation with the MSS, computerized cognitive training using the BrainHQ commercial training program (Posit Science), yoga with a certified yoga instructor, group-based wellness classes to provide information about healthy behaviors and health-behavior change coaching, and separate patient and partner supportive group therapy. Dyads participate in each component for 45 to 60 minutes for each day of the program. Patients with MCI attend the HABIT program with a care partner (most often a family member). The primary differences between the face-to-face and virtual formats are (1) yoga is presented as a 30-minute movement class in the virtual format rather than 45 to 60 minutes in the face-to-face format with more emphasis on seated movements in the virtual format given that the instructor is not in the same room with the patients and (2) computerized cognitive training was assigned as homework in the virtual format with compliance monitored in the cognitive rehabilitation session rather than a proctored computer laboratory. Individual memory compensation training with the MSS, wellness, and support groups were unchanged aside from being virtual rather than in person.

Virtual Platform

Dyads attended the virtual session via live, synchronous, 2-way interaction between the HABIT dyads and HABIT staff. Visits were completed using Mayo Clinic's Video Anyplace Telemedicine program, which utilizes Health Insurance Portability and Accountability Act (HIPAA)—compliant Zoom technology (Zoom Video Communications, Inc) with support from Mayo Clinic's Connected Care Video Support Team.

Patient Population

From August 1, 2020, to December 31, 2020, we saw 29 dyads for the virtual format of the HABIT program across 3 sessions. These dyads were compared with 28 dyads seen in our 3 face-to-face programs immediately before the COVID-19 pandemic, from October 1, 2019, to January 30, 2020.

Outcome Measures

We routinely collect clinically relevant outcome measures pre-HABIT and at treatment end as well as patient and partner program satisfaction data. These same measurements were given to both the in-person and virtual HABIT program dyads.

Mini-Mental State Examination. All patients have a comprehensive neuropsychological evaluation in the year prior to their participation in the HABIT program, so comprehensive cognitive data are not collected. However, all patients complete the Mini-Mental State Examination[11] at baseline for a global estimate. Scores range from 0 to 30 with higher scores indicating better global cognitive functioning.

Memory Self-efficacy. The memory self-efficacy scale[12] is a self-reported measure of the patient's confidence in managing memory-related activities, tasks, and emotional distress using a 10-point Likert scale. Total scores range from 9 to 90 with higher scores reflecting greater memory self-efficacy. The patient completes the memory self-efficacy scale at baseline and at program completion.

Center for Epidemiologic Studies Depression Scale. The Center for Epidemiologic Studies Depression Scale[13] is a self-reported measure of depressive symptoms. Scores range from 0 to 60 with higher scores reflecting greater symptoms of depression. Both the patient and partner complete the Center for Epidemiologic Studies Depression Scale at baseline and at program completion.

Anxiety Inventory Form. The Anxiety Inventory Form is a 10-item rating scale modified from the State-Trait Anxiety Inventory by the Resources for Enhancing Alzheimer's Caregiver Health (REACH) project.[14] Scores range from 10 to 40 with higher scores indicating more symptoms of anxiety. The patient and the partner each complete this measure at baseline and at program completion.

Everyday Cognition. The partner completes the memory and executive functioning modules of the everyday cognition (ECog) questionnaire[15] as an informant rating of the patient's daily functioning in these domains. The memory domain total score ranges from 8 to 32, and the executive functioning total score ranges from 15 50 60 with higher scores in each indicating more impairment. The partner completes this measurement at baseline and at program completion.

Patient and Partner Satisfaction. At program completion, patients and partners rate their satisfaction with several features of the HABIT program using a Likert scale from 1 (strongly disagree) to 7 (strongly agree) (Supplemental Material, available online at http://mcpiqojournal.org). For this analysis, the average satisfaction score across all features was evaluated. Patients and partners also rate the likelihood that they would recommend the HABIT program to a friend or family member from 1 (strongly disagree) to 5 (strongly agree). Our virtual participants were also specifically asked whether they would recommend the *virtual* format in addition to whether they would generally recommend the program. Virtual participants were also asked about prior familiarity with Zoom and using Mayo Clinic Patient Online Services, which is required to access the HIPAA-compliant Zoom technology, on a Likert scale (from 1 [not at all familiar] to 5 [very familiar]).

Planned Analyses

Demographic and baseline characteristic comparison included *t* tests for continuous variables and χ^2 tests for categorical variables. Satisfaction and likelihood of recommending the program were evaluated using the Mann-Whitney *U* nonparametric test given the substantial positive skew of the distributions for these ratings. Clinical outcomes were evaluated by first creating change scores from baseline to program completion raw scores, and then *t* test evaluation was conducted for those change values between groups. A value of $P=.05$ was considered statistically significant. Analyses were conducted using SPSS Statistics for Windows, version 25 (IBM Corp).

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RESULTS

Demographic and Baseline Characteristics

There were no significant demographic differences between the groups. At the time of their participation, patients who attended in-person sessions had an average age of 74.4 years and those who attended virtual sessions had an average age of 75.4 years (P=.60). Both groups had an average of 16.3 years of education (P=.95). Approximately half of the patients in both groups were male (30 of 57 [53%]), most were White (54 of 57 [95%]) and were accompanied to the program by a spouse (50 of 57 [88%]).

One significant difference between the groups was the number of years since their diagnosis of MCI. Those who participated in our in-person sessions had the diagnosis longer than those who participated in our virtual sessions (2.0 years vs 0.7 years; P=.009). Despite this difference, there was no significance in Mini-Mental State Examination score at baseline between the groups (24.8 in-person vs 25.9 virtual; P=.19) or baseline ECog memory (18.2 in-person vs 19.8 virtual; P=.26) or ECog executive (23.9 in-person vs 27.1 virtual; P=.19) impairment ratings. There were also no significant baseline differences in any of the other patient or partner self-reported or informant-reported measures (all $P \geq .48$; Table 1).

TABLE 1. Baseline Characteristics of the Study Groups[a,b]

Measurement	In-person HABIT (n=28)	Virtual HABIT (n=29)	*P* value
Pt MMSE	24.8±3.6	25.9±1.9	.19
ECog-mem	18.2±5.0	19.8±5.4	.26
ECog-exe	23.9±8.0	27.1±9.9	.19
Pt AIF	16.5±4.8	17.4±5.3	.53
Pt Mem-SE	74.8±13.4	71.5±21.4	.48
Pt CES-D	11.1±6.6	11.3±9.2	.94
Ptnr CES-D	10.1±9.4	9.8±8.6	.91
Ptnr AIF	17.0±4.3	17.4±5.9	.75
Ptnr burden	10.4±7.8	10.8±5.7	.83

[a]AIF, Anxiety Inventory Form; CES-D, Center for Epidemiologic Studies Depression Scale; ECog exe, everyday cognition executive functioning; ECog-mem, everyday cognition memory; HABIT, Healthy Action to Benefit Independence and Thinking; Mem-SE, memory self-efficacy; MMSE, Mini-Mental State Examination; Pt, patient; Ptnr, partner.
[b]Data are presented as mean ± SD.

Satisfaction and Likelihood of Recommending the HABIT Program

Overall satisfaction was high for patients in the in-person (mean ± SD, 6.5±0.59; median, 6.6) and virtual (mean ± SD, 5.8±0.71; median, 6.0) formats but statistically higher in the in-person format (P=.001). In partners, overall satisfaction was similarly high in both formats but with a trend toward higher satisfaction in the in-person (mean ± SD, 6.4±0.56; median, 6.3) vs virtual (mean ± SD, 6.0±0.80; median, 6.1) format (P=.07). Finally, on a scale of 1 to 5, with 1 indicating they definitely would not recommend the HABIT program and 5 indicating they definitely would recommend the program, there were no significant differences in the likelihood of patients and partners in either group recommending the HABIT program to a friend or family member (virtual patient, 4.6±0.74 and partner, 4.5±0.70; in-person patient, 4.7±0.42 [P=.65] and partner, 4.8±.32 [P=.51]).

Again on a scale of 1 to 5, patients in the virtual group rated themselves as moderately familiar (mean, 3.1) with Zoom technology and less familiar with using the Mayo Clinic Patient Online Services, which is required to access the HIPAA-compliant Zoom technology (mean, 2.9). Partners in the virtual group rated themselves as slightly more familiar with each (Zoom mean, 4.0; online services mean, 3.5).

Clinical Outcomes

Table 2 shows the change on our clinical outcome measures after our 10-day treatment program. There was no significant difference on any measure between groups (all $P \geq .20$). In general, both groups remained stable or had slight improvements on these measures by the end of treatment. The most notable changes across both formats were improvements in patient anxiety (Cohen's d=0.25 in-person; d=0.39 virtual), partner anxiety (d=0.37 in-person; d=0.34 virtual), and partner depression (d=0.37 in person; d=0.35 virtual). Although not statistically significant, the effect size for change in patient depression was moderate in the in-person format (d=0.56) compared with a small effect size in the virtual format (d=0.12).

TABLE 2. Change in Clinical Outcome Measurements at Treatment End[a,b,c]

Measurement	In-person HABIT (n=28)	Virtual HABIT (n=29)	*P* value
ECog-mem	−1.6±4.1	−0.86±5.5	.55
ECog-exe	−0.29±5.6	0.14±7.0	.80
Pt AIF	−1.2±3.7	−2.2±4.6	.37
Pt Mem-SE	0.71±10.0	3.2±14.4	.46
Pt CES-D	−3.3±5.7	−0.89±7.0	.20
Ptnr CES-D	−2.8±9.8	−3.1±6.1	.89
Ptnr AIF	−1.7±5.1	−2.3±3.9	.64
Ptnr burden	−0.29±6.0	−0.46±3.3	.89

[a]AIF, Anxiety Inventory Form; CES-D, Center for Epidemiologic Studies Depression Scale; ECog exe, everyday cognition executive functioning; ECog-mem, everyday cognition memory; HABIT, Healthy Action to Benefit Independence and Thinking; Mem-SE, memory self-efficacy; Pt, patient; Ptnr, partner.

[b]Data are presented as a mean change score ± SD.

[c]On all measures other than the Mem-SE, a negative score indicates improvement or fewer symptoms on that measure at treatment end. For Mem-SE, a positive score indicates improvement or higher self-efficacy at treatment end.

DISCUSSION

The COVID-19 pandemic necessitated restrictions on group gatherings for public health, which impacted Mayo Clinic's ability to provide our long-running nonpharmacological group treatment protocol for patients diagnosed as having MCI. As MCI is often a progressive disorder and our intervention has been found to be most effective early in the degree of cognitive loss, timely treatment to support functioning and quality of life is necessary. Therefore, we rapidly adapted our treatment model for virtual care, and this brief report documents that patient and partner satisfaction with their treatment remained high and clinical outcomes remained consistent with that seen in our prepandemic in-person model of care.

However, there are possible signs of differences in the treatment formats that bear ongoing monitoring. Although patient satisfaction was high in both models, it was higher in the in-person format than in the virtual program. It would be helpful to continue to evaluate this difference as our experience with patients grows and to determine if there are factors that may predict which patients are most likely to be maximally satisfied with their care under which model. For example, those in the in-person format had been diagnosed with MCI longer than those in the virtual format. When satisfaction is evaluated by duration of MCI, patients who have had the diagnoses longer than 1 year had higher satisfaction with the HABIT program (mean ± SD, 6.3±0.59) regardless of format than those living with the diagnosis for less than 1 year (mean ± SD, 5.9±0.78; $P<.001$). Perhaps higher satisfaction in the in-person format is related to having lived with MCI longer and not related to the program format. Partners showed a similar trend but it was not statistically significant (longer than 1 year 6.3±.59; less than 1 year 5.89±.92; $P=.07$)

In addition, although not statistically significant in this small sample, the effect size for change in patient depression was moderate in the in-person format but small in the virtual format. It will be important to continue to monitor this trend with larger samples to ensure that there is not a clinically significant difference related to format that this analysis is underpowered to detect.

Another limitation of this study is that this is a program innovation evaluation, not a randomized clinical trial; there was no option to receive the in-person format during the pandemic. As such, those who engaged in the virtual format of the program are those with the technological resources (computer/laptop with web camera and microphone, strong internet service) and willingness to try this version of the program. For those in rural settings who may not have access to reliable internet or resources for the technology hardware required, access to this version of the program may not be possible. However, the HABIT program would typically require those living outside the services of the Mayo Clinic in Phoenix, Arizona; Mayo Clinic Health System in La Crosse, Wisconsin; or Mayo Clinic in Jacksonville, Florida area to have the resources to physically travel to one of our campuses and remain in the area for 2 weeks for the program. Thus, overall, we anticipate that this virtual format increases access to this treatment program. Most participants in both formats of the HABIT program are well-educated, White couples. Satisfaction results may not generalize to other socioeconomic and racial groups and may vary with different types of relationships (such as adult child/

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parent). Finally, we do not yet have longer-term outcomes for this group of patients and partners, so we cannot comment whether there are longer-term differences in outcomes in dyads who participate virtually as compared with in person.

Overall, although continued program evaluation is recommended, it appears that our transition of the HABIT program at Mayo Clinic for patients with MCI to a virtual format has been successful in terms of maintaining high patient and partner satisfaction with the program as well as clinical outcomes at the end of treatment that appear consistent with our face-to-face format delivered pre-COVID. This study is also one of the first examples of its type attempting to answer the much larger need to examine patient satisfaction and effectiveness of mental health and behavioral interventions when delivered virtually. Virtual formatting is a necessity during this pandemic and likely to be a "new normal" postpandemic, the efficacy and tolerability of which must be understood. As vaccination rates increase, COVID-19 infections decrease, and the Centers for Disease Control and Prevention recommends easing of safety precautions, the HABIT teams across Mayo Clinic are encouraged by the results of this program evaluation project. We have many patients who eagerly await our return to in-person care, but we have also seen increased enthusiasm for the lower cost of virtual care for our out-of-town patients (since they are no longer required to travel and pay for lodging). We aim to continue to develop our virtual program model as a sustainable and ongoing option for patients who prefer this option or patients who may live at a distance from Mayo Clinic without the resources to come for 2 weeks for in-person care or who may simply prefer the convienence of receiving their care at home.

SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at http://mcpiqojournal.org. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

Abbreviations and Acronyms: **COVID-19**, coronavirus disease 2019; **ECog**, everyday cognition; **ES**, effect size; **HABIT**, Healthy Action to Benefit Independence and Thinking; **HIPAA**, Health Insurance Portability and Accountability Act; **MCI**, mild cognitive impairment; **MSS**, memory support system

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