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Original Research Article

Evaluation of a Novel Technology-Based Program Designed to Assess and Train Everyday Skills in Older Adults

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Abstract

Background and Objectives: Performance of everyday activities is often challenging for older adults. We evaluated a novel computer-based functional skills assessment and training (CFSAT) program, which includes simulations of everyday tasks (e.g., money and medication management).

Research Design and Methods: The sample included noncognitively impaired (NC) older adults (n = 51) and cognitively impaired (CI) older adults (n = 43), who ranged in age from 60 to 86 years (M = 73.12; SD = 6.06), were primarily female (90%), and ethnically diverse (23% Hispanic, 51% African American). Participants (stratified by cognitive status) were randomized to 1 of the 2 conditions training alone (CFSAT) or CFSAT with computerized cognitive training and trained up to 24 training sessions. Task performance, using measures of completion time and efficiency (accuracy/completion time), was evaluated at baseline, the final training session, and immediately posttraining with an alternate form of the CFSAT assessment.

Results: Both NC and CI participants demonstrated significant performance improvements across all tasks following training (all $ps < .001$). The CI participants demonstrated reduced training gains compared to the NC participants (all $ps < .001$). Training gains did not vary as a function of training conditions.

Discussion and Implications: The findings suggest that CFSAT is an efficacious program for assessing and training everyday task performance. CFSAT can ultimately be used as an intervention strategy to enhance functional independence for aging adults with and without cognitive impairments.

Translational Significance: The findings from this study demonstrate how functional skills training can be used to foster the ability of aging adults to adapt to the changing demands of everyday living tasks. Adaption and new learning is important to independent living given the continual influx of technology into everyday environments.

Keywords: Cognition, Independence, Information technology, Training

Models of successful aging posit that functional abilities and engagement in life activities are important to aging successfully and living independently (Pruchno et al., 2010; Rowe & Kahn, 1998). Everyday activities range in complexity and include activities such as managing money and medications, shopping, transportation, and activities related to social engagement. Performance of these activities requires the development of functional skills that rely to some extent on cognitive abilities such as working memory, executive function, and processing speed. For example, working memory and reasoning are predictors of ability to search the internet for information (Czaja et al., 2010) and manage medications (Insel et al., 2006; Stilley et al., 2010); and processing speed and attention are important to driving performance (Ball et al., 1998; Edwards et al., 2008). Because of age-related cognitive changes, everyday activities can become challenging for older adults. This is especially true for older adults with a cognitive impairment (CI). Several investigators (Burton et al., 2009; Farias et al., 2006; Gomar et al., 2011) have shown, for example, that individuals with mild cognitive impairment (MCI) have difficulty performing a range of everyday activities.

Emerging models of functional independence such as the adaptation for growth models (Wu et al., 2016) posit that adaptation to change and learning new skills is also important to functional independence, as environments are dynamic. To successfully engage in life activities, people need to have flexibility and adapt to changing contexts and everyday demands (Nguyen et al., 2020). In today's highly digitized world, the performance of everyday tasks frequently requires new learning and adapting to change. Technology is pervasive and technology applications change continually, requiring learning of new skills on the part of users or modifying previously learned performance patterns (Charness & Boot, 2009). This continual demand for new learning can be problematic for aging adults given age-related cognitive changes in abilities important to learning, such as working memory and other executive functions.

Together, models of successful aging and adaptation for growth models stress the importance of providing aging adults with opportunities for learning the changing demands associated with everyday tasks to facilitate adaptation to changing environmental demands and enhance independent living. Learning new skills can increase the cognitive abilities used by that skill (Chan et al., 2016; Park et al., 2014). For example, Park et al. (2014) found that older adults who learned new skills such as quilting or photography also demonstrated increased episodic memory abilities. Leanos et al. (2020) found that simultaneously learning multiple novel skills was feasible for older adults and also resulted in improvements in cognitive abilities. Evidence also suggests that engagement in cognitive activities may protect against cognitive decline (Edwards et al., 2017; Fratiglioni et al., 2004) and may lead to increases in learning self-efficacy and instill confidence in older adults that they can take on new learning challenges (Nguyen et al., 2020).

To date, interventions targeting improvements in everyday skills have largely centered on cognitive training (primarily computer-based) with the idea that improvements in cognition will broadly transfer to improvements in performance of everyday activities. Meta-analyses have shown that although training on cognitive abilities results in improvements on the abilities trained and related cognitive tests, there is limited evidence to suggest that training on cognitive abilities transfers to everyday task performance gains (Simons et al., 2016). One exception is the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) intervention, which provided training on memory, reasoning, and speed of processing. Cumulative findings from the trial demonstrate that the ACTIVE intervention resulted in transfer effects beyond improvements in cognitive abilities, including some improvements on driving performance (Ball et al., 2010), reduced declines in quality of life and the likelihood of developing depression (Wolinsky et al., 2006; Wolinsky, Mahncke, Weg et al., 2009), changes in medical expenditures (Wolinsky, Mahncke, Kosinski et al., 2009), and self-reported improvements in instrumental activities of daily living (Rebok et al., 2014). Overall, however, despite substantial enthusiasm and investments in cognitive training programs, findings to date suggest that these programs are limited with respect to fostering improvements on everyday task performance. Furthermore, to the best of our knowledge, research examining the benefits of cognitive training (CT) or functional skills training on the acquisition of novel real-world skills such as technology-based activities is limited, especially for aging adults with a cognitive impairment.

This study evaluated the feasibility and preliminary efficacy of a computer-based functional skills assessment and training (CFSAT) program, which includes ecologically valid simulations of everyday technology-based tasks important to everyday living. The program was evaluated on a sample of non-cognitively impaired older adults (NC) and cognitively impaired (CI) older adults, randomized to the CFSAT condition or a CFSAT with cognitive training condition (CFSAT/CT). We included the CFSAT/CT condition to examine if CT provided a booster to skills training as CT can result in an improvement in cognitive abilities, such as processing speed important to everyday activities. We hypothesized that the CFSAT would result in task performance improvements for both the impaired and nonimpaired older adults and generalize to an alternate form of the tasks. We also hypothesized that the CFSAT/CT would result in greater training gains. In addition, based on recent findings suggesting that learning new skills can result in improvement in cognition, we examined whether both training conditions resulted in improvements in cognitive abilities from baseline.

Design and Methods

Study Design

The trial was conducted at three community centers in South Florida: the City of Coral Gables Adult Activity Center, Village of Key Biscayne Community Centers, and the Charles Hadley Park Community Senior Center. Following screening, for basic eligibility and a baseline assessment, participants were randomized into the CFSAT or CFSAT/CT conditions. Randomization was stratified by cognitive status (NC vs. CI) and occurred within each site. The Institutional Review Board at the University of Miami Miller School of Medicine approved the study protocol, and all participants signed an informed consent form. Participants who were unable to comprehend the written consent form were not enrolled.

Participants

The sample consisted of English-speaking adults aged 60 or older living independently, who had at least 20/60 vision with or without correction, could read a computer screen, and were able to use a computer keyboard or mouse (e.g., did not have a severe motor impairment). Cognitive status was assessed using the Montreal Cognitive Assessment (MOCA, Nasreddine et al., 2005). Participants were also asked if they were experiencing memory problems. For the NC participants the MOCA cutoff was ≥26 (adjusted for education to a cutoff of 24 for participants with low education; Sink et al., 2015) and no history of memory impairments or reports of bothersome memory complaints (e.g., complaints other than "I sometimes forget where I put my keys"). Those in the CI condition had a MOCA ≥16 and ≤24–26 and reported a subjective history of frequent memory complaints. Participants were compensated $30.00 per assessment and $15.00 per training session. Recruitment strategies included advertisement in the centers' newsletters, posting flyers, presentations at the centers, and word of mouth.

Participant Flow

One hundred and fifty-four individuals were screened for inclusion (Figure 1). Of these, 20 were excluded due to ineligibility and 13 withdrew from participation prior to completion of the baseline assessment. A total of 121 participants were enrolled in the trial across the centers and 21 dropped before training completion (7 CFSAT participants [10%] and 14 CFSAT/CT participants [23%]). Because of coronavirus disease 2019, an additional six (three in each condition) were unable to complete training. Thus, we present complete data for 94 participants.

The sample was primarily female (90%), ranged in age from 60 to 86 years (M = 73.12; SD = 6.06), and was ethnically diverse (23% Hispanic, 51% African American, 4% Asian; Table 1). There were no differences in baseline characteristics among participants according to treatment condition. The CI participants had lower levels of educational attainment, $t(89) = 5.03, p < .001$.

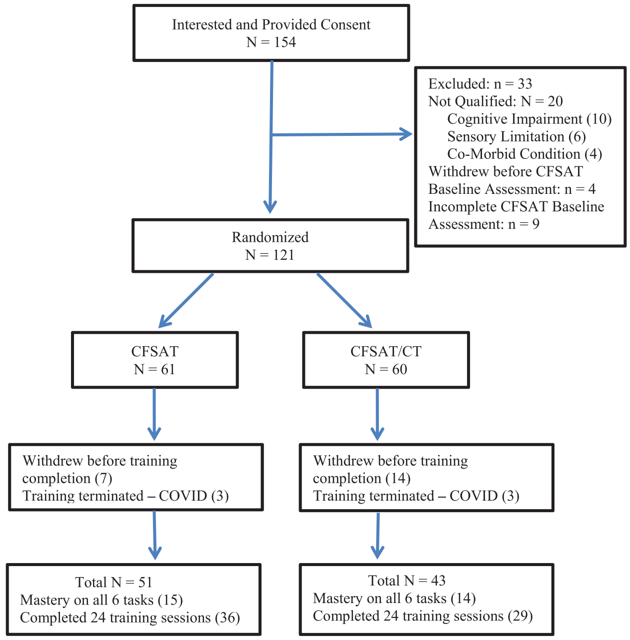

Figure 1. CONSORT diagram of participant flow. CFSAT = computer-based functional skills assessment and training; CFSAT/CT = computer-based functional skills assessment and training with cognitive trainin; COVID = coronavirus disease.

Procedure

CFSAT program

The tasks included in the CFSAT program were using a ticket kiosk, an ATM banking, telephone menu prescription refill, medication management (comprehending instructions on pills bottles and organizing medication), internet banking, using a pharmacy website (UGreens) for online shopping, and prescription refill (Figure 2). The tasks were chosen given their importance to independent living and technology has changed the manner in which they are performed. The tasks are presented in a multimedia format that includes graphic representations, text, and voice for the telephone refill task and consist of multiple subtasks with sequential demands. For example, for the telephone refill task, participants have to call the pharmacy (using a telephone keypad on the screen), refill different prescriptions (pill bottles appeared on the screen), choose a delivery preference, request a pick-up time and date, etc. "PIN numbers" and fictitious accounts were provided. Real-time data were collected on completion time, and an efficiency measure (total correct/time). Time was measured while the participant was actively engaging in a task. The CFSAT program was delivered on a touch-screen or mouse format in a PC environment.

Table 1. Sample Demographic Information

Variable	Noncognitively impaired (*N* = 53)	Cognitively impaired (*N* = 41)	CFSAT (*N* = 51)	CFSAT/CT (*N* = 43)
Age (*M*, *SD*)	73.15 (5.79)	73.07 (6.50)	73.12 (6.38)	73.12 (5.87)
Gender (*N*, %)				
Male	7 (13)	2(5)	4 (8)	5 (12)
Female	46 (87)	39 (95)	47 (92)	38 (88)
Years of education (*M*, *SD*)	15.84 (2.50)	13.29 (2.32)	14.57 (2.65)	14.83 (2.82)
Ethnicity (*N*, %)				
Hispanic	15 (29)	6 (15)	11(22)	10 (23)
Non-Hispanic white	17 (33)	4 (10)	9 (18)	12 (28)
Non-Hispanic black	18 (35)	30 (73)	29 (57)	19 (44)
Asian	3 (6)	1 (2)	2 (4)	2 (5)
MOCA (*M*, *SD*)	27.45 (1.77)	20.07 (2.77)	24.08 (4.53)	24.42 (4.09)
BACS composite (*M*, *SD*)	0.40 (0.92)	−0.69 (0.70)	0.10 (1.15)	−0.11 (1.06)

Note: BACS = Brief Assessment of Cognition in Schizophrenia; CFSAT = computer-based functional skills assessment and training; CFSAT/CT = computer-based functional skills assessment and training with cognitive training; MOCA = Montreal Cognitive Assessment.

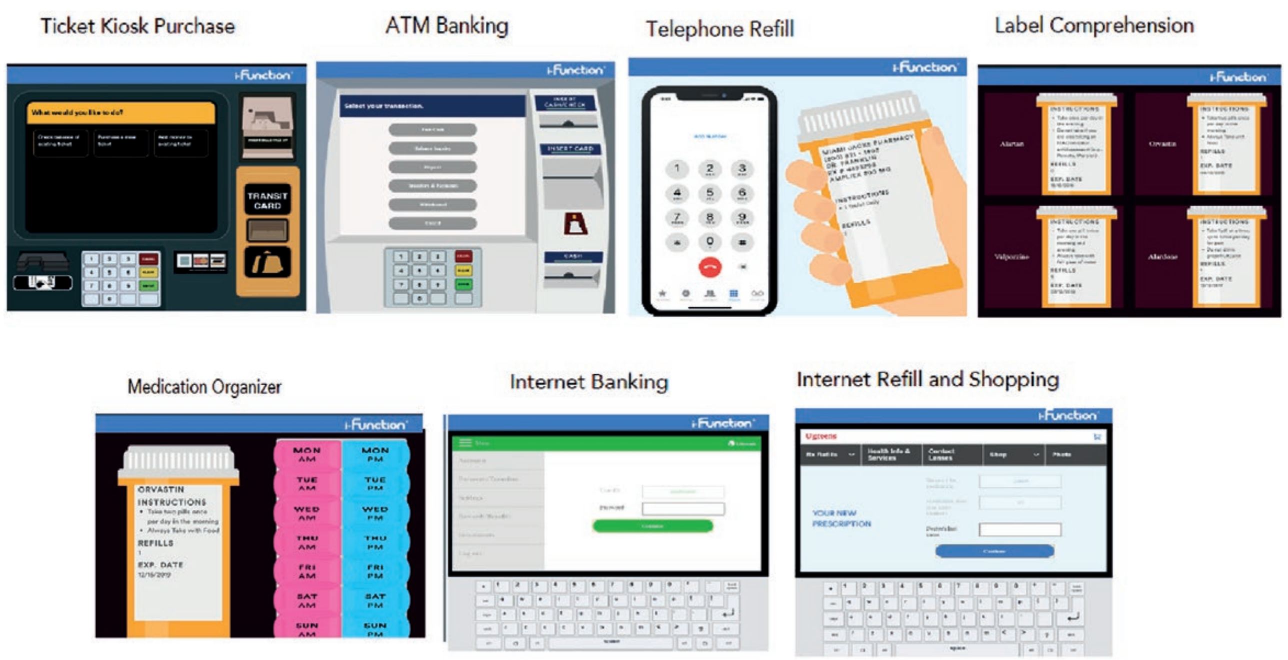

Figure 2. Screenshots of the task simulations. *Note:* Label comprehension and medication organization represent the medication management task; internet refill and shopping is the UGreens task.

For the CFSAT assessment component, the program was launched, and the participants proceeded through the tasks. If they made more than four errors on a subtask (e.g., repeatedly selected the wrong account in the ATM task), the program skipped ahead to the next subtask. Error feedback was delivered by repetition of the original instructions in a pop-up window. Our prior work (Czaja et al., 2017) has shown that it is feasible to use the CFSAT assessment battery with NC older adults and older adults with MCI.

The training component of CFSAT is based on an adaptive training protocol. Immediate feedback and instruction that increases in corrective information is provided following errors, followed by repetition of the previously failed item. For example, if the participant entered the wrong pin in the ATM task, they would receive the following feedback: "Your PIN is 1234, Please enter your PIN." If they repeated the error, feedback was "Your PIN is 1234, Please use the keypad to enter your PIN," and the feedback for the third error was "Your PIN is 1234. Enter 1, followed by 2, followed by 3, followed by 4." If they made a fourth error, the four keys lit up in sequence and the participant is instructed to touch them as they lit up. After four errors, the program proceeded to the next subtask. When the participant returned to training, the "failed" subtask was retrained. Successful mastery of a task was defined as performing all of the subtasks in a task twice consecutively without errors.

Protocol

The same protocol was followed at all three sites. Interested participants were screened for cognitive status with the MOCA and a short questionnaire that included items related to sociodemographic information and memory complaints. Participants who were eligible and consented were provided with an overview of the protocol, a basic review of computer operations (Czaja et al., 2018), and completed a baseline cognitive assessment using the computer tablet version (BAC App; Atkins et al., 2017) of the Brief Assessment of Cognition in Schizophrenia (BACS; Keefe et al., 2004). The subtests included on the BACS app are Verbal Learning and Memory, Digit Sequencing, Token Motor Task, Symbol Coding, Verbal Fluency Examinations, and Tower of London. For analysis purposes, a composite score was created by identifying the first principal component with an unrotated principal components analysis, entering the raw scores on six primary measures from the BAC for all participants at baseline, and then saving the principal component as the composite. Previous research demonstrated a unidimensional structure of the BAC measures in large samples of both patient populations and healthy people with the paper-and-pencil and tablet versions (Atkins et al., 2017; Hochberger et al., 2016).

Participants then performed the assessment component of the CFSAT program. Participants completed the tasks at their own pace in the following order: ticket kiosk, ATM, medication management, telephone refill, internet banking, and UGreens website. Participants were then randomized into training condition and scheduled to begin the training, which occurred in small groups (typically 4–8 participants) at the senior centers. Participants used individual computers and a facilitator was present.

Those in the CFSAT condition trained for 60 min per session and were instructed to try and train on two tasks and proceed through each task twice per training session, before moving to the next task, unless they had achieved mastery of the task. They proceeded through the tasks in the same order as the baseline assessment. Task training completion was tracked so at the next session the participant would begin with the next uncompleted task in sequence. As they progressed through training, participants trained only on tasks not previously mastered.

Those in the CFSAT/CT condition trained for 30 min on the Brain HQ Double Decision task before CFSAT. We chose the Double Decision task as it is a processing speed training task and processing speed training resulted in large training effects in the ACTIVE trial (Ball et al., 2002). Thus, participants in this condition trained only 50% of the time on the CFSAT tasks.

Training dosage was set at a maximum of 24 training sessions or mastery of all six tasks. The recommended training protocol was two 60 min sessions per week for a period of 12 weeks. Participants who missed an entire week of training could make up that week. If they missed a session during a week, they could not make up the session as training was restricted to certain days at the centers.

The majority of participants (94%) graduated or completed 24 sessions of training in 20 or fewer weeks, with 90% graduating or completing training in 16 or fewer weeks, and 71% completing training in 12 weeks. It was difficult for some participants to complete training in 12 weeks due to logistic challenges related to coming to the centers (e.g., transportation). Some participants (n = 6) took longer than 20 weeks to complete the training due to extended illness, vacation, or family-related travel.

The posttraining assessment was administered after each task had been mastered or completed at least twice and then immediately posttraining using an alternative form of the assessment component for that task. Following training completion, participants also completed an alternative form of the BAC.

Analyses

Task performance measures included task completion time and efficiency (total correct/task completion time) for each task, which were summed across the subtasks. Task completion time is an important performance indicator for many activities; for example, people rarely have unlimited time to use an ATM or ticket kiosk. The efficiency measure corrects for the time it took someone to obtain a correct score. For example, an individual could obtain a score of 100% correct in 2 min, whereas another individual could obtain the same score in 10 min.

Task performance differences were analyzed using a series of a mixed measures 2 (condition) × 2 (cognitive status) × 3 (assessment) repeated-measures analysis of variance (ANOVA) with condition and cognitive status being the between-subjects factors and assessment time (the first assessment, the final training session, and the alternative forms posttraining assessment) as the repeated measure. These analyses were computed in the SPSS 26 GLM Module. For each analysis, we entered subject as a random intercept into the model. As we were computing analyses for 12 different ANOVAs (6 simulations × 2 outcome variables), to correct for multiple comparisons we adopted a Bonferroni correction, which designated a p value of .004 as a significant result.

As we anticipated that there would be baseline differences between the CI and nonimpaired groups, we also examined treatment-related improvements with percentage change scores for each of the tasks. We only performed this analysis with time to completion data, using paired t tests within cognitive status groups and

Table 2. Task Completion Time for All Six Tasks at Baseline, Final Training Session, and Alternate Forms Assessment

	CFSAT						CFSAT/CT					
	Baseline		Final training		Post-test assessment		Baseline		Final training		Post-test assessment	
Task	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Ticket kiosk time (s)												
Normal	744.32	281.64	291.14	83.00	327.36	107.41	788.48	367.26	310.20	144.80	374.36	181.39
Impaired	1298.96	781.37	526.30	356.20	555.91	394.52	1018.22	469.66	366.61	167.13	346.56	89.34
ATM banking time (s)												
Normal	896.29	344.23	472.14	134.55	577.71	164.10	912.60	451.92	483.20	196.82	603.64	295.46
Impaired	1734.74	932.11	746.22	491.49	979.83	710.16	1326.61	654.55	692.11	414.17	734.11	271.18
Telephone refill time (s)												
Normal	577.43	184.06	290.89	78.56	310.18	99.30	599.56	222.18	310.76	110.78	306.00	76.00
Impaired	1017.87	617.27	392.13	224.85	392.13	224.85	701.33	292.08	330.89	127.60	330.89	127.60
Normal	833.57	311.26	383.86	111.12	398.86	115.46	819.80	323.76	405.56	181.16	417.72	167.33
Impaired	1418.65	766.63	713.22	497.80	608.09	374.58	1150.56	509.57	491.61	188.44	445.33	112.00
Internet banking time (s)												
Normal	1050.29	407.93	488.43	171.31	532.54	197.78	1044.56	188.35	479.44	188.35	557.32	230.78
Impaired	1839.48	832.58	929.70	613.09	920.61	640.95	1646.78	650.57	780.94	506.08	783.61	310.27
UGreens website time (s)												
Normal	1095.93	512.42	384.46	143.23	514.25	182.97	845.16	363.58	338.80	363.58	517.76	287.30
Impaired	1939.39	816.78	730.65	551.22	888.74	544.64	1717.50	740.42	632.61	491.63	731.89	365.37

Notes: CFSAT = computer-based functional skills assessment and training; CFSAT/CT = computer-based functional skills assessment and training with cognitive training. No baseline scores differ across conditions, all $t(92) < 0.77$, all $p > .44$.

the Bonferroni correction. We also examined the proportion of cases within cognitive status that mastered each task and manifested substantial performance gains in the absence of mastery using chi-square tests. We computed Pearson correlations between baseline and change scores across time to task completion for the entire sample and between these variables the baseline MOCA scores (Supplementary Table 1).

Finally, we examined changes in the BAC composite score with a 2 (condition) × 2 (cognitive status) × 3 (Assessment) repeated-measures ANOVA.

Results

Training Completion

As participants were randomized 1 to 1 to training conditions, stratified by site and cognitive status, the data reflect different rates of withdrawal across conditions. Sixty-one participants were randomized to the CFSAT condition and 60 were randomized to CFSAT/CT condition. Fifty-one participants in the CFSAT condition (90%) either "graduated" (obtained mastery on all six tasks) or completed 24 sessions of training and 43 of those in the CFSAT/CT condition (77%) either graduated or completed training. This difference in completion rate across conditions was significant, χ^2 (1) = 4.52, p = .03.

Changes in Performance From Baseline to Posttraining

Table 2 presents the means and standard deviations for task completion time for the six tasks at baseline, the final training session, and the posttest assessment (with an alternative form). The data for efficiency are presented in Supplementary Table 1. There were significant differences as a function of cognitive status in baseline assessment task performance for all six tasks for measures of both task completion time and task efficiency. We also found that MOCA scores predicted baseline task scores (Supplementary Table 1). The NC sample performed significantly better than the CI sample (all Fs (1, 92) > 3.96, all ps < .001). There were no significant differences in the baseline assessment task performance across the six tasks as a function of training condition (CFSAT vs. CFSAT/CT) for either task completion time or task efficiency (all t < 0.77; all ps > .05).

As hypothesized, examination of performance changes from the baseline assessment to the posttraining assessments revealed that overall for all six tasks there was a significant improvement in performance for both task completion time and efficiency (all Fs (1,92) > 127.00, all ps < .001). Contrary to our hypothesis, there were no significant main effects of training condition (all Fs (1,92) < 2.15, all ps > .11), or interaction effects of time × condition (all Fs (1, 92) < 3.08, all ps > .09) on either measure for any task.

However, the interactions of cognitive status × time of assessment were significant (all F (1,92) > 10.84, all p < .001). Although CI participants demonstrated improvements in performance with training, they made reduced gains with training compared to the NC participants for both task completion time and efficiency across all tasks.

Treatment Changes From Baseline as a Function of Baseline Global Cognitive Status

As baseline task performance scores differed across the NC and CI samples, and because the CI participants had significantly lower training gains, we calculated a percentage gain score from baseline to the final training session for the two groups on task completion time (Supplementary Figure 1). Paired t tests were used to examine change from baseline in both groups; changes were statistically significant and exceeded the Bonferroni correction for all tasks in both groups, all t > 7.97, all p < .001.

Mastery of Training

For CI participants who mastered each of the tasks, mastery ranged from a low of 15% (ATM task) to a high of 34% (telephone refill task). For the NC participants, mastery of tasks ranged from a low of 62% (internet banking) to a high of 79% (telephone refill). All differences were

Table 3. Task Improvement Analysis Across the Six Tasks

	Normal cognition		Cognitive impairment			
Task	*N*	%	*N*	%	χ^2	*p*
Ticket kiosk	48	91	26	63	10.17	.001
ATM banking	36	68	18	44	5.46	.02
Medication management	45	85	24	59	8.23	.004
Telephone refill	45	85	29	71	2.77	.1
Internet banking	44	83	20	49	12.47	<.001
UGreens website	46	87	21	51	12.29	<.001

significant, all χ^2 (1) > 19.52, all *p*s < .001. There were no significant differences in rate of mastery of the tasks as a function of training condition, all χ^2 (1) < 0.22, all *p* > .64. Twenty-nine percent (*n* = 15) of those in the CFSAT condition and 32% (*n* = 14) of those in the CFSAT/CT condition obtained mastery on all six tasks.

Our definition of mastery, perfect performance on a task, may be unrealistic for "successful" completion of everyday tasks. Thus, we operationalized "substantial improvement" in task performance as improvement in task completion time equivalent to 1.0 *SD* of the baseline scores of the NC participants. We compared the groups with chi-square tests and used a Bonferroni correction to correct for multiple comparisons (0.05/6 = 0.008). A substantial proportion of the CI participants improved by an amount greater than or equal to our criterion (Table 3). Furthermore, CI participants did not differ from NC participants in terms of this criterion on the Ticket Kiosk task and Telephone Prescription Refill task.

Changes in Cognitive Performance on the BACS

Participants in the CFSAT/CT condition improved by 0.46 *SD* on the Brief Assessment of Cognition in Schizophrenia (BACS) composite score, when compared with the CFSAT participants who improved by 0.21 *SD*. We computed a 2 (condition) × 2 (cognitive status) × 2 (assessment) repeated-measures ANOVA with condition and cognitive status being the between-subjects factors and assessment time (baseline vs. posttraining) as the repeated measure on BACS composite score and found significant two-way interactions of time × condition, $F(1,90) = 10.34$, $p = .003$, and time × cognitive status, $F(1,90) = 4.96$, $p = .028$, and a nearly significant three-way interaction of time × condition × cognitive status, $F(1,90) = 3.25$, $p = .075$. CI participants had less improvement in cognitive performance over time and participants randomized to CFSAT/CT condition had greater improvement in cognitive abilities than those randomized to CFSAT. However, when baseline and endpoint BAC scores were examined with a paired *t* test in the CFSAT participants, the results were significant at a nominal level, $t(50) = 2.32$, $p = .024$, suggesting some level of cognitive improvement associated with skills training alone.

Discussion

This study investigated the efficacy of a CFSAT program that included everyday activities such as money and medication management in samples of NC and CI older adults. The tasks were ecologically valid representations of systems that currently exist and used to perform everyday task activities.

Our focus was on technology-based systems as technology applications such as automated voice systems and the internet are commonly used to perform routine activities. Although the age-related digital divide is narrowing, it still exists for some older adults including those of lower socioeconomic status, in the older cohorts, and those with a disability (Pew Internet Research, 2019), placing these individuals at a disadvantage with respect to negotiating everyday task domains and at risk for being vulnerable to financial fraud and scams. Also, as technology is dynamic and continually changing even for technology-savvy older adults, performance of many activities requires continual learning of new skills or modifying previously learned performance patterns (Charness & Boot, 2009). For example, banks and pharmacies continually make changes to the format and functionality of their online applications. As posited by the recent Adaptation for Growth models of aging (Wu et al., 2016) an individual's ability to learn and adapt to new ways of doing things is important to independence.

Our baseline assessment findings indicated that in fact our NC sample did not in general have mastery of these tasks, indicating a need for training, and, as expected, performance on all six tasks was lower for those individuals with evidence of a CI. This is consistent with the literature that indicates that everyday tasks can be particularly challenging for those who are cognitively impaired (Burton et al., 2009; Farias et al., 2006; Gomar et al., 2011). Cognitive status (MOCA score) was related to task performance at the baseline assessment. Overall, the baseline findings underscore the need for older adults to have opportunities for everyday task training, especially for tasks that involve the use of technology. Based on anecdotal evidence, many of our participants stated that prior to training, they were uncomfortable even attempting to perform the tasks simulated in our program, as they had no confidence in their ability to successfully complete them.

Overall, the results suggest that the CFSAT program is efficacious. On average, for both NC and CI participants, training resulted in a demonstrated improvement for all tasks on measures of task completion time and efficiency at posttraining and in the assessment with an alternate form. For tasks such as using an ATM or a ticket kiosk, the time one spends using these systems is an important metric as there is often pressure created by others waiting to use the systems. Also, telephone voice menu systems often "time out" if a response is not made within a time window, which can be extremely frustrating and decrease motivation to use these systems.

Our findings also showed that, on average, there were still significant differences between the impaired and nonimpaired samples in the task performance measures and our metric of mastery posttraining. However, participants with a CI demonstrated improvements in performance and made significant training gains for all six tasks. Also, when we used a more lenient measure of mastery (improvements in performance of 1.0 *SD*s of the baseline scores of the NC participants for the tasks), we found that a substantial performance of the CI participants achieved this mark and for two of the tasks, use of a ticket kiosk and a telephone voice menu, there were no differences between the CI and NC participants. These findings are encouraging and suggest that skills training is feasible and beneficial for use for those with a CI. It may be that the amount of training was insufficient for these individuals or that the introduction of the tasks should be more gradual. This is one of the first studies to show improvements in this population on targeted technology-focused training.

Contrary to our hypotheses, there were no differences in improvements in task performance according to training condition. This may indicate that a lesser dose of skills training can be efficacious. The CFSAT/CT did result in improvements on our composite measure of cognition. Importantly, when we examined cognitive gains solely among the CFSAT participants we also found improvements on the composite measure. These results support findings that learning new skills may result in an increase in cognitive abilities (Chan et al., 2016; Park et al., 2014). Successful mastery of new skills may also enhance learning self-efficacy and enhance an individuals willingness to participate in other learning opportunities. In fact, one of our participants reported that as a result of the skills training she was able to use an online service to produce a business card.

There were limitations to our study. We did not examine maintenance of training effects over time or the need for booster training. Furthermore, although we examined performance gains using an alternative form of the tasks, we did not examine transfer of training gains to performance of the tasks in daily living. Also, although our sample was ethnically/culturally diverse, the sample size was relatively small. The training took place at senior centers, which created logistic challenges for some of our participants. Home-based training would likely be more convenient. The optimal dosage of training also needs to be examined as a function of individual characteristics. Despite these limitations, our findings clearly point to the benefits of the CFSAT program and to directions for future research, which we are currently undertaking to address the study limitations.

Implications

Our findings indicate that functional skills training can be beneficial for aging adults and may enhance their ability to negotiate everyday activities. The results also demonstrate that nonpharmacological behavioral treatment approaches can result in performance gains for aging adults with a CI. As next steps the efficacy of the training needs to be examined among larger as well as more impaired populations. The use of home-based technology-based training platforms also needs further exploration, especially in situations such as pandemics when "stay at home" requirements restrict access to community centers.

Supplementary Material

Supplementary data are available at *Innovations in Aging* online.

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Conflict of Interest

P. Kallestrup is the CEO and a co-founder of i-Function, and S. J. Czaja and P. D. Harvey are co-founders and chief scientific officers of i-Function.

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