MEMORI Corps: Activity-based Companion Care for Dementia

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Protocol Title: MEMORI Corps: A novel activity-based companion program to benefit community-living persons with dementia, their families, and senior volunteers

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Executive Summary

This project adapts a novel activity-based companion care model (MEMORI Corps) for community-living persons with dementia for a virtual delivery format, and then implements the intervention in a pilot, two-arm, randomized controlled trial to evaluate intervention acceptability, feasibility, and preliminary efficacy versus an augmented waitlist control. The goal of the program is to provide persons with dementia meaningful and individualized activity programming, dementia caregivers with support, information and respite opportunities, as well as provide health benefits, meaningful productive engagement, and peer support opportunities for senior volunteers. Core intervention components are derived and synthesized from Tailored Activities Program® , Experience Corps® and MIND at Home® and include: (1) detailed initial assessment of interests and preserved abilities of PWD; (2) individualized activity program plans based on interests and abilities; (3) training of volunteers in communication and simplification strategies and use of activity program plans; (4) delivery of activity plans by volunteers to PWD over 12 weeks (primary end point) (5 hours/week) from their homes; (5) family caregiver education on activity plans, activity engagement support, disorder education, and ways to utilize respite opportunities; and (6) support of volunteers from a skilled multidisciplinary team.

The target group is 60 dyads (persons living with dementia and their informal co-residing caregiver) and 36 companion guides (health volunteer 55 years of age and older). Participants are randomized 1:1 either to the intervention or waitlist control group. Waitlist participants are offered the opportunity for cross-over into active intervention group. PWD/CG outcomes will be assessed at BL, 6-, and 12-weeks (PWD/CG participation lasts 12 weeks). Volunteer Companion Guide outcomes will be assessed at baseline, 3-, and 6-months (Volunteer participation lasts 6 months).

This model program could serve as an important new advancement for community-based long term care for PWD that addresses unmet patient- and family-centered needs through civic engagement of seniors. It could also serve as an intervention for dementia risk-reduction and brain health if found to be efficacious.

Research Aims

Aim 1: Adapt and refine the MEMORI Corps intervention for a virtual delivery format using iterative user-centered design principles and multiple stakeholder input.

Aim 2: Conduct a pilot, two-arm, randomized controlled trial to evaluate acceptability, feasibility, safety, and preliminary efficacy of the MEMORI Corps intervention (vs. wait list control group) in 60 community-living PLWD and informal caregiver dyads and 36 volunteer companion guides from geographically and demographically diverse regions in Maryland.

Aim 3: Evaluate the feasibility of ascertainment of community-living PWLD, caregiver, and volunteer-level outcomes over time using virtual and telephonic data collection methods.

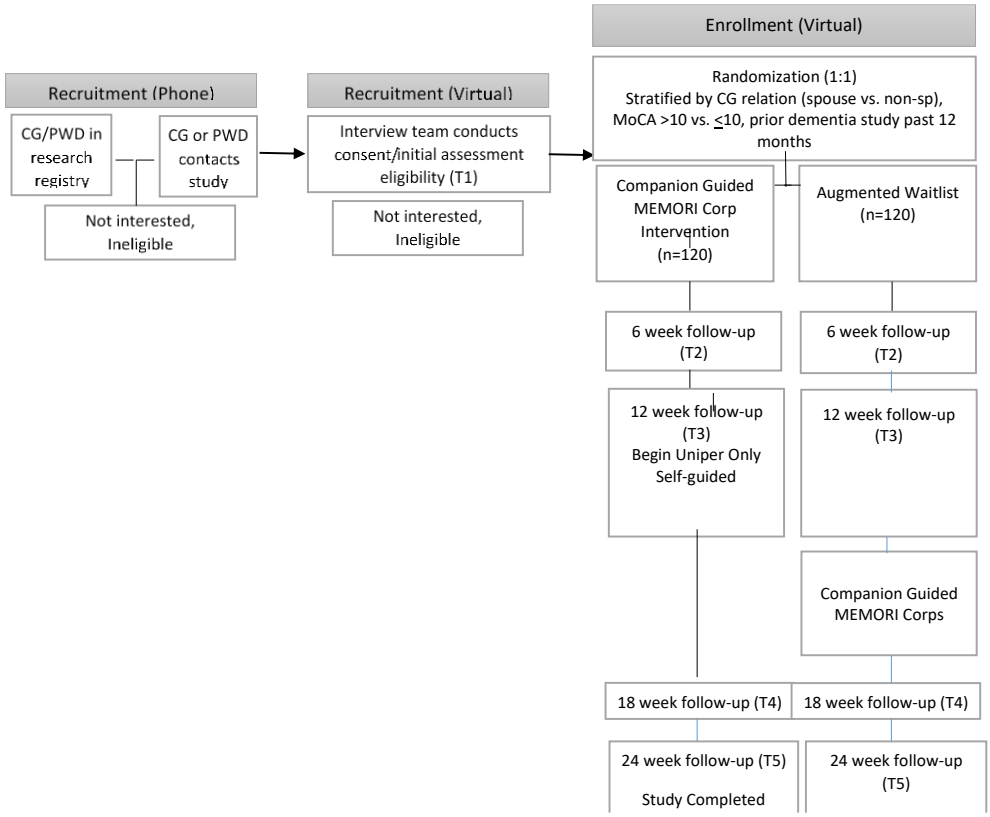
Overview of study design and procedures.

This is a single blind, intention-to-treat, randomized controlled trial design to evaluate the feasibility and efficacy of a 12 week (12-weeks is the primary end point for PWD/CG outcomes), evidence-based, individualized MEMORI Corps program delivered by trained older volunteers (n=36) to community-living PWD/CG dyads (n=60). Eligible PWD/CG dyads will be randomized to the intervention group (n=30), or augmented waitlist control group (n=30). Intervention group PWD/CGs will be matched with a senior volunteer who will routinely engage and guide the PWD through virtual (and in some circumstances in-person) companion-guided MEMORI Corps activity programming for Weeks 1-12 (at least 5 hours per week of direct guidance/ companion engagement). For the wait-list control group PWD/CGs after 12-week wait list period, the control group will receive the MEMORI Corps Companion guided activity the group for weeks 13-24 weeks.

Outcome, process, fidelity, and acceptability measures will be collected at BL, 6 weeks, 12 weeks (primary end point), 18 weeks, and 24 weeks. Eligible volunteers (i.e. "Companion Guides") will be randomized to 12 months of MEMORI Corps active duty (n=18) where they will be matched to three families over the course of a year, or a 6-month augmented waitlist control group (n=18) followed by opportunity to serve 6 months active duty in MEMORI Corps.

PWD/CG design and procedures (Figure 4). PWD/CG dyads will be recruited through a multipronged outreach strategy, in partnership with community organizations, as done previously[95] Referral dyads will complete a phone screen (e.g. explain study and procedures, determine demographic eligibility, confirm a CG, and screen for cognitive impairment/diagnoses).Those eligible, will receive an initial assessment (via telephone, JHU enterprise secure Zoom platform, or in-person—only if absolutely necessary) by study member study team (research interviewers) to obtain informed consent, confirm eligibility, collect information on baseline outcome measures for PWD and CGs (Table 5). PWD/CG dyads will then be randomized (within 2 weeks) to either intervention or augmented waitlist. **Intervention dyads** will be referred to the Alzheimer's Association for additional assessments, to create the individual activity plan (measures on Roles/Occupation/Interests, cognitive, physical, sensory, behavioral function, social orientation, daily routines/activities), and will be matched to a trained volunteer using a set of matching characteristics (geography, sex, age, occupation, interests, faith, and/or culture). The activity coordinator and matched volunteer will then jointly introduce the activity plan (e.g., provide a program orientation/rules, basic education, and teaching in use of activities) to PWD/CG dyad and begin implementation (Table 4). The volunteer will then conduct routine, semi-structured companion sessions using the activity plan for the remainder of the 12-week program virtually via Zoom platform or in a hybrid virtual/in-person format (5 hours per week). CGs will receive a written copy of PWD activity plan, and written educational/coaching materials on various topics (bi-weekly). **Augmented waitlist dyads** (control group) will be offered an opportunity for participation in the intervention arm at 12 weeks. Evaluators masked to group allocation will assess all dyads at 6-weeks (T2), and 12-weeks (T3) (the main trial endpoint). This assessment schedule is consistent with outcome measurement intervals on behavioral and caregiver burden in TAP trial. Willing and eligible wait-list dyads will then receive MEMORI Corps Companion-Guided activity programming (weeks 13-24). PWD and CG will each receive $20 for each study assessment (T1, T2, T3, T4, T5,).

Figure 4. Study Flow and Randomization for PWD/CG



Senior volunteer design and procedures (Figure 5) . Senior volunteers will be recruited through a multipronged outreach strategy, in partnership with community organizations as the PWD/CG. Referrals will complete an initial screen for core eligibility (e.g. explain study and procedures, determine demographic eligibility, screen for cognitive impairment/diagnoses, IADL/ADL function, basic literacy screen). Those eligible, will be invited to a virtual meeting followed by oral consent and baseline assessment (via telephone, JHU enterprise secure Zoom platform, or in-person—only if absolutely necessary) by study member study team (research interviewers) (Table 5). Following a an adapted methodology originally developed in the Experience Corps program A group of senior volunteers (n=36, age 55 years or older) will be recruited in several, staggered cohorts through a multipronged outreach campaign involving community partner organizations (e.g. Alzheimer's Association, AARP Maryland), and general and targeted community outreach. Interested volunteers will contact JHU and will be screened by the JHU study staff, taking part in a three step recruitment process (Figure 5) that includes (1) an initial description of the program and core eligibility screening (age, time commitment, motivation) by phone, (2) a virtual informational meeting hosted jointly by the Alzheimer's Association and Johns Hopkins (full information including goals, commitment, randomization and study assessments, Q&A), and (3) obtain informed consent by phone/in-person, and collection of baseline measures (Table 5). Volunteers will then be randomized to either MEMORI Corps active duty intervention (12-months) or Augmented Waitlist Control. **Intervention volunteers** will then be referred to the Alzheimer's Association and undergo several more intake steps: (4) they will receive an extensive MEMORI Corps training, (5) and a criminal background check, and health screening, followed by (6) matching to their first PWD/CG dyad, facilitated by the study OT. This 6-step intake process is in part designed to reduce attrition and enroll only those who would likely be able to fulfil the high intensity commitment. Over the 12 month period of service, each volunteer will be matched to about three different PWD/CG families (only working with one at a time), spending 12 weeks with each one. The remaining 3 months of the service period will be time off (flexible schedule, coordinated with the Volunteer Coordinator at the Alzheimer's Association). In addition to the 5 hours per week volunteers spend with PWD, they will also spend 1 hours per week in a team meeting with peer volunteers (equaling a total of 6 hours per week of active service). Volunteers (when matched to PWD) will receive a monthly stipend of $200/month (taxable) similar to **Augmented wait-list volunteers** will be offered an opportunity for participation in the intervention arm at 6 months. All volunteers will have outcomes assessed by masked evaluators at 6-months (T2) (the main trial endpoint), and 12-months (T3) (Figure 5). *This assessment schedule is consistent with outcome measurement intervals on physical function, cognition, and engagement in Experience Corps trials.* Willing and eligible wait-list volunteers will then cross-over into the intervention arm, and following the same procedures for intake described earlier, will commit to 6 months of MEMORI Corps program active service, with outcomes assessed by masked evaluators at 6-months (T3) post intervention initiation. Volunteers who have successfully completed 12 months of service, and desire to commit to another 12 months of service will be allowed (within the time frame of the study). Time served in the program and number of PWD/CG dyads matched will be tracked for each volunteer. Volunteers will each receive $20 for each study assessment.

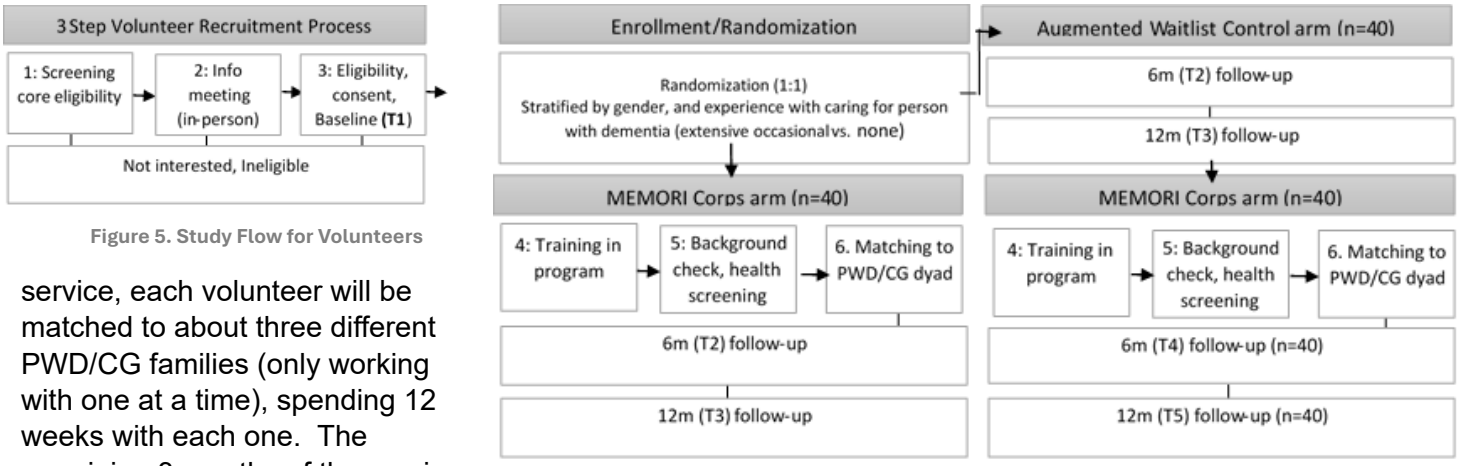


Figure 5. Study Flow for Volunteers

Recruitment, Enrollment and Randomization. **PWD/CG dyads** (n=60) will be recruited throughout all counties in Maryland and Baltimore City. (catchment area). To ensure we meet our sample size requirements and the study participants from diverse backgrounds and diverse geographic regions, we will use and

extensive multipronged outreach campaign that includes mailings/eblasts/referrals through aging services providers and community organizations (e.g. religious organizations, senior housing, health providers, social services agencies, aging resource agencies, nutritional services), a variety of recruitment materials in different media formats, a variety of recruitment sites (e.g., Johns Hopkins Community Physicians, Johns Hopkins Home-Based Medicine (JHOME)). We may also use social media opportunities/platforms such as podcasts and livestream sessions and targeted media briefings (e.g., Kaiser Health News, WashPo, NPR/WAMU, Beacon, Next Ave, others) to raise public awareness of the science to date on the topic related to brain health, social and activity (which relates to the COVID pandemic), and to provide contact/descriptive information on the MEMORI Corps trial as a way to highlight that research is currently ongoing on this topic. We may also work with the Maryland Department of Health IRB (as we have in the past for IRB00054802) to obtain permission to work with state agencies and aging programs and local health departments to assist in outreaching to potentially eligible clients (such as those in Caregiver Support program or on the Medicaid Waiver Waiting lists) as well as more generalized community outreach (e.g. radio advertisements, event participation).

Senior volunteers (n=36) will be recruited through a multipronged outreach campaign too involving mailings/eblasts by community and partner organizations (e.g. Alzheimer's Association, AARP Maryland, other senior advocacy organizations, religious organizations, senior housing, continuing care communities, senior centers) and general and targeted community outreach (e.g. events/health fairs/seminars, publicity/media, paid advertisements/marketing), following established methods.[51,69,101] The Alzheimer's Association and Johns Hopkins will co-lead the outreach campaign. Potentially eligible senior volunteers will be screened by the Hopkins team (Steps 1-3, Figure 5), and if eligible will be randomized into either the Intervention or Waitlist Control group. The Intervention group will be referred to the Alzheimer's Association (who will lead all volunteer operations for this project) for onboarding, intake, and matching (Steps 4-6, Figure 5). The Hopkins evaluation/interview team will conduct separate masked outcomes assessments for all enrolled volunteers. We will work closely with the Alzheimer's Association and AARP's Baltimore Experience Corps, who will provide "know how" through their extensive volunteer recruitment, training, management, and retention experience. To ensure the supply of trained volunteers (with a 25% reserve pool to account for time off/illness/attrition) will match the PWD/CG enrollment rates (8 per month), volunteers will be enrolled/randomized in four staggered cohorts, 20 per group (a critical mass).

Replacement Rule*:* Participants will be replaced if for any reason they become ineligible, unavailable, or unwilling to participate up to the date they are randomized. **Randomization:** We will use dynamic minimization[102] to ensure that dyad study arms are balanced with respect to CG relationship (spouse/non-spouse), MMSE>10, and participation in a different dementia study in the previous 12 months (yes/no). Software to perform this type of minimization has already been developed and used by our research group in clinical trials (e.g. MIND at Home). A similar procedure will be used to randomize volunteers, which will balance arms on sex and dementia caregiving experience.

Intervention (MEMORI Corps). This activity-based companion care program for PWD is delivered by trained senior volunteers, supported by a clinical team, over a 12-week intervention period (5 hours per week, 4-5 days per week) for each PWD/CG dyad. Primary roles of the volunteers are to provide peer-to-peer companionship, and an individualized activity program that focuses on meaningful, engaging and enjoyable activities that match PWD abilities and interests and covers broad domains (physical activity, cognitive engagement/stimulation, and social engagement). Program goals are to provide persons with dementia meaningful evidence-based activity programming, provide family caregivers with support, education and respite opportunities, as well as provide health benefits, meaningful productive engagement, and peer support opportunities for senior volunteers. **Core elements:** Intervention components are derived and synthesized from Tailored Activities Program (TAP)®, Experience Corps (EC)® and MIND at Home® (Table 1) and include: **(1)** a detailed initial assessment of interests and preserved abilities of PWD, **(2)** individualized Activity Plans created by trained Activity Coordinator; **(3)** initial training of volunteers in the use of activity program plans, dementia education, communication and simplification strategies, and environment setup; **(4)** delivery of activity plans by volunteers to PWD over 12 weeks (5 hours/week) in their homes; **(5)** family caregiver education on activity plans, dementia, and ways to utilize respite opportunities; and **(6)** support of volunteers from a skilled multidisciplinary clinical team. **Process:** Once a PWD/CG dyad has been randomized to

intervention arm, the individualized program is developed and implemented in three phases—Assessment and Activity Plan Development, Orientation and Instruction, Implementation (see TABLE 4). *It relies on adaptation of the well-developed, manualized TAP protocols that have been previously tested in trials and adapted to a variety of settings/cultures/interventionists.* Activity plans will be semi-structured weekly schedules with 4-5 sessions designed for 1-1.5 hours sessions and will consist of a combination of **(a)** one-on-one social and activity time between PWD and Volunteer, **(b)** physical activities, **(c)** group-based live social activities (e.g., live chair Yoga sessions), and/or **(d)** cognitively engaging activities (e.g. virtual Baltimore art museum tour, Trivia). Challenges and emergent issues faced by volunteers, PWD, or CG will be reviewed by the supervising multidisciplinary team and changes in the Activity Plans will be made as indicated. Activity Plan Intake Assessment: The Activity Coordinator (at the Alzheimer's Association) will perform a short virtual intake to gather additional information about the PWD to inform the Activity Plan. The Activity Coordinator will collect information about activity interests/preferences, executive functioning (e.g., Assessment of Executive Functioning TAP, TAP Linking Matrix Screening Questions, Assessment of Physical function, Observation of Comportment). These data will be used to develop a weekly activity plan. **Activities:** A wide range of activity types (over 150) including), exercise/physical (e.g. chair dancing/exercise), cognitive (e.g., virtual brain games, educational programming), music/entertainment (e.g. listening preferred music, singing), social/family (e.g. calling or skyping friends, live group book club/poetry reading), manipulation/sensory/sorting (e.g. twiddlemuffs, cards), arts and crafts (e.g. painting, coloring, domestic and homemaking (e.g. preparation of snack/light meal, folding laundry, doing dishes) are available for selection for incorporation into Activity Plans based on individual characteristics cognition, function, and preferences, using previously described guidelines and the TAP protocol.[81]. The volunteer will have use of an approved device (e.g., Samsung Galaxy Chromebook), using cellular networks, to support implementation of the planned activities (e.g. to access music, YouTube (or similar), and other web-based resources). **Training, supervision, engagement:** Study leaders will lead volunteer training, with participation by colleagues from Johns Hopkins, and Alzheimer's Association, representing a range of disciplines (e.g. medicine, nursing, social work). OTs participating as consultants will already have extensive training in TAP using an online program (http://learn.nursing.jhu.edu/face-to-face/institutes/NewWay-TAP/index.html), coupled with face-to-face didactic and interactive teaching. This comprehensive initial didactic and interactive training for volunteers, will include but not limited to: orientation to the research program, the MEMORI Corps team/roles/program structure, dementia overview (overview of dementia diagnoses, needs by stage, behavioral symptoms, home safety, treatments), Zoom use, IRB/HIPPA compliance, adverse event and emergency reporting protocols, overview of activity plans, home visit policies and safety, engagement and rapport, dementia communication techniques, establishing healthy boundaries, instruction in use of a paper log to document activities (described below), how to detect and report behavior changes, and stress reduction techniques. We will perform formal competency assessments to ensure volunteer readiness. Volunteer trained in Cohorts 2-4 will observe at least 2 companion-guided sessions led by peer volunteers as part of the training. Once matched, volunteers will receive ongoing, regular supervision and oversight from the volunteer coordinator, OTs, and physician co-investigators during the 1-hour weekly volunteer team meetings. These meetings have been found to be a key ingredient to increasing volunteer engagement and social support in the Experience Corps program and provide an opportunity to discuss challenges encountered, and provide additional training, education, and protocol boosters. Continuing education modules (15 minutes) will be included regularly in these meetings to provide additional information on key topics (setting up the environment for activities, modifying activities, addressing behavior challenges, cultural awareness and competency, maintaining professional boundaries). Volunteers will also be able to speak with a study clinician as needed to address specific issues or concerns. Several volunteer oriented events will also be held to engage volunteers and reduce attrition as done in Baltimore Experience Corps. **Matching:** To the extent possible, PWD and volunteers will be matched to ensure compatibility. Matching characteristics considered may be geography, sex, age, occupation, roles, interests, faith, and culture. **Activity Delivery Tracking:** We will provide volunteers with REDCap based survey links to record delivery processes (e.g., day/time of visit, persons in home during visit), details about implementation of the Activity Plan (e.g., activities started/completed, time spent in each activity), and ratings of impact/engagement of PWD and difficulties/challenges experienced by PWD and/or volunteer for each session, consistent with methods developed and used in our five previous trials of TAP. Surveys completed by volunteers at each visit will be reviewed and monitored by the Volunteer supervisor at the Alzheimer's Association on a biweekly basis for fidelity during the volunteer team meetings and used to analyze delivery process. **Fidelity:** To ensure internal validity, feasibility, and replication potential: (1) volunteers will be trained as described above; (2) the team (volunteers, site supervisors, physician) will meet weekly to discuss cases, procedures, troubleshoot problems;

(3) volunteer's activity delivery surveys reviewed on a bi-weekly basis to ensure protocol adherence by volunteer coordinator, and (4) standardized operational manuals will be reviewed and provided to all team members.

Augmented Wait-list Control. PWD/CG dyads randomized to the augmented waitlist control arm will continue any services and supports they are using, will receive a free copy of "A Caregiver's Guide to Dementia: Using Activities and Other Strategies to Prevent, Reduce and Manage Behavioral Symptom"[103]) and written educational materials on management of CG stress/well-being. Volunteers randomized to waitlist control will continue their usual activities (volunteer or other), and will receive additional written educational materials on cognitive health (NIA) and exercise and Physical Activity (Go4Life) and referrals to the Baltimore City Commission on Aging and Retirement Education for volunteering opportunities. Waitlist dyads will be followed at specified intervals by the research team and then offered an opportunity for participation in the intervention arm (at 12 weeks for PWD/CG, and at 12 months for volunteers).

Measures. Outcome measures will be assessed by masked evaluators at T2, T3, T4, and T5. We will evaluate implementation protocol adherence through process and fidelity measures logged by volunteers in the activity delivery session surveys (REDCap), program acceptability, satisfaction (adapted from TAP and MIND at Home surveys), and skill mastery for PWDs, CGs, volunteers, supervisors will be assessed with self-administered surveys at T3, T5, or at time of disenrollment (if premature). We will also measure how CGs used the respite time (T3,T5). We will conduct mixed methods (survey/interviews/focus groups) with a subgroup of PWD, CG, and volunteers to refine the operation manual and intervention protocol, post-delivery.

Inclusion and Exclusion criteria

PWD/CG must both meet eligibility criteria. These criteria are designed to reduce PWD/CG attrition and ensure safety of PWD, CG, and volunteers.

PWD are eligible if: (1) English speaking; (2) have an established physician clinical diagnosis of dementia (any stage) and confirmed with IQCODE cut off >=52 , (3) are able to participate in at least 4 basic Activities of Daily Living (out of 11), (4) have not received formal (i.e., in-home companion care, or adult day center) activity-focused care services in the past 4 weeks, (5) living at home in all counties in Maryland and Baltimore City, (6) have a co-residing informal caregiver willing to participate as study partner, and (7) 30 years old or older.

PWD are excluded if: (1) they are deemed to be in a crisis/unsafe situation at baseline, (2) planned transition from home in less than 6 months, (3) at end-stage disease (e.g. bed-bound and non-communicative, or hospice), (5) they are currently enrolled in a dementia related clinical trial, or (6) deemed to have severe behavioral symptoms so severe that they make participation in this study unsafe (e.g., are placing self or others at harm).

CG are eligible if: (1) English speaking, (2) 21 years of age or older (male or female), (3) they are deemed to be a reliable informal caregiver (not paid for their caregiving of PWD) who knows the PWD well, (4) they are co-residing with the PWD, and (5) are relied on by the PWD for assistance in activities of daily living (instrumental or basic).

CGs are excluded if: (1) they do not plan to be co-residing with the PWD in the next 6 months, or (2) they are currently involved in a behavioral/educational clinical trial. These criteria are designed to reduce PWD/CG attrition and ensure safety of PWD, CG, and volunteers.

Volunteers (i.e. "Companion Guides") are eligible if: (1) English-speaking,(2) 55 years or older, (3) High School diploma or GED (minimum) (2) ability pass a basic adult literacy screen (3) ability to pass a background check, physical and mental health screening, (3) a MoCA-Blind score of 18 or above, (4) ability to commit to 12 months of service (5 hours per week, excluding travel time and continuing education and support), and (5) are reliable during intake and onboarding process and able to successfully complete training.

Volunteers are excluded: (1) if they are planning on moving from the area in the next 12 months, (2) unable to provide informed consent, and (3) report having an existing cognitive disorder diagnosis by a health provider (e.g., Mild Cognitive Impairment, Alzheimer's disease or other type of dementia).

Study Statistics

Primary outcome variable.

Aim 2: Preliminary efficacy on PWD quality of life (QOL) and neuropsychiatric symptoms and caregiver subjective and objective burden and depressive symptoms compared to augmented wait-list control over 12 week intervention. We will fit a longitudinal linear mixed effects model with a random intercept such that $E[Yij]=\beta0+\beta1weeks + \beta2weeks*treatment$, and $\beta2$ represents the difference in change in outcome over time between intervention and wait-list PWD/caregivers

Secondary outcome variables.

Aim 2: Preliminary efficacy on volunteer physical function, cognition, and social and psychological engagement over 12 months of service. We will fit a longitudinal linear mixed effects model with a random intercept, analogous to those used for PWD outcomes but with months as the unit of time, and volunteers as the unit of measure, rather than PWD/caregiver dyad. **Aim 3:** Acceptability and feasibility of implementing the MEMORI Corps program from various stakeholder perspectives (PWD, informal CGs, senior volunteers, volunteer coordinators/supervisors). Analyses for this aim will be descriptive, and will evaluate treatment adherence, delivery, fidelity and program acceptability and satisfaction from the point of view of the PWDs, caregivers, volunteers, and volunteer supervisors. Exploratory/Secondary Analyses: Additionally, we will model change in dyads and volunteers randomized to augmented waitlist followed by intervention, to determine if trajectories for outcomes change between the augmented waitlist and intervention periods. We will also combine the intervention period from both study arms and compare baseline and 12-week measures (for PWD/CG) or 6- and 12-month measures (for Volunteers). With regard to PWD outcomes, we will model all-cause transition from home (including death) during the first 12 weeks as a function of treatment assignment, and we will also compare social engagement and utilization of health (ED/inpatient/outpatient, etc.) and community services between the waitlist and intervention groups, and measure change in utilization among the waitlist participants after they receive the intervention. We will examine potential predictors of intervention response including biological variables such as PWD, CG and volunteer sex, dementia severity, CG relationship, by including intervention x time x predictor terms in longitudinal regression models. To explore the relationships between change in PWDs and caregivers, we will fit parallel process models to data from the intervention period.106 For example, such a model would allow for the joint modeling of both PWD and caregiver QOL, and would allow for the explicit modeling of correlation between the two trajectories.

Statistical plan including sample size justification

Analytic Plan. Descriptive analyses will be conducted and measures checked for outliers and to ensure that distributional assumptions of the planned analyses are appropriate. If not, analogous non-parametric methods will be used. The outcomes will be primary modeled using mixed effects regression models which, unlike the method of generalized estimating equations (GEE), do not require data to be missing completely at random.[104] These models allow for correlation of outcomes over time within individuals. Clustering at the volunteer level is possible, but since such clusters would be small relative to the total sample size, it is unlikely that such clustering would affect estimation of standard errors or statistical power to detect a treatment effect.[105] All primary analyses will be intent-to-treat, and will be adjusted for the variables used to balance randomization. We will use "per protocol" secondary analyses to estimate the efficacy on outcomes for intervention participants who receive a minimum dose of intervention (defined as at least 5 hours per week for at least 6 weeks or least 30 hours total of companion guided activity programming post randomization) compared to usual care group participants (control group) who remain in the study for at least 12 weeks post randomization. The intention-to-treat analyses will be the primary analytic approach for this trial. To investigate sensitivity to missing values, those with and without missing

values will be compared by background covariates. Tests will be two-sided and p-values <0.05 will be considered significant. Multiple test corrections will be applied as appropriate.

Sample Size Calculations. Using published recommendations for estimation of pilot trial sample size targets, we revised the pilot trial sample size (Aim 2) to a sample size of 30 per arm for persons living with dementia and caregiver dyads (60 total, including a 20% attrition rate) to plan for the future main efficacy trial with 90% power, 2-sided 5% significance and small (0.2) standardized effect sizes on continuous outcomes. For volunteer companion guides, we revised the pilot trial sample size (Aim 2) to a sample size of 18 per arm (36 total, including a 20% attrition rate) to plan for the future main efficacy trial with 90% power, 2-sided 5% significance and medium (0.5) standardized effect sizes on continuous outcomes.