# Translating Exercise into the Community to Preserve Independence among Older Adults with Motoric Cognitive Risk Syndrome

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# Background & Rationale

- Age-related cognitive decline has a profound impact on the daily functioning of older adults, their families and healthcare systems.

- Currently 46.8 million people worldwide are living with dementia. This number will double by 2030 and more than triple by 2050.

- The widespread implementation of effective and scalable low-cost interventions to maintain the cognitive independence of broad populations of older persons is now an urgent public health priority.

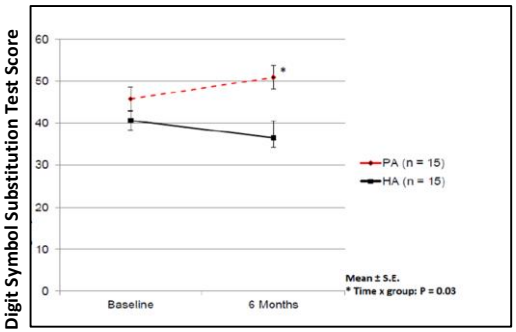
- **ENGAGE Pilot Study** **(ENhancing independence using Group-based community interventions for healthy AGing in Elders)**

- LIFE physical activity (PA) intervention translated to a real-world community-based senior center:
  - Safe & feasible
  - Preserves mobility, ↓ falls, ↑ executive cognitive functioning

**ENGAGE Participants – Baseline Characteristics**

| Variable | Total (n=40) |
|---|---|
| Age, (yrs) | 76.9 ± 7.3 |
| BMI ( kg/ m²) | 32.7 ± 7.4 |
| Female gender, n (%) | 34 (85%) |
| Caucasian Race, n (%) | 36 (90%) |
| Number of medications | 7.2 ± 3.8 |
| Number of conditions | 4.0 ± 2.0 |
| Systolic blood pressure, mmHg | 138.9 ± 18.5 |
| | |
| SPPB score | 6.3 ± 2.2 |
| Subjects with SPPB score ≤ 7, n (%) | 25 (62.5%) |
| 4m gait speed, m/sec | 0.59 ± 0.16 |
| Fell in past 6 months (Y/N), n (%) | 17 (42.5%) |

**ENGAGE PA Improves Cognition**




**Reid et al. 2018**
***J Gerontol A Biol Med Sci***

# Innovation

## ENGAGE for Brain Health (ENGAGE-B)

- New pragmatic community-based 6-month pilot RCT in 40 vulnerable older adults who are identified as being at early and increased risk for subsequent cognitive decline

- Motoric Cognitive Risk Syndrome (MCR): Verghese et al. 2013
  - assessment is simple as it avoids the need for clinical / neuropsychological testing
  - slow gait and subjective cognitive complaints
  - early & independent predictor of future cognitive decline and dementia in older adults (Verghese et al. 2013, 2016; Allali et al. 2016)
  - the prevalence of MCR among the general population of older adults is high (~10%)
  - MCR may represent a distinct “at-risk” target population that may benefit from PA
  - no study to date has examined the effects of PA among older adults with MCR
  - an important and much-needed advance for the field would be to demonstrate that PA is an effective intervention for mitigating cognitive decline among real-world older adults identified as being at elevated risk for developing subsequent dementia

- PA intervention will be delivered by an existing community-based employee without a background in exercise physiology

# Specific Aims

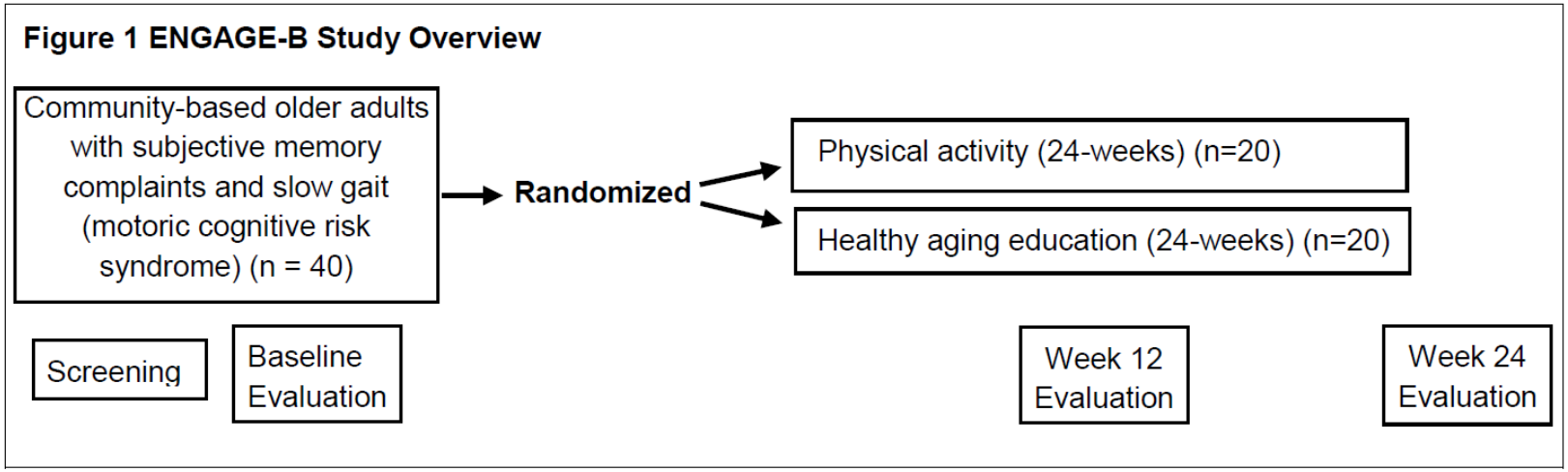
## ENGAGE for Brain Health (ENGAGE-B)

- **Aim 1: To evaluate the feasibility of 6 months of moderate-intensity PA delivered by an existing community-based employee versus directed healthy aging education (HE) in older adults with MCR.**
  Hypothesis 1. PA participants will successfully and safely adhere to exercise sessions (attendance rate ≥ 60%), and compared to HE, will have significant increases in habitual physical activity levels (assessed by self-report and accelerometry) with no significant differences in adverse event rates.

- **Aim 2: To compare the preliminary effect sizes associated with 6 months of moderate-intensity PA delivered by an existing community-based employee versus HE on cognitive performance in older adults with MCR.**
  Hypothesis 2. Participants randomized to PA, compared to HE, will elicit improvements in cognitive performance (on mobile testing platform) and improvements in dual-task cognitive outcomes.

- **Exploratory Aim 3:** Compare the relative effects of PA vs. HE interventions on functional near-infrared spectroscopy (fNIRS) derived measures of prefrontal brain activation and other cognitive outcomes, mobility (SPPB), depressive symptoms (geriatric depression scale), quality of life (quality of well-being scale) and use additional information from this pilot study research (recruitment yields, MCR prevalence rates, intervention costs) to plan a larger scale implementation study.

# Study Design



# Study Inclusion /Exclusion Criteria

Participants will be considered to have MCR if they meet all of the following criteria:

1. Self-reported memory complaint as assessed by Question 10 on the GDS ("Do you feel you have more problems with memory than most?").
2. Objectively defined slow gait
3. Absence of mobility-disability (inability to ambulate even with assistance or walking aids)
4. Absence of dementia diagnosis.

**Table 2**

| Inclusion Criteria | Exclusion criteria |
|---|---|
| 1. Age 60-89 years, community-dwelling, ambulatory | 1. Serious medical conditions limiting the ability to safety participate in either the PA or HE interventions; these include acute or terminal illness, symptomatic heart or vascular disease, severe hypertension, recent myocardial infarction or stroke (in past 6 months), severe insulin-dependent diabetes mellitus, psychiatric disorder, renal disease, liver disease, active cancer, Upper or lower extremity fracture in the previous 6 months |
| 2. Presence of MCR syndrome | 2. 3MSE score < 80* (*Exclusion criteria is indicated for subjects with 9 or more years of education. If subject reports <9 years of education, the exclusion criteria is adjusted to <76 (<70 if African American). |
| 3. Sedentary (no participation in a structured physical activity program within the past 6 months) | 3. Plans to relocate from the region during the trial period |
| 4. Written permission from PCP for study participation | 4. Unable/ unwilling to give informed consent / to be randomized to either PA or HE |
| 5. Willingness to be randomized and participate for 24 weeks | |

# Assessment Schedule

| Assessment | Screening | Baseline | 12-Week | Intervention | Follow-up |
|---|---|---|---|---|---|
| Informed Consent | X | | | | |
| Medical History | X | | | | |
| Blood pressure and pulse | X | X | | | X |
| SPPB | X | | X | | X |
| 3MSE | X | | | | X |
| GDS | | X | | | X |
| CHAMPS questionnaire | | X | | | |
| Height | | X | | | |
| Weight | | X | | | X |
| Cognitive Testing Battery | | X | X | | X |
| fNIRS assessment and submaximal cycle ergometry | | X | X | | X |
| 6 Minute Walk Test | | X | X | | X |
| Grip Strength | | X | | | X |
| CWTs | | X | | | X |
| Quality of Well Being | | X | | | X |
| Falls History | | X | | | X |
| Falls Efficacy Scale-I | | X | | | X |
| Accelerometry | | X | | | X |
| Adverse Events | | X | X | X | X |
| Concomitant Medication | X | X | | X | X |
| | | | | | |
| Physical Activity[1] | | | | X | |
| Healthy Aging[1] | | | | X | |

[1]Study subjects will be randomized to either the Physical Activity or Healthy Aging intervention.

# Physical Activity Intervention

- Twice per week, about 60 minutes per session
- Exercises include:
  - Walking
  - Strength exercises for upper and lower body
  - Stretching
  - Balance
- All classes are located at the Holland Street Senior Center in Somerville

# Current Status (ENGAGE-B)

- Recruitment Status ( Initiated January 2019)
  - older adults reached: 400+
  - pre-screened: 61
  - Screened: 28
  - Enrolled and randomized: 10

- Intervention Adherence (median)
  - Physical activity: 69%
  - Control: 60%

# Current Status (ENGAGE-B)

- Baseline Characteristics

**Table 1 – Baseline Characteristics (n = 10)**

| Variable | |
|---|---|
| Age, yrs | 75.5 ± 7.5 |
| BMI, kg/m$^2$ | 31.7 ± 4.9 |
| Female sex, n (%) | 9 (90) |
| Caucasian race, n (%) | 6 (60) |
| Number of medications | 7.3 ± 4.0 |
| 3MSE score | 91.4 ± 6.9 |
| SPPB score | 3.8 ± 2.2 |
| Gait speed (4m), m/sec | 0.53 ± 0.12 |

Values are Mean ± SD.

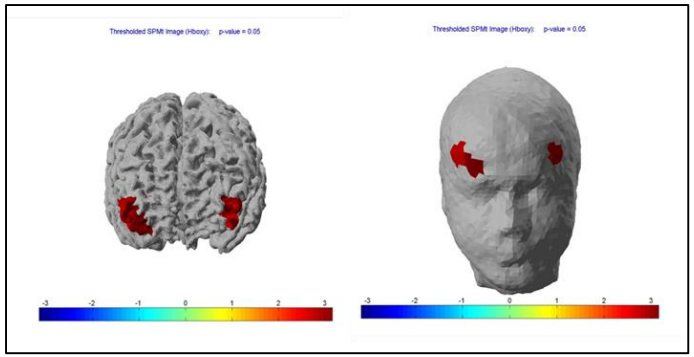
# Current Status (ENGAGE-B)

**fNirs/Exercise Test: Report – ENGAGE-B**

- Subjects evaluated: n= 10  Exercise test completed: n = 8

- Example of one subject:

**$O_2Hb$**

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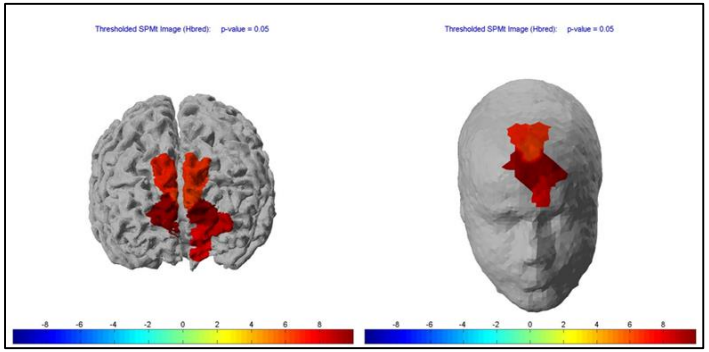


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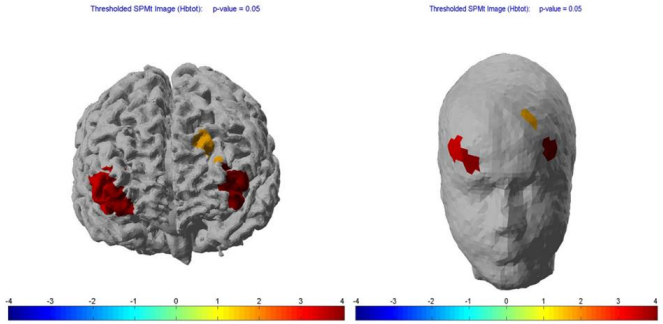

# NEXT STEPS

- 3 major components to career development plan:

  1) advanced didactic training / courses pertinent to implementation science and fNIRS
  2) participating in regular meetings of the Boston OAIC and national OAIC conference
  3) mentoring from internationally recognized experts

- Boston Pepper Center Core Usage:
  - Research Education Component (REC)
  - Functional Assessment Core (FAC)
  - Biostatistical Design and Analysis Core (BDAC)

- R21 grant application: June 2019
- R Series: Late 2019 / 2020

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