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**2022 CURS Summer Scholars program**

Interdisciplinary Health Sciences Department

Augusta University

May 23-July 22, 2022

**Mentor**: Dr. Researcher

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**Participating Students:** Student 1 Student 2

**Course: CURS 2990**

**Project Title:** The influence of the Otago Exercise Program on executive function among older adults living with dementia

**Project Description:**

Dementia is a growing public health problem. Approximately 46.8 million individuals worldwide were living with dementia in 2015, which is estimated to reach 131.5 million by 2050.1 The global healthcare expenditure of dementia was $604 billion in 2010, which is projected to dramatically increase.2 Therefore, there is an urgent need to alleviate this growing public health concern. Executive function is important for maintaining independence in activities of daily living; yet, people living with dementia have poor executive function.3 Executive function includes the abilities to: make decisions, reason, problem-solve, initiate and maintain tasks, as well as adapt to changing cognitive conditions.4 Poor executive function is linked with other important health markers, such as poor physical function,5, 6 falls,5 and mortality.7 There is strong evidence to suggest that exercise improves executive function among older adults without dementia.8-11 Historically, people living with dementia have been systematically excluded from intervention studies due to researchers’ ineligibility criteria. Only one study has examined the influence of exercise on executive function in people living with dementia. Exercise improved mobility but not executive function.12 Altogether, more research is necessary to determine the influence of exercise on executive function and health markers among diverse community-dwelling people living with dementia.

**Primary Aim:** The primary aim of this study is to conduct a pilot 6-month assessor-blinded randomized controlled trial to determine if a home-based Otago Exercise Program plus usual care improves executive function in community-dwelling people living with dementia compared to usual care alone.

**Exploratory Aims:** The exploratory aims are to determine if the Otago Exercise Program plus usual care differentially improves inflammatory blood biomarkers, kynurenine metabolites, mobility, cognition, mood, fall-related self-efficacy, health-related quality of life, balance, sleep, physical activity, and falls by sex and race among community-dwelling people living with dementia compared to usual care alone.

**curs summer scholars program Goals**

* To provide intentional mentoring and professional development through collaborative research and creative scholarship;
* To increase opportunities for underrepresented students to become actively engaged in research and creative scholarship;
* To provide undergraduates with intensive experiential learning through engagement in research and creative scholarship;
* To support high impact scholarly activity that yields significant student development and academic achievements while furthering the research productivity of Augusta University.

**Educational goals for this project**

By the end of the course, students should be able to:

1. Describe the prevalence and impact of dementia on individuals and society
2. Critically apprise research articles in the field
3. Schedule and coordinate assessment dates with the nursing home(s) and assisted living facility(ies)
4. Use equipment to measure physical performance measures
5. Assess various cognitive domains with valid and reliable cognitive assessment tools
6. Use OnCore to enter data
7. Assist physical therapist(s) in delivering the Otago Exercise Program
8. Emulate high ethical conduct and confidentiality in research
9. Effectively communicate with people living with dementia, as well as their legally authorized representative and healthcare providers

**roles for this project**

Dr. Researcher will provide guidance and oversight of research activities. Dr. Researcher will conduct laboratory meetings at least weekly that include discussion of each of the educational goals for this project listed above, and ultimately drafting of portions of the randomized controlled trial protocol manuscript. The aim of these meetings is to provide the students with an introduction to core concepts in the experimental analysis of cognition and physical performance measures, in the design of randomized controlled trials, as well as in ethical and professional issues in research.

Students will have several roles. First, they will read impactful research articles examining the effects of exercise on cognition among people living with dementia. Second, they will collect data in a conscientious manner, with the welfare of the research participants among our primary concerns. Third, they will assist the physical therapist in delivering the exercise intervention. Fourth, they will assist in data entry and analysis. Fifth, they will prepare and present our findings to CURS colleagues and at external scientific meetings. Sixth, they will contribute to the authorship of the protocol manuscript submitted for publication in a peer-reviewed journal.

**EXPECTATIONS**

**Professionalism and Respect.** It is expected that all lab members conduct themselves in a professional and respectful manner. We value diversity along many dimensions in the lab, and expect members to reflect these values. Please be supportive of your fellow lab members, and respect their strengths and weaknesses. If you’re struggling or don’t understand something, please ask for help, and if someone asks you for help, please put forth a good faith effort. Please adhere to any deadlines we agree on, and if you determine that you will be unable to keep a deadline, please communication this in a timely manner.

**Human Research**. This project includes working with people living with dementia is nursing homes and assisted living facilities. Human welfare is a major priority. The procedures associated with this project will be approved by the Augusta University Institutional Review Board Committee (protocol #1836020-2) and are supported by the CURS Summer Scholars Program and the Augusta University Intramural Grant Program. All research activities must be consistent with the protocol. If you have questions about procedures, protocols, or human welfare please err on the side of caution and feel free to ask questions.

**Scheduling and Communication**. The CURS SSP requires 20 hours of work per week. This project will include in-lab activities (e.g. data collection and weekly lab meetings), and out of lab work (e.g. creating lab manual) that will all contribute to the 20 hour per week requirement. Reading articles does not count towards the 20 hours per week. All lab members are expected to maintain the schedule that is agreed upon for in-lab activities, and if circumstances arise that do not permit this, timely communication is expected. Email is the appropriate means of communication for standard issues, but text or a phone call is appropriate for more urgent issues. Instant messaging through Teams can also be used. Please be sure to check both email and Teams regularly throughout the SSP.

**General Laboratory Etiquette.** Please refrain from bringing food or drink into the lab, as the equipment could be damaged. Please dress appropriately depending on the circumstance. For example, when assisting with the exercise, please wear clothing that you feel comfortable moving in, and when presenting your research, please dress more professionally. Please do not wear open-toed shoes, or clothing with potentially offensive language.

**Data Management.** Data should be stored on Oncore or AU Research Box. Hard copies will be stored in EC-1515 in a locked file cabinet. Please read and sign the data management and confidentiality form. General data management guidelines include: when in doubt, err on the side of including more information; adhere to the lab file naming and organization policy (to be discussed early in the summer); do not remove data from the lab; never delete or discard anything.

**required trainingS**

* CITI Training: **GCP – Social and Behavioral Research Best Practices for Clinical Research**
* **CITI Training: Group 2 – Non-FDA Regulated Research**
* OnCore training – data management
* Training on physical performance equipment
* Training on cognitive assessment delivery
* Training on how to obtain consent and assent

**Mentor Philosophy:** I’m passionate about empowering students to become lifelong learners. To do so, I want to highlight 3 strategies that I use in my teaching philosophy. Firstly, I aim to develop problem-based learning. I aim to create an environment where students can develop the ability to think critically, problem solve, analyze assumptions, question ideas rather than taking them at face value, build an argument, organize ideas, and reflect. For example, if students are having technical issues with equipment, I would ask them first what they think they should do, what they have done to trouble-shoot, and guide them to the answer through constructive feedback. Secondly, I aim to foster autonomy in my students by catering to different learning styles and providing opportunities for students to thrive through self-discovery. More specifically, my goal is to develop well-rounded students who understand the research process from start to finish; however, I do recognize that one size does not fit all when it comes to teaching. I am dedicated to meeting the needs of individual students and providing opportunities for each student to thrive whenever possible. Lastly, I aim to create a safe and inclusive environment where students feel comfortable, respected, where their voices are heard. For example, I do this by making myself available and attentive through open-door office hours, as well as foster community through team meetings and social outings.

**key dates and events**

* Program Duration: May 23, 2022-July 22, 2022
* Student Orientation: May 18, 2022, 3:00-4:30
* Workshops (**attendance is required**): Wednesdays from 12-1:30 (starts May 25, 2022)
* Symposium and reception: July 21, 2022 4-6pm

**TIMELINE OF MAJOR ACTIVITIES**

 The first two weeks of the summer scholars program will be devoted to laboratory-specific training and practicing the testing protocol. Starting at the beginning of week 3 I anticipate that we will start the consenting/assenting process and start scheduling and conducting testing sessions; I predict this will continue through week 8. Students will also enter data, clean the data, and analyze the data when they are not collecting data. During this time we will also conduct weekly laboratory meeting where we will discuss peer reviewed articles (see reading list below), the data we have collected, and the exercise intervention. Weekly CURS workshops will also occur during this time, and attendance is required. We will begin formal preparation of the poster (i.e. final data analysis, data visualization, etc.) around week 7. The Summer Scholars Program will end with a symposium, and students will have an opportunity to present their research at this time.

Tentative Schedule

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| Week | Topic |
| Week 1 | -Course introduction-Laboratory tour and equipment demonstration-Students to work on completing trainings-Students to practice working with equipment, practice the protocol, practice obtaining consent, and write equipment manuals |
| Week 2 | -Students to practice working with equipment, practice the protocol, practice obtaining consent, and write equipment manuals |
| Week 3 | -Students to begin the consent and assent process-Students to schedule assessments |
| Week 4 | -Students to begin the consent and assent process-Students to schedule assessments-Students to start to collect data |
| Week 5 | -Students to collect data |
| Week 6 | -Students to collect data-Students to schedule intervention |
| Week 7 | -Students to collect data-Students to assist physical therapist with intervention-Students to start working on poster |
| Week 8 | -Students to collect data-Students to assist physical therapist with intervention |
| Week 9 | -Students to collect data-Students to assist physical therapist with intervention -Students to finalize poster and practice presentation for the symposium |

**reading list**

* Dr. Researcher Intramural Grant Application
* Background literature, citations: 1-12
* Randomized controlled trials examining the effects of exercise on falls and cognition, citations: 13-22

1. Prince M, Wimo A, Guerchet M, et al. *World Alzheimer Report 2015: The global impact of dementia: An analysis of prevalence, incidence, cost & trends* 2015:1-87.

2. Wimo A, Jönsson L, Bond J, Prince M, Winblad B. The worldwide economic impact of dementia 2010. *Alzheimers Dement*. Jan 2013;9(1):1-11.e3. doi:10.1016/j.jalz.2012.11.006

3. van der Wardt V, Logan P, Hood V, Booth V, Masud T, Harwood R. The Association of Specific Executive Functions and Falls Risk in People with Mild Cognitive Impairment and Early-Stage Dementia. *Dement Geriatr Cogn Disord*. 2015;40(3-4):178-185. doi:10.1159/000433523

4. Suchy Y. Executive functioning: overview, assessment, and research issues for non-neuropsychologists. *Ann Behav Med*. Apr 2009;37(2):106-16. doi:10.1007/s12160-009-9097-4

5. Kearney FC, Harwood RH, Gladman JR, Lincoln N, Masud T. The relationship between executive function and falls and gait abnormalities in older adults: a systematic review. *Dement Geriatr Cogn Disord*. 2013;36(1-2):20-35. doi:10.1159/000350031

6. Handing EP, Chen H, Rejeski WJ, et al. Cognitive Function as a Predictor of Major Mobility Disability in Older Adults: Results From the LIFE Study. *Innov Aging*. May 2019;3(2):igz010. doi:10.1093/geroni/igz010

7. Fried LP, Kronmal RA, Newman AB, et al. Risk factors for 5-year mortality in older adults: the Cardiovascular Health Study. *JAMA*. Feb 25 1998;279(8):585-92. doi:10.1001/jama.279.8.585

8. Küster OC, Laptinskaya D, Fissler P, et al. Novel Blood-Based Biomarkers of Cognition, Stress, and Physical or Cognitive Training in Older Adults at Risk of Dementia: Preliminary Evidence for a Role of BDNF, Irisin, and the Kynurenine Pathway. *J Alzheimers Dis*. 2017;59(3):1097-1111. doi:10.3233/jad-170447

9. Sherrington C, Michaleff ZA, Fairhall N, et al. Exercise to prevent falls in older adults: an updated systematic review and meta-analysis. *Br J Sports Med*. 2017;51(24):1750-1758. doi:10.1136/bjsports-2016-096547

10. Tricco AC, Thomas SM, Veroniki AA, et al. Comparisons of Interventions for Preventing Falls in Older Adults: A Systematic Review and Meta-analysis. *JAMA : the journal of the American Medical Association*. 2017;318(17):1687-1699. doi:10.1001/jama.2017.15006

11. Jehu DA, Davis JC, Madden K, Parmar N, Liu-Ambrose T. Minimal Clinically Important Difference of Executive Function Performance in Older Adults Who Fall: A Secondary Analysis of a Randomized Controlled Trial. *Gerontology*. Oct 15 2021:1-9. doi:10.1159/000518939

12. Toots A, Littbrand H, Boström G, et al. Effects of Exercise on Cognitive Function in Older People with Dementia: A Randomized Controlled Trial. *J Alzheimers Dis*. 2017;60(1):323-332. doi:10.3233/jad-170014

13. Kovács E, Sztruhár Jónásné I, Karóczi CK, Korpos A, Gondos T. Effects of a multimodal exercise program on balance, functional mobility and fall risk in older adults with cognitive impairment: a randomized controlled single-blind study. *Eur J Phys Rehabil Med*. Oct 2013;49(5):639-48.

14. Lamb SE, Sheehan B, Atherton N, et al. Dementia And Physical Activity (DAPA) trial of moderate to high intensity exercise training for people with dementia: randomised controlled trial. *BMJ*. May 16 2018;361:k1675. doi:10.1136/bmj.k1675

15. Nyman SR, Ingram W, Sanders J, et al. Randomised Controlled Trial Of The Effect Of Tai Chi On Postural Balance Of People With Dementia. *Clin Interv Aging*. 2019;14:2017-2029. doi:10.2147/cia.s228931

16. Pitkälä KH, Pöysti MM, Laakkonen M-L, et al. Effects of the Finnish Alzheimer Disease Exercise Trial (FINALEX): A Randomized Controlled Trial. *JAMA internal medicine*. 2013;173(10):1-8. doi:10.1001/jamainternmed.2013.359

17. Shaw FE, Bond J, Richardson DA, et al. Multifactorial intervention after a fall in older people with cognitive impairment and dementia presenting to the accident and emergency department: randomised controlled trial. *BMJ*. Jan 11 2003;326(7380):73. doi:10.1136/bmj.326.7380.73

18. Suttanon P, Hill KD, Said CM, Byrne KN, Dodd KJ. Factors influencing commencement and adherence to a home-based balance exercise program for reducing risk of falls: perceptions of people with Alzheimer's disease and their caregivers. *Int Psychogeriatr*. Jul 2012;24(7):1172-82. doi:10.1017/s1041610211002729

19. Taylor ME, Wesson J, Sherrington C, et al. Tailored exercise and home hazard reduction for fall prevention in older people with cognitive impairment: the i-FOCIS randomized controlled trial. *J Gerontol A Biol Sci Med Sci*. Sep 19 2020;doi:10.1093/gerona/glaa241

20. Toots A, Wiklund R, Littbrand H, et al. The Effects of Exercise on Falls in Older People With Dementia Living in Nursing Homes: A Randomized Controlled Trial. *J Am Med Dir Assoc*. Jul 2019;20(7):835-842.e1. doi:10.1016/j.jamda.2018.10.009

21. Wesson J, Clemson L, Brodaty H, et al. A feasibility study and pilot randomised trial of a tailored prevention program to reduce falls in older people with mild dementia. *BMC Geriatr*. 2013;13(1):89-89. doi:10.1186/1471-2318-13-89

22. Zieschang T, Schwenk M, Becker C, Uhlmann L, Oster P, Hauer K. Falls and Physical Activity in Persons With Mild to Moderate Dementia Participating in an Intensive Motor Training: Randomized Controlled Trial. *Alzheimer Dis Assoc Disord*. Oct-Dec 2017;31(4):307-314. doi:10.1097/wad.0000000000000201