

POSTER PRESENTATION 3: PHYSICAL AND MENTAL HEALTH

Developing innovative digitalized community-based senior exercise program to improve older adults' cognitive and physical functions

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Purpose The impact of COVID-19 on the quality of life for older adults (i.e., aged above 65) who live in senior living facilities has been disruptive and detrimental regarding all aspects of their cognitive, physical, and emotional health. The pandemic forced older adults to encounter limited physical activities and increased rates of social isolation, loneliness, and unexpected bereavement, resulting in significant reduction in cognitive/physical/mental function of older adults, especially those living senior facilities. As we are rapidly recovering from COVID-19 pandemic, health care providers (HCPs) face significant challenges to meet the increased yet various health needs of the vulnerable aging population, most importantly, their need for living an “Active and Healthy Aging (AHA)” without physical dysfunction and dementia. The desire for AHA without having physical or mental dysfunction becomes more important than ever (WHO, 2020a). The purpose of this study is to develop Digitalized Community-based Senior Exercise Program (DCSEP) which can improve cognitive and physical functions of older adults with minimal or mild cognitive impairment (MCI). This is the stage 1 study, which will be followed by a pilot intervention study (Stage 2) and a quasi-experimental, multi-measure pre/post-test research study with large sample size (stage 3). **Method** Square-Stepping Exercise (SSE), created by Shigematus and Okura in 2006, was specifically developed for older adults aimed at decreasing the risk of fall-related injuries by improving their cognitive and overall balance functions. To overcome several limitations of the original SSE program, a new format of SSE program with an innovative approach was developed to allow each participating older adult to have an individualized SSE exercise pattern based on his/her cognitive and physical function level while she/he enjoy group exercise in community setting. This Digitalized Community-based Senior Exercise Program (DCSEP) was developed by Interdisciplinary research team of nursing, kinesiology, IT, and statistics, utilizing IoT, ubiquitous network integrated exercise mats (AHA mats), associated operating software, and management system integrated with I-Pad to improve cognitive and physical functions of older adults residing in senior living facilities. For the purpose of this study, the cognitive function is operationally defined as the score measured by Montreal Cognitive Assessment (MoCA), and physical function as the scores measured by Berg Balance Scale (BBS) and Time Up and Go Test (TUG). **Results and Discussion** This program is among the first system to adopt an innovative digitalized AHA mats, the associated operating software with data management system (AHA system). The pilot study using this innovative DCSEP, which is the next stage following by this study, will be conducted in 2023 to evaluate the multi-layered impacts of DCSEP on improving cognitive and physical functions of older adults with minimal or mild cognitive impairment (MCI) residing in older adults. The results from the pilot study will provide solid data base to expand the use of DCSEP as sustainable tool nationwide to prevent MCI's progress to dementia and fall-related injuries. It will also help us expand its use to older adults with severe cognitive impairment and dementia residing in assisted living facilities who has extremely minimal chances for health promotion.

Keywords: active & happy ageing (aha), aha index, square stepping exercise, cognitive-body coordination

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AHA Platform Service Design

Active & Happy Ageing (AHA) Index based Service Platform

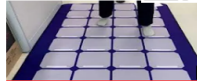
AHA Digitized Stepping Mat

- Data collection and information delivery through sensors
- Controller box with Bluetooth communication, speaker, C-type lithium battery
- 25×25 (cm) 40 squares (4×10)
- LED lights (Red, Green, Yellow)
- Acrylic material, fixed mat



AHA Digitized Rhythmic Mat

- Data collection and information delivery through sensors
- Controller box with Bluetooth communication, speaker, C-type lithium battery
- 25×25 (cm) 40 squares (4×10)
- LED lights
- PVC material, flexible mat



AHA Platform



- 220 stepping patterns
- Human pose estimation software
- Unlimited Songs(Rhythmic Mat)

AHA Index

- Physical / Longevity Age
- Cognitive Screening Test
- Happiness Score (10 factors)
- Collected Cognitive-Motor Coordination Data

Applications for Users / Instructors

- Analysis, Statistics, Notification Service
- Users' exercise history information
- Managing Users/Leaders Activities
- Managing Device Connections
- Pre-Post AHA data(history) Report



Empirical Studies

- Pangyo Social Welfare Center
- Seongnam Sports Complex
- Kolon Sporex, Paju
- School of Nursing, Texas A&M University, USA
- Dept. of Computer Science, Kent State University, USA

