

# A Community-Based Trial of Novel Applications for Cognitive Decline Detection and Management

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**Abstract**— An ageing population results in the increased prevalence of conditions such as dementia. Two mobile apps have been developed to assist with both the assessment and management of cognitive decline. This paper describes the initial findings unveiled during a 6-month trial and presents suggestions for improvement in their usability.

## I. INTRODUCTION

The ageing population is resulting in an increased prevalence of chronic conditions. One such condition is dementia, which was estimated to affect 46.8 million globally in 2015, and is predicted to reach 74.7 million in 2030 [1]. The Northern Ireland Connected Health Innovation Centre (NI-CHIC) is based at Ulster University, and focusses on business-lead research within the domain of connected health [2]. NI-CHIC is working with Redburn Solutions, Fingerprint Learning, Ann's Home Care, Engage with Age and the Alzheimer's Society in Northern Ireland to develop two mobile apps for use with healthy older adults and those with dementia to detect and manage the impact of cognitive decline. A trial is currently being undertaken to investigate usability by the target population. BrightLightOn was designed as an alternative to the Mini-Mental State Examination (MMSE) which is used for the clinical assessment of dementia progression. The approach is based on the Lüscher color test which evaluates psychophysical state based on color preferences. Users are asked to select colors they associate with a series of words by pressing the desired color on-screen. The solution aims to be capable of generating metrics providing assessment scores of areas including language, orientation, concentration and semantic memory. The BrainFit Plan, designed for the purposes of reducing the impact of cognitive decline, focusses on the prescription of brain training activities based on user preference. The app asks the user 14 questions and recommends activities that can be completed on the tablet based on the answers provided. Activities focus on areas including executive function, short term memory, linguistic, numerical, and visuospatial functioning. Recommended activities consist of relevant apps chosen from the Google Play Store.

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## II. TRIAL DETAILS

The data collection phase of the trial started in January 2016, with a duration of 6 months. Participants consist of 8 participants diagnosed with early stage dementia, 11 healthy older adults and 4 participants who are cognitively healthy but require long term domiciliary care provided by Ann's Home Care. All participants were aged over 65 years old. The apps have been deployed to Nexus 9 tablet computers. All participants are visited once per month by a health scientist from NI-CHIC in order to complete the BrightLightOn assessment in addition to an MMSE assessment. Participants recruited from Ann's Home Care are asked to use the BrainFit Plan for 4 months.

## III. INITIAL RESULTS

Usability issues have been monitored in the initial stages of the trial. All users were able to complete the questionnaire component of the BrainFit Plan. Every user preferred the use of a stylus in order to assist with interaction. This was often due to dexterity issues and an unfamiliarity with touch screen interfaces. Many users preferred to set the tablet on their knee or a table rather than holding. All users recruited from Engage with Age were able to complete the BrightLightOn test without noteworthy issues. Those recruited from Ann's Home Care and the Alzheimer's Society were able to complete the BrightLightOn test, however, many of the users struggled with the length of the test. In response to this feedback, the app was amended to facilitate the use of a short (60 words), medium (81 words) or full length (108 words) test. Despite the BrainFit app being designed with a simplistic user interface, all users struggled with the complexities of Android's user interface on a touch screen device. For example, holding the device occasionally resulted in accidentally switching on the flashlight, or accidentally exiting the current app. Many apps within the Google Play store were not suitable for use by older adults due to complexity or the size of user interface components. Only apps without advertisements could be used due to the risk of accidental clicks and uncontrollable content. As the trial continues, an analysis of the comparison between MMSE and BrightLightOn scores will be performed in order to assess the ability of BrightLightOn to detect and quantify the progression of Alzheimer's disease.

## REFERENCES

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