The Educational and Supportive Mobile Application for Caregivers of Dementia People

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Abstract. This paper presents a healthcare mobile app for caregivers of dementia patients. The app had been implemented to run on wearable and mobile devices, and it helps caregivers to take dementia test, review dementia test history, and search location of public health centers in the vicinity. The collective purpose of these features is to provide meaningful healthcare services to elderly at risk of dementia. The app uses the time and change (T&C) test for screening for dementia. The app was tried for its validity and usability for the intended purpose, and participating users were surveyed to evaluate its usefulness.

Keywords. Dementia, Smartphone application, Dementia caregiver, Wearable mobile device, Cognitive testing function

1. Introduction

About 7.7 million people have being observed with dementia each year. According to "Dementia Prevalence Rate Report, 2012" from the Ministry of Health and Welfare in South Korea, the dementia prevalence rate has been on a steady rise as South Korean society is aging quickly; there were 54 thousand confirmed cases of dementia in the country as of 2012. It is expected that the number of patients would double every twenty years, so the number of patients with dementia would reach 1.27 million by 2030 and 2.71 million by 2050 [1, 2]. Early diagnosis can help slow down the progress of the condition, however, the majority of the public have incorrect ideas of dementia, harming/hindering the chances of adequate response, and there are often lots of cases that the patient is sent to hospital for diagnosis when it is too late. The overarching goal of the app is helping the elderly at high risk of dementia by educating them on the status of severity level, performing screen tests to detect those with deteriorating cognition, and providing relevant information to the caregivers. Additionally, the app allows the user to view the time test and cognition (T&C) test result history and find public healthcare centers in the vicinity.

2. Methods

The app was developed on the Android platform. The development environment involved Android Studio and Java SE Development Kit for coding, LG G2 for smartphone, and LG G watch for smartwatch. These two devices communicate through Bluetooth to perform screen test.

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3. Results

The app fetches the GPS coordinates and locates public healthcare centers in the vicinity, and provides with the mini-mental state examination (MMSE) as well as an assortment of reliable cognition tests, including voice recognition test. Within the context of the time and change test for dementia screening test, the app measures user's response time and suggests test results.

The time and change (T&C) test is easy to use, reliable, and quick to administer to screen test for dementia [5]. In the time test of our app, the user sees an analog clock with an hour hand and a minute hand and tells to his/her caregiver the time with precision within 60 seconds. In the change test, the user receives/takes coins - 3 quarters, 7 dimes, and 7 nickels - and makes a combination of the coins to the sum of one dollar within 180 seconds. Time to completion is recorded in each test, and the user can retry the test when failing to achieve test goals.

Next, a poll was conducted to find out the overall usefulness of the app by experienced users. We polled 17 users in ages between their 40s and 70s, and recorded their age, gender, occupation, as well as user satisfaction after using the app. The Likert-type scale was used between 1 and 5, with 5 being most satisfied and 1 not satisfied at all. None of the poll participants had tried a dementia screening test service previously. The majority of them indicated the app is easy to use so that we found little difficulty of the app's comfort. In a while, a few pointed to the small font on the smartwatch and thought the questions were not readily understandable. The participants indicated that this type of dementia screening test is more convenient than the traditional pen-and-paper type.

4. Discussion

The app is limited only to Android platform and it needs to be converted to web-based service to support various platforms. The majority of the conventional dementia screening tests are pen-and-paper-based, thus they are not tailored for testing on a digital device. More work should be done to devise tests suitable on digital device platforms. The data used in the app needs to comply with existing standards in order to ensure interoperability among devices because the app transfers personal health data via digital devices. FHIR(Fast Healthcare Interoperability Resources) of HL7(Health Level 7) can be adopted for standardization of the web app platform. The current work used only a simple dementia screening test, however, the user's vital signs, language, behavioral characteristics could be exploited to enhance accuracy of screening test.

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