



# Mindful Age and Technology: Promoting Quality of Life in Older Adults with a Tablet/Smartphone App

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**Abstract.** Based on the Langerian definition of mindfulness, we created a smartphone App to promote cognitive flexibility, curiosity, novelty seeking, and creativity in a population of older adults. So far, we have tested it on 68 participants, randomly assigned to the experimental group or to a wait-list control group. Between group comparisons failed to detect a significant effect on quality of life, though qualitative analysis report a positive impact of the App over participants' lives.

**Keywords:** Mindfulness · Smartphone apps · Older adults · Quality of life

## 1 Introduction

Ageing and technological innovation are two important topics of current times. As life expectancy has increased, traditional health care systems have faced different challenges in terms of costs-effectiveness as well as high quality services delivery capability [1]. New ways to improve older adults' quality of life have been explored, taking advantage of new technological solutions: encouraging different and healthier lifestyles, making non-invasive assessments or delivering distance intervention [2–4]. Recent studies [5] suggest that mindfulness practice may lead to adaptive cognitive schemas' change and emotional self-regulation. Mindfulness can be considered as the simple act of paying attention to novelty, as opposed to being stuck in previous categories and schemas [6]. A mindful outlook is composed by flexibility, openness, curiosity, awareness, and creativity. It plays a key role in the ageing process, both from a psychological and biological perspective [6]. Under these assumptions, a tablet/smartphone application has been developed to promote cognitive flexibility, psychological well-being and an curious attitude to the present moment. The application of advanced technology to psychological and behavioral programs for older adults has been recognized as a promising solution for many issues, including depression, anxiety, and mild cognitive impairment [7].

## 2 Methods

The research design of this study is a randomized controlled trial, RCT, aimed to investigate the effect of a mindfulness-based smartphone App on the quality of life of an elderly sample. We were also interested, as secondary aims, to collect information about the effects of the App on psychological well-being, mindfulness disposition, locus of control, depression and anxiety. Participants were randomly assigned to the experimental condition, receiving the App for 14 days, or to a wait-list control group, which received access to the App after three months.

### 2.1 Assessments

The assessments considered here were conducted at the recruitment (T0, baseline), and after the treatment (T1, post-intervention). The following questionnaire were administered:

- The Psychological General Well-Being Index (PGWBI) was used to evaluate subjective mental health. The 22-item questionnaire is commonly use to generate a self-perceived evaluation of subjects ‘psychological well-being expressed by a summary score [8].
- The 14-item version of the Langer Mindfulness Scale (LMS), was used to assess mindfulness. It asses four domains associated with mindful thinking: novelty-seeking, engagement, novelty producing, and flexibility [9].
- The Geriatric Depression Scale (GDS) and the Geriatric Anxiety Inventory (GAI) were used to screen for depression or anxiety within the participants. Both test, specifically designed for the elder population, are largely considered to be able to effectively discriminate between patients with or without depression or anxiety symptoms [10, 11].

Together with the questionnaires, we included a semi-structured interview, which were administered to evaluate subjects’ attitude towards technology and related alterations, considered to be influential factors in the acceptance’s process and usability of the smartphone application.

### 2.2 Participants

Participants were recruited with the support of 7 different institutions that provide advance education to older adults. So far, 68 participants where recruited for the protocol from the selected structures. All participants were volunteer.

Inclusion criteria were:

- Age > 65
- Mini-Mental State Examinations, (MMSE; 14) > 18
- No severe neurological or medical condition, according to medical records.

### 2.3 Intervention

The App was developed with the MIT App Inventor Software (<http://appinventor.mit.edu/explore/>) and consists of a set of theoretical explanations plus fourteen exercises: half of them linked to logical reasoning while others aimed to share and adopt mindfulness abilities. In the first 7 exercises, participants are cognitively stimulated with simple puzzling tasks, ensuring greater adherence to the protocol due to the ludic engagement experience and easily achievable positive reinforcements resulting from the questions' solution. The other 7 exercises instead require a different approach, stimulating creative and non-conventional solutions, with clear references to everyday situations. Some of the exercises provide audio or video files explaining mindfulness fundamental concept, maintaining an easy and simple language suitable for the specific needs of the users. The entire intervention lasted fourteen days, with one daily exercise/task to be completed. Participants were able to perform all the exercise on their own, wherever they preferred. By completing the first exercise, the App automatically unlocked the next one for the specific next day, allowing users to only complete one task for each day.

## 3 Results and Discussion

Although this research is still at a preliminary stage, descriptive statistics of data analysis have shown difference between mean score of the groups. In all measured outcomes, participants belonging to the experimental group shown more suitable scores underlining a more adaptive response. Data analyzed in this first stage of the research project, although not statistically relevant, proved to be clinically encouraging (Table 1).

**Table 1.** Measures collected after the intervention.

Assessment	Intervention group (mean, SD)	Control group (mean, SD)	T-test
PGWBI	88.14 (15.36)	87.9 (11.76)	t(40) = .056, p = .232
LMS	1.87 (.07)	1.86 (.08)	t(40) = .233, p = .861
GDS	.035 (.29)	.44 (.31)	t(27) = -.747, p = .817
GAI	.42 (.429)	.53 (.041)	t(33) = -.781, p = .974

The qualitative data analysis and codification of the semi-structured interview has highlighted how 45% of the entire sample successfully used the App, while only 7% of the participant declaring not to use it ever. These preliminary data, in line with research hypotheses, show how the elderly population can respond positively to interventions involving different forms of technology, overcoming the stereotype that wants this specific kind of subjects as reluctant to technology. When asked: "Do you believe technology could be useful increasing your wellbeing?", 62% of the subject answered yes, with only 16% of the respondents declaring not to know it clearly. A further

analysis of the data collected specifically from the subjects belonging to the experimental condition, found how 66% of the sample have been able to use the smartphone application every day, with only 34% reporting small difficulties with the daily exercise, thus being able to finish the 14-exercise program during the 2 given weeks of the trial.

To the question aimed at understanding how participants felt the applications could have helped them, or what kind of benefits they derived from it, 28% underlined cognitive training, 24% finding alternative and possible solutions to daily problems, 14% highlighted realizing how more points of view could coexist on a single issue and 9% reported mixed benefits, such as memory training or attention improvements.

Since the research protocol is still in progress, further data and specific results analysis will be presented at the conference. This first experimentation of integration between technology and psychology has, however, shown numerous potential, being welcomed by the elderly population and proving to be clinically valid in promoting psychological well-being of the subjects. Future perspectives, therefore, seem to indicate this research line as innovative and extremely important, succeeding in filling a generational gap between psychological demand, technology and clinical practice.

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