The feasibility of TECH: Tablet Enhancement of Cognition and Health, a novel cognitive intervention for people with Mild Cognitive Impairment

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Abstract— **This paper presents a novel cognitive intervention utilizing touchscreen tablet applications for self-training: TECH-'Tablet Enhancement of Cognition and Health' and examined its feasibility for older adults with Mild Cognitive Impairment (MCI). A single-blind randomized controlled trial was conducted and participants were allocated to TECH (experimental) or control group. This paper focuses only on the TECH group. Twenty-three community-dwelling older adults with MCI (age range 70-87) participated in the TECH groups. Feasibility (adherence and satisfaction from the program) was high. Data collection is still ongoing to establish the effectiveness of TECH for people with MCI.**

Keywords—cognitive training, touchscreen tablets, older adults

I. INTRODUCTION

Mild cognitive impairment (MCI) is a newly developed intermediate stage of cognitive impairment that is often, but not always, a transitional phase from normal ageing cognitive changes to dementia [1-3]. People with MCI experience mild memory and executive functions problems. Yet they retain awareness for their impairments, which allows them to acquire metacognitive and compensatory strategies [4].

The use of touchscreen tablets, which are commonly-used and popular devices, might be an effective way to deliver cognitive training in a fun and motivating manner. Cognitive training using tablets uses puzzle-games applications (apps), which activate various cognitive components such as visual perception, problem solving, working memory etc. The purpose of this paper is to present a novel cognitive intervention utilizing tablet apps - the TECH protocol (Tablet Enhancement of Cognition and Health) and to examine the protocol feasibility for people with MCI.

II. METHODS

A. Trial design

A single-blind randomized controlled trial (RCT) was conducted, This paper focus on the experimental group, which entailed five weekly-groups meetings and daily self-training using the tablet.

B. Population

Older adults (>65 years), who live in the community and report having memory problems. Inclusion criteria; Mild cognitive impairment (MCI), independence Daily Living, with normal or corrected vision and hearing, speak, write and read Hebrew, able to use touchscreen tablet after initial demonstration. Individuals were excluded if they experienced severe depressive symptoms, and if they were diagnosed with dementia, or other neurological or psychiatric conditions.

C. Assessment Tools to assess Feasibility

Feasibility of TECH protocol included Adherence and Satisfaction from the program. Adherence was assessed by Self-training time – the total training hours a week, taken from participant's daily logs and iPad Screen time information. Attendance during the Six weekly group sessions was registered. Satisfaction from the intervention was determined by a questionnaire, developed for the study, included questions such as "How satisfied are you with the intervention", "How much did the self-training motivate you to make an effort".

D. TECH intervention

a) Group-based sessions: Weekly-hour sessions over 5 weeks, in a small group setting (4-6 participants) took place

and was led by an experienced occupational therapist. Sessions focused on tablet operation, exploring and practicing new apps, obtaining feedback of the past week, relearning previous apps to increase the ability for self-operating. Participants were taught and asked to monitor their training sessions using a daily log page. Each participant received a booklet with explanations and photographs of the tablet and app operation. The training sessions provided social support to enhance motivation..

b) Self-training: Participants received iPads to take home to perform the self-training; 3-5 times a week X 30-60 minutes, for a total of 15-25 training sessions. Participants were requested to play puzzle-apps, to practice different cognitive components. For example, 'Buttons and Scissors' app (KyWorks Software) requires planning, visual perception and problem solving abilities for participants to "cut off" buttons in the same color with a "scissors" so the fabric will be button-free. For each self-training session participants were asked to practice at least two puzzle-game apps, from a list of selected apps. In addition, participants were encouraged to use the tablets for a variety of everyday uses such as banking, news reading, on-line information seeking etc.
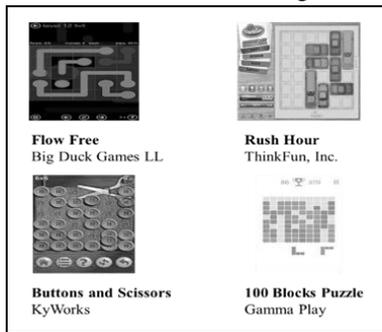

Fig. 1. Examples of apps used for TECH self-training – **Name** and Company

E. Data analysis

Descriptive statistics were used to characterize the sample, and describe the feasibility of TECH intervention.

III. Results

23 participants with MCI [11 women and 12 men aged 70-87 (mean age 76.9)] were allocated to the TECH intervention group and are included in the analysis of this paper. Most participants reported to use a smartphone or/and a computer on a daily basis, a few had previous tablet experience (Table 1).

During the intervention, two participants dropped-out due to deterioration in health condition (N=1) and lack of interest (N=1), therefore Feasibility data is regarding the remaining 21 participants. Adherence was high; participants self-trained on average 19.8 training sessions over the five weeks, total self-training time ranged from 9.2-50.1 hours (mean total training time of 24.7 hours, 4.9 hours per week). All participants attended at least 80% of the group sessions.

79% of the participants reported very high satisfaction with the program and 84% reported that the intervention motivated them to a great extent to make an effort. 83.3% reported that they would be interested in continuing to practice using tablets on their own at the end of the intervention.

TABLE I. DEMOGRAPHIC INFORMATION (N=23)

	Mean (SD)	Min-Max
MoCA (0-30)	22.6 (1.9)	19.0-25.0
Education Years	13.5 (4.4)	8.0-30.0
	N (/23)	**%**
Residence with spouse	19	82.6
Retired	18	78.3
Drive	19	82.6
Computer use	18	78.3
Smartphone use	20	87.0
Tablet use	5	21.7

IV. Discussion

TECH is a novel intervention based on self-training of puzzle tablet-apps, aiming to enhance cognition, and prevent cognitive deterioration of adults with MCI. TECH was found to be feasible for adults with MCI, who managed to operate tablets independently and trained on average almost 25 hours over 5-week intervention. The intervention was found to be suitable also for older adults with no previous tablet experience who successfully learned how to use different apps. Participants were highly satisfied with the intervention, and motivated, resulting in high adherence; high attendance and self-training time. Further research is needed to establish the TECH effectiveness in maintaining and improving cognitive function of people with MCI.

References

[1] R. C. Petersen, B. Caracciolo, C. Brayne, S. Gauthier, V. Jelic, and L. Fratiglioni, "Mild cognitive impairment: a concept in evolution," J Intern Med, vol. 275, pp. 214-228, March 2014.

[2] R. Roberts, and D. S. Knopman, "Classification and Epidemiology of MCI," Clin Geriatr Med, vol. 29, pp. 753-772, November 2013.

[3] P. Werner, and A. D. Korczyn, "Mild cognitive impairment: conceptual, assessment, ethical, and social issues," Clin Interv Aging, vol. 3, pp. 413-420, 2008.

[4] L. L. Levy, "Cognitive aging," in Cognitive, occupation, and participation across the life span, N. Katz, Ed. The American Occupational Therapy Association, 2011, pp. 117-141.