“Be-SMART” computer-assisted Training Program for Elderly Patients with memory decline: RCT

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Outline of presentation

- Background / Objective of the project
- Literature review
- Research design
- Computer-assisted memory training
  - Be-SMART program
- Results
- Discussion / sharing of training resources
- Conclusion
Objective of Cognitive Health Study

The aim of the study is to develop and evaluate the training outcome of "Be-SMART" computer-assisted memory training programme, compared with the control group, using conventional treatment as usual.

The study includes the community based intervention and hospital based intervention program.
Background

Prof. David Man, Dept of Rehabilitation Sciences, HKPU, pioneer cognitive health projects for the elderly, with collaboration with Occupational Therapy Dept of Kwai Chung Hospital and Neighbourhood Advice-Action Council (NAAC) for about 8 years.

New Mobile Errorless learning training programme was collaborated by clinical experts of OT Dept of Kwai Chung Hospital, OT Dept of Prince of Wales Hospital, and Prof. David Man, Neuro cognitive academic experts and colleagues of Dept of Rehabilitation Sciences of the Hong Kong Polytechnic University, with expert panel session and field tests.
By Prof. David Man, Dr. Grace Lee and research team
Project Implementation

Community Phase
■ Cognitive training programme is implementing in the six community elderly centres from Sept., 2014 to June, 2015

Hospital Phase
■ Cognitive training is implementing in OT Dept of Kwai Chung Hospital & OT Dept of Prince of Wales Hospital from Dec., 2014 to Dec., 2015, with the support from the Dept of Rehabilitation Sciences, the Hong Kong Polytechnic University
**Literature review/ computer training & cognitive decline**

- RCT study showed that computer training would delay the cognitive decline of subjects of MCI and dementia (Galante, Venturini & Fiaccadori, 2007); improve cognition after training (5 day/week; 20-25 minutes/ day for 6 months (Miller, et al., 2013)

- Feasibility and efficacy of intensive cognitive training for 21 early AD patients in U.S. showed that training of 10 days over 2 weeks of 4 to 5 hours individualized cognitive training (computerized or paper-and-pencil task) each day, showed post-test improved outcomes on MMSE, letter fluency & Trail-making tests, maintained effect at 2- & 4- month FU (Kanaan, McDowd, Colgrove, Burns, Gajewski & Pohl, 2014)

- A single-blinded RCT Computer-assisted errorless-learning based programme for 75 subjects, is found to be effective in enhancing the memory function of early Alzheimer's Disease older adults in Mattis Dementia Rating Scale, (p=0.001) (Lee, Yip, Yu & Man, 2014).
Computerised cognitive training in cognitively healthy older adults: a systematic review and meta-analysis of effect modifiers (Lampit, Hallock & Valenzuela, 2014)

- 51 RCT studies, 4885 healthy subjects of age 60 or above
- Aim of the review was to determine if computerised cognitive training (CCT) are able to enhance cognitive performance in healthy older adults
- Medline, Enbase and PsycINFO were searched for eligible RCT investigating the effects of more than 4 hours of CCT on performance in neuropsychological tests in older adults without dementia or cognitive impairment
- Conclusion: CCT is modestly effective in improving cognitive performance in healthy older adults (session: >30 mins & 2-3 /wk), but efficacy various across cognitive domains determined by the trial’s design choices. Training with a researcher is more effective than home based training.
Training Older Adults to Use Tablet Computers: Does It Enhance Cognitive Function? (Chan, Haber, Drew, & Park, 2014)

- A total of 54 older adults (age 60-90) committed 15 hr./week for 3 months. The extensive iPad training group was compared with 2 separate controls (a Placebo group / a social group).

- Result: Compared with both controls, the iPad group showed greater improvements in episodic memory and processing speed but did not differ in mental control or visuospatial processing.

Based on cognitive reserve and neuroplasticity theories that the brain’s neuroplasticity can be enriched through cognitive experience through training (Bell, et al, 2008; Berlucchi, 2011; Velligan, Kern & Gold, 2006).

Evaluation of a computer-assisted errorless learning-based memory training program for patients with early Alzheimer’s disease in Hong Kong: a pilot study

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Background: Improving the situation in older adults with cognitive decline and evidence of cognitive rehabilitation is considered crucial in long-term care of the elderly. The objective of this study was to implement a computerized errorless learning-based memory training program (CELP) for persons with early Alzheimer’s disease, and to compare the training outcomes of a CELP group with those of a therapist-led errorless learning program (TELP) group and a waiting-list control group.

Methods: A randomized controlled trial with a single-blind research design was used in the study. Chinese patients with early Alzheimer’s disease screened by the Clinical Dementia Rating (score of 1) were recruited. The subjects were randomly assigned to CELP (n = 6), TELP (n = 6), and waiting-list control (n = 7) groups. Evaluation of subjects before and after testing, and at three-month follow-up was achieved using primary outcomes on the Chinese Mini-Mental State Examination, Chinese Dementia Rating Scale, Hong Kong List Learning Test, and the Brief Assessment of Prospective Memory-Short Form. Secondary outcomes were the Modified
Be-SMART training program

- The programme is incorporated with techniques of errorless learning, spaced retrieval and vanishing cues (Clare & Jones, 2008; Kanaan, McDowd, Colgrove, Burns, Gajewski & Pohl, 2014; Lee & Man, 2008).
Research design / sampling

- An single-blind RCT, with pre-and-post test and 3 month follow up evaluation
- Subjects are allocated to intervention group or control group by random sampling
Research questions

1. Would the use of errorless memory rehabilitation programme improve the memory function of Chinese elderly patients/persons with memory decline?

2. Would there be any significant differences in the treatment effectiveness of the intervention group when compared with the control group?
Outcome Measures

- Montreal Cognitive Assessment – Hong Kong version (HK-MoCA)
- FULD Object Memory Evaluation
- Cantonese version on Comprehensive Assessment of Prospective Memory
Subject recruitment / sampling / evaluation

- 120 elder subjects with memory decline from 6 community centres (Community phase) & 60 subjects to be recruited from day/ out psychogeriatric/geriatric patients, with memory decline of OT Dept of KCH/ PWH (Hospital phase), are recruited according to the inclusion and exclusion criteria of research and allocated to intervention group or control group by random sampling.

- Independent blind assessor performed the pre-and-post test and the 3 months follow up evaluation.
Inclusion criteria

- Patients of age 60 or above
- With MMSE score of 18-28
- Community dwelling persons
- Male or Female
- Early dementia/MCI/ mem. decline
Exclusion Criteria

- Patients with attention span of less than 30 mins
- Patients with computer phobia
- Patients having epilepsy
- Patients with severe hearing and visual impairment
Be-SMART Mobile Computer Cognitive Training Program
Basic training: 15 sessions; Advanced training: 15 sessions (including 3 revision sessions; each session 30-45 mins)

「複習篇」單元會於學員每完成4個單元後自動出現
「複習篇」單元的題目，是根據剛完成的4個單元中自行隨機抽出
Example of daily life training tasks

Attention
- 請看以下相片，總共有多少件點心。

Visual memory
- 剛才見過多少輛停泊了的巴士？

Calculation
- 小點: $8  中點: $10  大點: $12  特點: $14
- 請問結帳時需付多少錢？

Categorization of objects
- 以下相片是相同類別，還是不同類別呢？
Memory strategies

Face-name recognition

記住人名/面孔方法

例如：李姑娘
- 木、子等於李
- 聯想起李姑娘喜歡
  吃雪「梨」，「梨」諧音
- 短頭髮，有戴眼鏡等
Gradation from basic to advance training – based on errorless learning strategy, with cognitive challenges

辨認物件:

交通燈(司機)

巴士站

危險警告燈

紅綠燈(行人)
Positive Reinforcement
**Data Analysis**

- Independent t test for baseline comparison & evaluate changes between groups
- Paired t test for within group comparison
Result: Initial Outcome I
(at 30.4.2015)

Community Phase
★ 35 subjects in intervention group and 26 subjects in control group
★ 12 male and 49 female
★ Mean age: 76.52 ± 7.74

Hospital Phase
★ 4 subjects in intervention group and 7 subjects in control group
Initial Outcome II

Significant changes in

- Cantonese version of Comprehensive Assessment of Prospective Memory – total score (p=0.031)
- FULD Object Memory Evaluation (retention) (p=0.019)
- Positive memory gain was found in the intervention group
Cantonese Comprehensive Assessment of Prospective Memory

Legend
- Blue: Pre-Assessment
- Green: Post-Assessment
- Red: Change in Treatment Group
- Yellow: Change in Control Group

- p=0.001
- p=0.329
- p=0.031
Discussion & Sharing of Training Resource

e.g. HKPU, HKADA, JCCPA, EMV ...
EBP Computer-assisted Errorless Learning Training for early dementia of HKPU (Lee, Yip, Yu & Man, 2014) - to be published
I-pad Training
e.g. Apps of HKADA
香港認知障礙症協會推出了一個平板電腦應用程式 (Ipad app) 名為「六藝智趣」，讓社會大眾能隨時隨地接觸認知障礙症 (前稱:老年癡呆症) 的資訊及認知遊戲。「六藝智趣」現可於 app store 免費下載！應用程式 (app) 的內容主要分為三部分：

一) 認知互動遊戲 - 利用中國傳統「六藝」(禮、樂、射、御、書、數) 的理念，製作多個活腦遊戲，例如書法、運算等，長者可透過遊戲全面地鍛鍊腦筋，有助延緩認知障礙；

二) 自我問卷檢測 - 問卷的問題都是普遍初期認知障礙症患者於日常生活中遇到的情況，完成問卷後會得到初步的建議，是否需要作詳細的評估；

三) 教育動畫短片 - 片內以故事形式講解認知障礙症的病理、病徵、藥物及非藥物治療等，從而提高公眾對認知障礙症的認識和了解。
Jockey Club Centre for Positive Ageing
One Click To Know Dementia
「腦退化一按知」

*Available on Android 4.0 or above and iOS 6.0 or above

Jockey Club Centre for Positive Ageing
ReSoPedia (Introduction on Rehabilitation Apps)
Conclusion

- Initial positive gain was found in the memory function in older adults with memory decline in intervention group (including the community / hospital based group), using tablet PC, incorporating errorless training program.

- More large scale RCT on factors affecting the cognitive function of older adults (e.g. healthy lifestyle or cognitive remediation program) might be implemented.
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- Patients / carers participating / supporting the research
- NGO collaborators, including staff, volunteers
- Participants of the projects
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Thank You!