



International Support of a Common Awareness and
Knowledge Platform for Studying and
Enabling Independent Living

Summary – Deliverable 6.21

Objectives

The overall objective of this package is to identify a standard, minimum set of software tools that could be used to provide support for care of elders and help them maintain high quality of life by providing a physical and cognitive health coaching intervention, with communications system suggesting tailored interventions

- Compilation and review of existing approaches to providing intervention based on data from unobtrusive monitoring in the home.
- Identify potential principles governing the interventions.
- Identify health and lifestyle goals of a broad base of elders.
- Develop definitions for requirements for systems to enhance communication for coaching and guidance in a wide range of areas including physical exercise, nutrition, sleep monitoring, medication management, stress management and socialization.

This is a companion workpackage to the Software and Interface workpage which looks at the real-time analysis and interaction needs of ICT solutions.

Project Objectives

The overall objectives for the Intervention Systems workpackage are:

1. Compile and review existing tools for health coaching.
2. Identify and document the known motivational interviewing and readiness-to-change principles of health behavior change.
3. Review existing tools that provide connections with personal health records (PHRs), disease management systems and electronic health records. Summarize the current interoperability standards.
4. Conduct a needs assessment of elders' health and lifestyle goals (across cultures, economic situations, rural vs urban, etc.)
5. Determine elder and family caregiver preferences for data sharing, communications media, messaging style, and privacy concerns.

6. Determine the issues to include in care protocols for cognitive coaching, physical exercise, nutrition, medication management, sleep, stress management, and socialization. Compile background materials to use as reference.
7. Understand preferences for interface design for elders, family caregivers and coaches (using paper or PowerPoint mock-ups).

Intervention paradigms will be introduced as an element within the CAPSIL Wiki. The CAPSIL approach to intervention systems will expedite the process of developing intervention software for research and development. The assembled CAPSIL's will allow researchers to identify the optimal approaches in designing, implementing and conducting field trials with these systems. Access to a knowledge base of standard building blocks for a wide range of clinical applications should contribute the stimulating enhanced activities in the area. As researchers use the CAPSILs such they will be able to provide feedback on the quality and accuracy of the information provide and to contribute their own inputs to continually evolve the CAPSILs.

Main objectives and tasks for this period were:

- To define a structure for the wiki entries related to Intervention Systems.
- Starting the state of the art analysis in Europe, USA and Japan.
- Create a preliminary version of the wiki entries.

Work Progress and Achievements during the Period

- Initial resources were assigned to the CAPSIL project by the WP leader, OHSU – Misha Pavel, Holly Jimison, Lakshmi Harinath.
- Attendance at the initial CAPSIL workshop in London, at which the high level structure of the Wiki and initial topics were agreed with partners and documented.

References

1. (2003) Adami, A. M., Hayes, T. L., & Pavel, M. Unobtrusive monitoring of sleep patterns. 25th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2, 1360-1363, Cancun, Mexico. 2. (2005) Adami, A. M., Hayes, T. L., Pavel, M., & Singer, C. M. Detection and classification of movements in bed using load cells. 27th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Shanghai, China.
3. Ambrogini P, et al. Learning may induce neurogenesis in adult rat dentate gyrus. *Neuroscience Letters*. 2004;359:13-16.
4. American National Standards Institute, HITSP Interoperability Specifications, http://www.ansi42.org/standards_activities/standards_boards_panels/hiisb/hiisb.asp?menuid=3 last viewed 2.10.07.
5. Ancoli-Israel S., Roth T. Characteristics of insomnia in the United States: results of the 1991 National Sleep Foundation Survey. 1. *Sleep*. 22 (Suppl 2): S347-S353.1999.
6. Ball, K., Berch, D., Helmers, K., et al., Effects of cognitive training interventions with older adults: A randomized controlled trial. *Journal of American Medical Association*, 288(18):2271-2281.
7. Bennett, DA, et al. Education modifies the relation of AD pathology to level of cognitive function in older persons. *Neurology*. 2003;60(12):1909-15.
8. Bigio EH, Hyman LS, Sontag E, Satumitra S, White CL. Synapse loss is greater in presenile than senile onset Alzheimer disease: implications for the cognitive reserve hypothesis. *Neuropathology and Applied Neurobiology*. 2002;28(2):218-27.
9. Blackwell T <http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Blackwell%20T%22%6BAuthor%6D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVCitation&...>, *Amc011-1sc*
10. Bruehl-Jungeman ES, Laroche, Rampon C. New neurons in the dentate gyrus are involved in the expression of enhanced long-term memory following environmental enrichment. *European Journal of Neuroscience*. 2005;21(2):513-21.
11. Campbell S.S., Dawson D., Anderson M.W. Alleviation of sleep maintenance insomnia with timed exposure to bright light. *J Am Geriatr Soc* 41, (8): 829-836. 1993.
12. Colcombe S, Erickson E, Scalf P, et al. Aerobic exercise training increases brain volume in aging humans. *J Gerontol Med Sci* 2006, 61A:1166-1170.
13. Colcombe, S. & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults: a meta-analytic study. *Psychological Science*, 14(2), 125-130.
14. Colcombe, S. J., Kramer, A. F., Erickson, K. I., Scalf, P., McAuley, E., Cohen, N. J., Webb, A., Jerome, G. J., Marquez, D. X., & Sternani, E. (2004). Cardiovascular fitness, cortical plasticity, and aging. *PNAS* 101(9), 3316-3321.
15. Curatolo P.W., Robertson D. The health consequences of caffeine. *Ann Intern Med* 99. (5 Pt 1): 641-653.1983.
16. Cutliff, C. C., (2008). Teaching the geriatric patient. Making the most of "cognitive resources" and "gains". *Orthop Nurs*, 27 (3), 195-8, quiz 199-200.
17. Derwinger A, Stigsdotter Neely A, Backman L. Design your own memory strategies! Self-generated strategy training versus mnemonic training in old age: an 8-month follow-up. *Neuropsychol Rehabil* 2005; 15:37-54.
18. Dobbs, B.M., (2008). Aging baby boomers-a blessing or challenge for driver licensing authorities. *Traffic Inj Prev*, 9 (4), 379-86.
19. Donders, FC. Die Schnelligkeit psychischer Prozesse. Erster Artikel. *Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin*, 1868, 657- 681.

- An on-going review of relevant academic literature was initiated (See Fig. 1)

Fig. 1 Literature Review sample

- An on-going review of commercial systems and solutions was initiated (See Fig. 2)

Commercial Products

Luminosity

<http://www.luminosity.com/> Cognitive training with computer games Recommended 10 minutes/day Feedback and adaptive models Sharp Brains <http://www.sharpbrains.com/> Newsletters Expert chats online Eboards on various cognitive health topics Recommended cognitive games Post Science <http://www.postscience.com/> Computer exercises designed to improve the user's ability to incorporate sensory information Basic Classic - auditory exercises to improve attention Insight - Computer games for visual processing MyBrainTrainer 39 short (one to three minutes each) interactive exercises requiring the user to respond rapidly to a series of random stimuli. Each exercise isolates a specific region of the brain. 21-Day Training - structured progression of exercises, 10-20 minutes / day MegaStats - displays average scores by age, occupation and gender BrainBoard - the place for members to trade tips and thoughts on brain training Newsletter - either online or in email box BrainDiary - enables one to monitor performance across several variables, e.g., time of day, hours of sleep, consumption of caffeine Happy Neuron Brain Fitness CD-ROM Recommend 20 minutes/day Addresses memory, language, logic, concentration, visual/spatial skills CogniFit <http://www.mindfit.com/> MindFit - computer exercises adapted to the individual, sharpening memory, eye-hand coordination, multi-tasking abilities Recommended 20 minutes per day, 3x/wk MindFit Back on Track - for women recovering from Br Ca Golden DriveFit - sharpening driving skills at advanced age

Nintendo

Brain Age - handheld game device with cognitive computer games Calculates "brain age" Least scientific, least tested Spry Learning <http://www.sprylearning.com/> 9 cognitive computer games designed for elders Embedded monitoring algorithms Adaptive presentation Being integrated with a cognitive health coaching tool at OHSU These are all commercially available cognitive training systems, with varying degrees of scientific underpinnings and evaluations. All offer a potentially inexpensive and scalable approach to improving cognitive health. The clinical effect size of such interventions under maintenance use has not been fully tested. In addition, long-term usage without motivational encouragement could be a severe barrier. New work in cognitive health coaching, designed to motivate and manage cognitive health remotely is under development. However, this is a nascent field that is changing rapidly. A scalable and low-cost approach could be very effective in keeping elderly people independent and able to age in place.

Fig. 2 Commercial Products sample

- Initial Intervention Systems Wiki pages created
- Structure agreed for private TwiKi, to act as repository for CAPSIL research materials, later to be distilled into public facing Wiki.
- Initial content migrated to closed TwiKi

Results

- Resources assigned to project
- High level Wiki structure agreed
- State Of The Art analysis and literature review begun: provisional results indicated that:
 - there must be a concentration on self-management systems
 - chronic disease is very costly and so must be targeted
 - the lower wage healthcare provider must be used
 - solutions must be scalable
 - solutions must be interoperable with new and existing healthcare record systems
 - smoking and weight management were key areas.
- Private TwiKi populated with resource material