

R. DAVID (Convener) Use of information and communication technology (ICT) for dementia patients: From assessment to intervention. Gerontechnology 2014; 13(2):81; doi:10.4017/gt.2014.13.02.043.00 **Participants** A. König (Netherlands), P.C. Chung (Taiwan), F. Bremond (France), P.H. Robert (France), R. David (France). **Issue** In Alzheimer's disease (AD) and related disorders, none of the classical assessment tools, mainly scales and questionnaires, fully capture the complexity of the disease. Information and Communication Technologies (ICT) provide an innovative assessment tool and may also provide assistive non-pharmacological strategies for the management of behavioural disturbances and the improvement of cognitive abilities. **Content** AD is associated with cognitive decline as well as behavioral changes and a loss of autonomy for activities of daily living. Although no curative treatment for AD currently exists, early AD detection along with early care using pharmacologic and non-pharmacologic approaches can delay institutionalization, slow cognitive and behavioral disturbances, and reduce healthcare costs. ICT may improve clinical assessment of behavioral disturbances associated with dementia, provide more objective and reproducible evaluations, and could provide non-pharmacologic approaches to treatment, such as stimulation therapies, to improve behavioral and cognitive impairments. First, this symposium will present results from experiments using ICT as assessment tools (including wearable sensors such as actimeters and video cameras, and environmental sensors such as automatic video recognition cameras) and as stimulation tools (use of serious games to improve physical activity, cognition and apathetic behaviors). Then, we will present a French-Taiwanese collaborative project called Safe and Easy Environment for Alzheimer's disease (SafEE) aimed at combining wearable and environmental sensors to improve short- and long-term behavioral and cognitive assessments, and propose tailored therapeutic strategies for physical activity, behavioral disorders and cognitive improvement. **Structure** Four papers will be presented, followed by a question-and-answer session and general discussion. **Conclusion** Due to the increasing cost of AD care and lack of available pharmacologic therapies, ICT could provide alternatives designed to improve clinical assessment of AD impairments and reduce several behavioral disturbances and loss of autonomy.

Keywords: Alzheimer, dementia, assessment

Address: Resources and Research Memory Center, Nice Sophia-Antipolis University, France

E: david.r@chu-nice.fr

A. KÖNIG, P. AALTEN, F. Verhey, R. David, P.H. Robert. Use of ICT for the assessment of dementia patients. Gerontechnology 2014;13(2):81-82; doi:10.4017/gt.2014.13.02.054.00 The European Commission project FP7 Dem@Care aspires to contribute to the timely diagnosis, assessment, maintenance, and promotion of self-independence for people with dementia by deepening the understanding of how the disease affects their everyday life and behavior. This project implements a multi-parametric, closed-loop, remote management program that affords adaptive feedback to the person with dementia, while at the same time including clinicians in the remote follow-up, enabling them to maintain a comprehensive view of the health status and progress of the affected person. **Scientific objective:** The presentation will include the objectives of the project in the research, development, and application of multi-parametric monitoring of daily activities, lifestyle, and behavior. Results will be presented for the multisensor assessment of daily living activity for patients with either Alzheimer's Disease (AD) or Mild Cognitive Impairment (MCI) and for elderly controls. **Purpose** Assessment and care for AD and related disorders are becoming increasingly more complex and heterogeneous. None of the classical scale and staging systems fully capture the complexity of the disease. In this field, the use of Information and Communication Technologies (ICTs) is an innovative method for assessment and may represent a promising tool for professional as well as family caregivers. This paper describes the development of assessment methods to detect behavioral changes and a decline in functionality. These methods consist of a multi-sensor system for automatic activity recognition. The goal of this research is to provide clinicians a comprehensive image of a person's condition and illness progression. **Method** Three groups consisting of 15 healthy elderly subjects, 15 MCI patients, and 15 AD patients were asked to carry out a 30-minute standardized scenario while being recorded with several video, audio, and move-

ment sensors. The protocol included directed activities (execution of motor tasks), semi-directed activities (execution of Instrumental Activities of Daily Living or IADLs), and undirected 'free' activities. Recorded data output of the different sensors were analyzed in order to determine relevant markers that predict decline in functionality measured objectively with the help of ICTs. **Results & Discussion** Recordings of activity levels, execution of IADLs, and speech fluency capture the patients' functional and cognitive status with a high degree of accuracy^{1,2,3}. It has been shown that the data coming from the different sensors can provide meaningful additional information to clinicians for assessment and diagnosis purposes. Additionally, this new method may overcome former evaluation problems that result from biases and lack of reproducibility that are often present in clinical practice.

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Address: School for Mental Health and Neuroscience, Maastricht University, Netherlands

E: a.konig@maastrichtuniversity.nl

W-H. WANG, P-C. CHUNG, Y-L. HSU, M-C. PAI. **Use of ICT in dementia from assessment to intervention: The Taiwanese contribution to the SafEE project.** *Gerontechnology* 2014; 13(2):82-83; doi:10.4017/gt.2014.13.02.174.00 **Purpose** SafEE (Safe and Easy Environment for Alzheimer's disease) is a French-Taiwanese collaborative project on technologies for health and autonomy, aimed at improving safety, autonomy and quality of life of older people diagnosed with Alzheimer's disease (AD) and related disorders. The Alzheimer's disease population is growing dramatically. In 2006, 26.6 million people were afflicted by AD, and the number could quadruple by 2050¹. Patients with AD and dementia, gait disorders, cognitive frailty, and memory impairments will increasingly become more impaired as the patients' illnesses progress^{2,3}. Even worse is that AD cannot be cured, and patients rely on the drugs only to postpone the symptoms. Hence, the SafEE project focuses on specific clinical targets in three domains: behavior, motricity and cognition, merges assessment and non-pharmacological help/interventions; and proposes easy ICT device solutions for the end users. **Method** SafEE is a 3-year project involving industrial and university partners. In this project, an ICT-based behavior analysis platform had been developed. This platform is able to detect, recognize, and assess walking/balancing capabilities, orientation and procedural memory. A device consisting of a triaxial accelerometer, a uniaxial gyroscope, and a biaxial gyroscope was developed to collect the signals while participants walked and took some balance tests. In this project, participants are patients with Alzheimer's disease and healthy people. We asked participants to complete single-task and dual-task activities while walking. The balance tests included four subtests: (i) basic balance tests, (ii) single-leg balance tests, (iii) Timed Up-and-Go test, and (iv) repeated chair stands test. In the basic balance tests, participants were asked to engage in specific movements, including the side by side stand and semi-tandem stand. Each of the tests was completed open eyed and close eyed. In the single-leg balance tests, participants needed to stand on one foot (right and left, in respective tests) with open eyes, for 10 seconds or less if the patient encountered difficulties. In the Time-Up and Go Test (TUGT), participants were asked to stand up from an armchair, walk 3 meters, turn, walk back, and sit down on the armchair. In the repeated chair stands test, the examiner asked the participant to make the first chair stand, from sit to stand position without using their arms. The examiner then asked the participant to do the same action 5 times in a row. **Results & Discussion** Preliminary results show that an automated detection algorithm can accurately detect the patients' stride and gait parameters (e.g., stride length, stride frequency) using the wearable device we developed. The results also show that the AD patients have poor performance in the semi-

tandem stand (both the left foot in front and right foot in front). In the repeated chair stands test and TUGT, AD patients needed more time to complete the tests than healthy people.

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Address: National Cheng Kung University, Tainan City, Taiwan; **E:** oneway1027@gmail.com

F. BREMOND, R. DAVID. Use of ICT in dementia from assessment to intervention: The French contribution to the SafEE project. Gerontechnology 2014;13(2):83;

doi:10.4017/gt.2014.13.02.094.00 **Purpose** SafEE (Safe and Easy Environment for Alzheimer's disease) is a French-Taiwanese collaborative project on technologies for health and autonomy aimed at improving safety, autonomy, and quality of life for older people diagnosed with Alzheimer's disease and related disorders. More specifically the SafEE project: (i) focuses on specific clinical targets in three domains: behavior, motricity, and cognition; (ii) merges assessment and non-pharmacological help/intervention; and (iii) proposes easy ICT device solutions for end users. **Method** French partners within SafEE are designing an ICT system combining event automatic video recognition with actigraphy components. This system is detects, recognizes, and assesses daytime (such as agitation) and night-time (such as sleep disturbances) behavioral patterns (BEHAVIOR), walking/balancing capabilities (MOTRICITY), orientation, and procedural memory (COGNITION). Event models combine a priori knowledge of the scene (3D geometric and semantic information, such as contextual zones and equipments) with moving objects (e.g., a Person) detected by the monitoring system. The event models follow a generic ontology based on natural language, which allows domain experts to easily adapt them for a variety of tasks. The framework's novelty relies on combining multiple sensors at the decision (event) level, and handling conflicts using a probabilistic approach. The proposed approach for event conflict handling computes the event reliability for each sensor, and then combines them using probabilistic assessment with an alternative combination rule. The proposed framework is evaluated using multi-sensor recording of the instrumental daily living activities (e.g., watching TV, writing a check, preparing tea, organizing week intake of prescribed medication) of participants of a clinical trial for Alzheimer's disease. **Results & Discussion** Preliminary results show that the automated monitoring system can accurately detect activities, characteristic behavioral patterns, and motricity capabilities. We have evaluated the activity recognition algorithm on a large dataset containing 38 elderly participants undertaking instrumental activities of daily living (IADL) during 15 minutes (570 min. in total). The recordings took place in the observation room of the Memory Center of Nice hospital using a video camera. A summary of the recognized activities (e.g., duration, frequency) was produced at the end of the monitoring task and provided to the participants' doctor as a basis for assessing patient performance on IADL.

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Address: INRIA, France; **E:** Francois.Bremond@inria.fr

P.H. ROBERT, V. MANERA, A. KÖNIG. Recommendations for the development and use of serious games in patients with AD and other dementia-related disorders. Gerontechnology 2014; 13(2):83-84;

doi:10.4017/gt.2014.13.02.126.00 **Purpose** Alzheimer's disease (AD) and dementia-related disorders that usually affect an aging population represent a major challenge for health care systems. Information and Communication Technologies (ICT) can be employed to help assess and evaluate a patients' functional impairments. Aside from its usefulness during assessment, ICT can also play a key role in patient treatment while providing a source of

stimulation for the patient. This idea underlies for the development of Serious Games (SGs), digital applications especially designed for other purposes than entertainment. SGs provide training and education, and can also be used to inform, communicate, and market products or ideas. For example, SG can play different roles by either taking the lead in creating a societal/ideological impact on specific subjects, or by enhancing a user's aptitude or cognitive/physical functions. **Method** The objective of the IA workshop was to gather recommendations for the development and use of SG targeting people with frailty syndrome, AD and other dementia-related disorders. The following recommendations were endorsed by stakeholders in the field, after being collected and discussed during the Innovation Alzheimer workshop 2013 (IA workshop 2013). The IA had a two-step design as follows. *First round*: The first round took place in Nice, Italy on November 7, 2013. Fifty participants including health care professionals and family association representatives (n=25), ICT engineers (n=10), companies involved with ICT and economical experts (n=15) participated in group discussions during three sessions: (i) A session working on a Strength, Weakness, Opportunity, Threat (SWOT) analysis of SGs in the health sector, with a special focus on the assessment and rehabilitation of dementia-related disorders; (ii) a discussion and voting session; and (iii) an SG design session (2 groups of 4 participants), with the objective to design an SG targeting patients suffering from AD or related disorders. *Second round*: The second round took place during the 6th edition of Clinical Trials on Alzheimer's Disease conference held in San Diego, CA, USA on November 14, 2013. The expert panel included geriatricians, epidemiologists, neurologists, psychiatrists, psychologists, and ICT engineers. **Results & Discussion** The presentation will describe the recommendations derived from the workshop in two main sections. The first section will be dedicated to a SWOT analysis of the field of SG in the domain of health and rehabilitation, with a specific focus on dementia-related disorders. The second section will report on practical recommendations concerning the development and use of SG for people with dementia.

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Address: CoBteK research unit, University of Nice Sophia Antipolis, France

E: phil.robert15@orange.fr
