M. Göversin (Convener). ***Developing new assistive technologies for older adults.*** *Gerontechnology 2012;11(2):228;* doi:10.4017/gt.2012.11.02.100.00 **Participants**: *M. Göversin, Y. Költzsch, S. Wegel, J. Kiselev* (all from Germany). **ISSUE** Aging leads to a declining ability to handle activities of daily living (ADL) and independence[1]. Furthermore, decreased activity levels are associated with higher incidence of chronic diseases[2].There is proof that regular exercise can slow down or even reverse this trend[3-5]. However, the higher the age, the lower the proportion of those who stay active[3]. Assistive technologies have a great potential to help older people stay active. To meet the special needs of this target group, those technologies have to be tailored specifically[6-8]. **CONTENT** In this symposium, recent developments of different assistive technologies for elderly people in ongoing projects of the Geriatrics Research Group (Charité, Berlin) are presented in four sessions on ambient technologies for the assessment of mobility and the risk of falling of elderly people and sensor-based training systems for prevention and rehabilitation. **STRUCTURE** In the first presentation, a 'feedback-oriented rehabilitation trainer' (FORT) is portrayed. In a randomized controlled trial, 78 patients with hip replacement were recruited into three groups to demonstrate the usability and effectiveness of FORT. First results are demonstrated. A computer-based training system is discussed in the second presentation. Through a combination of ambient and inertial sensors, specific exercises can be surveyed and feedback can be given. The presentation exhibits the concept, development, and evaluation process of an interactive trainer. In the third presentation, a validation study for a sensor-based assessment tool for falls' detection is presented. A total of 50 people aged 55+ completed a test battery with the sensor system and were re-evaluated after six months. Additionally, all patients were contacted on a monthly basis over a period of twelve months for occurring falls. A correlation between falls and the stair-climbing speed of the participants could be shown. Finally, the fourth presentation demonstrates a sensor-integrated chair capable of gait assessment in a home-based environment. The session gives an insight into the layout of the chair and a validation study protocol. **CONCLUSION** The symposium will present recent concepts and developments of ambient and rehabilitative assistive technologies for older people. Both advancements and barriers are demonstrated. Further refinements of developmental strategies are needed and should be discussed.

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M. GÖVERCIN, A. RATZINGER, E. STEINHAGEN-THIESSEN. ***Feedback-mediated Orthopedic Training efficiency (FORT): A randomized controlled trial.*** *Gerontechnology 2012;11(2):229;* doi:10.4017/gt.2012.11.02.013.00 **Purpose** Hip fracture and hip prosthesis are important reasons for morbidity and mortality among elderly people[1]. Prolonged confinement to bed, time spent in a hospital and immobility can be avoided by early physiotherapy treatment[2,3]. Patient compliance increases, if exercises for a self-therapy program are discussed and reviewed with the patient inside the physiotherapy treatment[4]. Within the context of the demographic change, the number of hip fractures among the elderly is expected to increase. The situation of an aging population has to be considered against the question of feasibility and viability of existing rehabilitation concepts[5]. New innovative technologies, which help to improve patient compliance in a cost-efficient way, will gain in importance in the future. Among these technologies are rehabilitation products and health care technologies. **Method** Over the course of six months, the Geriatrics Research Group of the Charité -Universitätsmedizin Berlin investigated in a prospective, randomized, controlled, multicentered study the functionality and efficiency of the orthopedic trainer of Philips Research versus a conventional, paper-based self-therapy. The study was three-pronged and consisted of an intervention-group with intensive self-therapy, a second intervention-group for self-therapy with the orthopedic trainer and a control-group with conventional paper-based self-therapy. **Results & Discussion** Preliminary results demonstrate that elderly patients show a very high acceptance for the orthopedic trainer. Further outcomes regarding the effectiveness and cost efficiency are expected by mid-2011.

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J. KISELEV, M. GÖVERCIN, M. JOHN, B. HENNIG, M. HAESNER, E. STEINHAGEN-THIESSEN. ***An automated training system for home-based rehabilitation of the elderly.*** *Gerontechnology 2012;11(2):229-230;* doi:10.4017/gt.2012.11.02.198.00 **Purpose** About a third of the people age 65 and older falls once per year[1,2], 15 percent more often[2]. In a recent prospective study examining the risk factors in a very old home-dwelling population of 85 years and older during an 11-month period, half of the participants has fallen at least once, many of them multiple times[3]. The consequences are serious. Falls are responsible for over 90percent of all fractures of the femoral neck and 50 percent of all spinal fractures[4]. This leads to an obvious demand for adequate preventive therapeutic strategies. In several systematical Reviews[5-7], the suitability of different therapeutic strategies in reducing the fall risk of older people could be demonstrated. However, continuous exercising is essential to avoid functional capacity to decline again[6]. Unfortunately, training continuity is a problematic issue. Although improvements of functional abilities can be achieved with supervised training[8], continuous supervised training is financially not feasible. Additionally, home-based

therapy seems to be more effective in the long run[8,9]. Such exercise programs need to be supervised in order to be effective[10]. Since there is some evidence that telemedical approaches are suitable for such a supervision[11], an interactive training system for telemedically supervised training was developed. **Method** The 'Interactive Trainer' consists of a computer system, ambient and inertial sensors and a dialogue system for controlling the computer as well as motivating the user while exercising. Movements during exercises are measured by the sensor system and analyzed by custom-made software. On the basis of this analysis, a visual, auditory and tactile feedback for correction of the movements is generated. A 'knowledge-of-results'-approach and a serious-game based setting aim to improve the user's motivation to exercise regularly. **Results & Discussion** The presentation illustrates the concept and different parts of the Interactive Trainer. A pilot-study randomized control trail (RCT), starting in March 2012, will test the usability of the Interactive Trainer in a home setting of 50 older people. The RCT consists of 4 study arms with two groups (older people at risk of falling or stroke patients) each being randomized into an intervention and a control group) to allow first insights into the effectiveness of the system.

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Y. Költzsch, M. Gövercin, J. Spehr, M. Gietzelt, M. Marschollek. ***Identification of sensor-based parameters that predict falls of older people.*** *Gerontechnology 2012;11(2):230-231;* doi:10.4017/gt.2012.11.02.199.00 **Purpose** Falls strongly affect the independence of older people[1]. Thirty percent of people over 65 fall at least once a year and this rises to more than 50% for people over 80[2]. Falls can lead to moderate injuries, such as bruises or abrasions, or to more serious consequences, such as fractures or even death[3,4]. There is therefore an increasing need for a home-based system to assist therapists in assessing the fall risk with simple and objective methods. Against this background the Geriatrics Research Group (Charité Berlin) carried out a study with the aim of developing a technology-based detection system for individual fall risk using optical and acceleration sensors. **Method** The study was prospectively designed and con-

ducted at a single centre, with 50 participants older than 55 over a twelve-month period. Within this study the participants performed selected geriatric assessments (TUG[5], Tinetti[6], Stratify[7], Barthel-Index[8], MMSE[9]) and different exercises (4x7m gait track, stair climbing) which were captured simultaneously via optical and acceleration sensors. In addition, activity levels and fall risk assessment were recorded with questionnaires; actual falls and their causes were noted. During the study period two main visits were conducted during which the geriatric assessments were performed - the first at the beginning of the study; the second six month later. In addition, telephone interviews were held in order to record falls of the participants during the study. **Results & Discussion** Of the 50 study participants, 30% were male and 70% female, with a mean age of 72.8 years. To date, 32 falls have been documented, 19.2% led to minor injuries and 7.7% resulted in a fracture. The analysis of the results revealed no obvious correlation between the incident rate of falls and predicted sensor-based gait parameters for the gait track. Moreover, none of the clinical fall assessments described in medical literature appear to be applicable for fall prediction. However, the exploratory data analysis suggested a new sensor-based assessment scheme, which is based upon the subject's ability to climb stairs**.** With algorithms for a short-, medium- and long-term prognosis it was possible to differentiate between fallers and non-fallers with a correct classification rate of up to 92.1%. In light of the initial results, the study will be continued for another two years to strengthen the findings with longer-term data.

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S. WEGEL, J. KISELEV, M. GÖVERCIN, T. FRENKEN. ***Determination of mobility and risk of falls in old age: Automated 'Up & Go' assessment.*** *Gerontechnology 2012;11(2):231-232;* doi:10.4017/gt.2012.11.02.170.00 **Purpose** Increasing age is accompanied by a reduction of strength and physical function[1]. Age and morbidity-related changes alone, or in combination with other factors (e.g. medication), lead to an increase in fall risk[2] and significant health care costs[3]. The 'Timed Up & Go' (TUG) test is a widespread assessment used for mobility testing[4]. **Method** Five patients (74-91 years old; 4 females, 1 male) in a residential care facility in Oldenburg, Germany, were recruited for a pilot study. The total time for TUG and its individual sequences (getting up, turning around, going back, and sitting down) were recorded by sensors, stopwatch, and video-recordings analysis. Subsequently a single-center prospective cohort study was planned

involving 110 older people at risk of falling (TUG>15s). Automation of the TUG is effected by light barriers, force sensors, and a laser-range scanner built into a chair (*Figure 1*). While the light barrier at the back of the seat of the chair can detect the start and the end of the TUG, the force sensors built into the legs of the chair measure weight distribution during the stand-up and sit-down periods of the TUG. The laser sensor is a class-I-sensor able to measure step length, step cadence, gait velocity, and distance walked. All subjects are assessed with the automatic TUG-chair and reference measurements are taken at baseline and again at 30 and 90 days. In addition, subjects are contacted every three months for a year after a fall occurrence. Detected falls are correlated with the sensor data for establishing diagnostic accuracy (sensitivity, specificity) of the TUG for the prediction of falls. As reference standard, a hand-stopped TUG, the Berg Balance Scale (BBS)[5] and the GAITRite walkway system are used[6]. Results from the TUG and the reference measurements are compared by calculating a correlation coefficient and performing a regression analysis. The main difference between the pilot and the cohort study is the use of light barriers at the end of the three meter walk path. **Results & Discussion** The prospective cohort study is still underway. Results from the pilot show that all methods with the exception of those based on the laser range scanner measurements, are highly precise. As a result we are expecting an objective and automated measurement of the TUG by the use of sensor technologies.

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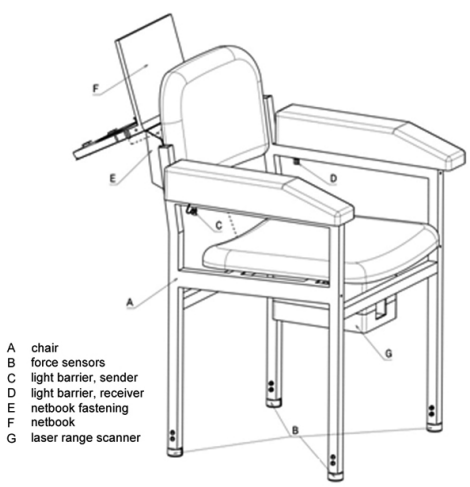

Figure 1. aTUG-chair (Source: OFFIS)