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Introduction

Welcome to the 2017 conference on e-Coaching for Health and Wellbeing (eCHW)! This biannual scientific conference builds on a successful conference in November 2015 in Eindhoven, the Netherlands, which was the capstone conference of the research programme "Healthy Lifestyle Solutions" of the Technology Foundation STW (co-funded by Philips Research and the NWO National Initiative Brain & Cognition, NIHC). This conference aims to showcase research addressing all aspects relevant to e-coaching applications that support people in adopting or maintaining a healthy lifestyle. A healthy lifestyle is reflected, for example, in sufficient physical activity, good sleeping and eating patterns, and behaviors related to stress reduction and mental wellbeing. This research area is of importance to understanding fundamental scientific issues of behavior change through technological systems, as well as crucial for developing vitally needed innovations. The conference has brought together researchers and practitioners from several fields, including psychology, computer science, health sciences, human-computer interaction, ethics and artificial intelligence.

More information: www.echw.science

Organisation

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Sponsoring

The conference is supported by Philips and Technology Foundation STW, National Initiative Brain & Cognition (NIHC) under the Partnership programme Healthy Lifestyle Solutions.

Program

Thursday, January 26th	
10.00	Registration and coffee
10.30	**Jaap Ham** Opening
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11.15	**Simon Provoost**, Jeroen Ruwaard, Koen Neijenhuijs and Heleen Riper Improving Adherence to Ecological Momentary Assessment with Visual Feedback: A Paradigm to Study the Relationship Between Support, Motivation, and Adherence
11.40	Corine Horsch, Jaap Lancee, Robbert Jan Beun, Mark Neerincx and **Willem-Paul Brinkman** The Downward Spiral of Ambivalence: Doubts about Insomnia, Cognitive Behavioral Therapy, and a Pre-treatment Motivation Module
12.05	**Mieke Kleppe** and Erik de Vries Assessing Digital Skills in Healthcare and Wellbeing Professionals
12.30	Poster pitches, chair: **Suze Stuurman**
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	Session 2, chair: **Michel Klein**
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	Session 3: Healthy Lifestyle Solution Program, chair **Jaap Ham**
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15.15	**Robbert Jan Beun** Sleep Well with SleepCare: The Role of e-Coaching in Insomnia Therapy
15.30	**Michel Klein and Saskia te Velde** Stimulating Physical Activity among Young Adults: The Active2Gether System
15.45	**Joel Anderson** Second-Order Health Procrastination
16.00	**Keynote 3: Reinder Haakma** The Role of Wearable Sensor Technology in Healthy Lifestyle Promotion
16.45	**Jaap Ham** Day Closure
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11.00	**Bart Kamphorst**, Sanne Nauts, Denise De Ridder and Joel Anderson Too Depleted to Turn In: The Relevance of End-of-Day Resource Depletion for e-Coaching Aimed at Reducing Bedtime Procrastination
11.25	**Hendrika van Lier**, Mira Oberhagemann, Jessica Stroes, Niklas Enewoldsen, Marcel Pieterse, Jan Maarten Schraagen, Marloes Postel, Miriam Vollenbroek-Hutten, Hein de Haan and Matthijs Noordzij Evaluating Design Decisions for an Observational Real Time Alcohol Craving Study Using Physiological and Psychological Measures
11.50	**Fiemke Griffioen-Both**, Robbert Jan Beun, Siska Fitrianie, Sandor Spruit, Corine Horsch and Jaap Lancee Shared Decision Making in Automated E-Coaching - SleepCare a Mobile Insomnia Treatment
12.15	Poster pitches, chair: **Suze Stuurman**
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	Session 5, chair: **Joel Anderson**
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14.15	**Lisette van Gemert** Data Driven Persuasive Coaching: Challenges for Personalized Healthcare
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15.40	Rim Helaoui, Koen de Groot, **Aki Harma** and Arlette van Wissen Lifestyle-Optimized Intervention Plan for Physical Activity Coaching
16.05	Aldert Nooitgedagt, Robbert Jan Beun and **Frank Dignum** e-Coaching for Intensive Cardiac Rehabilitation: A Requirement Analysis
16.30	**Keynote 6: Timothy Bickmore** Coaching to Death
17.15	**Michel Klein** Conference Closure

Abstracts

Keynotes

Timothy Bickmore (Northeastern University, Boston, USA)
Coaching to Death
Conceptualizations of "wellness" typically bring to mind young, fit, healthy adults who are trying to maintain their idyllic state as long as possible. However, "wellness" is important for everyone, including those nearing the end of life, and must encompass reduction in suffering as well as the promotion of behaviors we associate with wellness. I will discuss needs and opportunities for wellness promotion in palliative care, and work my lab has been doing on a virtual palliative care coach. This e-coach works with individuals during their last year of life to help them manage pain and other symptoms, reduce stress and anxiety, and identify and address unmet spiritual needs, in addition to promoting more traditional wellness behaviors such as physical activity.
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Denny Borsboom (University of Amsterdam, The Netherlands)
Personalized Network Analysis
In the past decade, network approaches have been put forward as a plausible modeling framework for the analysis of mental disorders. Such network models represent symptoms (e.g., hallucinations, fear, social isolation) as nodes, and interactions between symptoms (e.g., hallucinations -> fear -> social isolation) as edges that connect the nodes in a symptom network. If repeated measures of symptoms are available, it is possible to estimate different network structures for different people. Due to the increasing use of Experience Sampling Methodology (ESM), use of such personalized networks is rapidly becoming a realistic possibility. As I will show in the present talk, personalized networks yield information that can be useful for (a) monitoring an individual, (b) analysing the structure of the individual's symptom dynamics, (c) selecting an optimal intervention in therapy, and (d) assessing therapy effectiveness. In addition, I will discuss the first applications of network analysis in the context of ESM.
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Reinder Haakma (Philips Research, Eindhoven, The Netherlands)
The Role of Wearable Sensor Technology in Healthy Lifestyle Promotion
Increasingly, healthcare is moving out of hospitals and doctor's offices into our homes and daily lives. Due to rising healthcare costs and shortage of sufficient medical staff, there is more and more pressure on people to take control of their personal health. To allow them to make informed decisions about their health and disease, affordable and reliable devices are needed to capture information about their personal physiology and lifestyle. Wearable sensor technologies represent a key means of facilitating cost-effective solutions for monitoring health-related factors, such as one's physical activity, sleep and eating behavior and stress levels. The next wave of these devices is expected to also be able to provide timely detection

of common, underdiagnosed conditions associated with an unhealthy lifestyle such as hypertension and cardiac arrhythmia. As wearable devices are ever more widely adopted and move beyond fitness tracking to health monitoring, they can thereby enable a major paradigm shift in preventive healthcare.
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Susan Michie (University College London, UK)
Drink Less: An Evidence-Based Alcohol-Reduction Smartphone App
This presentation reports the development and evaluation of an alcohol reduction smartphone app: Drink Less. The app contains five modules selected and developed on the basis of expert advice, behavior change theory and a review of research evidence and further developed in two usability studies. In addition to a core goal-setting module, the modules are: self-monitoring and feedback, action planning, normative feedback, identity change and cognitive bias retraining. The effectiveness of the app as a whole and its component modules have been evaluated in a randomized full factorial trial. The results will be presented. For more information about the app, see Drink Less Alcohol
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Paschal Sheeran (University of North Carolina at Chapel Hill, USA)
Reception, Motivation, Application (REMAP): New Approaches to Problems in Behavior Change
Communications designed to promote behavior change face three significant hurdles. People may ignore or superficially process messages (the reception problem). The message may fail to convince people or energize them to act (the motivation problem). And even if people become motivated, they may fail to effectively translate that motivation into action (the application problem). This presentation reviews the techniques characteristically used to tackle these problems, and offers new data on promising alternative approaches.
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Tillmann Vierkant (University of Edinburgh, UK)
E-Coaching and Willpower Muscle Atrophy: Does Reliance on Self-Regulation Technology Bypass the Agency of Users?
In this paper I will discuss one of the most important ethical worries that has been raised about the rise of self-regulation technologies. The worry is that self-regulation technologies achieve their regulation aim by bypassing the agent. This, so the worry, means that users of such technologies will often not practice agent-involving self-regulation and thereby become dependent on the technology and less autonomous. I think there is an important worry here, but it is not really clear what the worry amounts to. I argue that agent-involving self-regulation either does not actually exist or that the difference between agent-involving and non-agent-involving self-regulation is far less clear cut than one might think.
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Oral Presentations

Joel Anderson
Second-Order Health Procrastination
In this presentation, I discuss some of the key insights developed in the Healthy Lifestyle Solutions project "Promoting Effective Intentions: Volitional Scaffolding, Implementation Intentions, and Bedtime Procrastination". One area in which e-coaching holds significant promise is in helping to close the gap between people's best intentions regarding their health-related behaviors and the behaviors that they actually engage in. One form that this self-regulation failure takes is *health procrastination*. There are a number of confusions around the concept of procrastination, which I address briefly, defining procrastination in terms of "culpably unwarranted delay." Progress is being made in understanding factors that contribute to procrastination, some of which I review here. And when individuals put these insights to use, they can help reduce procrastination, including the phenomenon central to our research project, what we have termed "bedtime procrastination." The problem, however, is that individuals often put off taking measures that can expect to reduce their health procrastination. This "second-order procrastination" involves procrastinating on implementing solutions to one's procrastination. I discuss here the prospects (and pitfalls) related to forms of e-coaching that target second-order health procrastination.
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Robbert Jan Beun
Sleep Well with SleepCare: the Role of e-Coaching in Insomnia Therapy
In this talk, I will introduce the SleepCare project. The aim of the project was to enhance the understanding of personalized self-help therapy with the aid of existing (mobile) technology, in particular in the domain of insomnia. As a proof-of-concept, an automated e-coaching system was developed in which various persuasive strategies for sustainable behaviour change were implemented. Central in the approach is to improve the user's adherence to the exercises of the therapy. Based on the so-called 'Talk-and-Tools' paradigm for interaction, the system integrates two types of interface elements, i.e. natural language conversation and dedicated tools. The paradigm is based on the idea that people interact in two ways with their environment: symbolically and physically. A variety of system and user tests were conducted, including an RCT, to validate the use of the system. After a six-week therapy, some users spontaneously reported the experience of building a relationship with the e-coach.
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Fiemke Griffioen-Both, Robbert Jan Beun, Siska Fitrianie, Sandor Spruit, Corine Horsch and Jaap Lancee
Shared Decision Making in Automated e-Coaching - SleepCare a Mobile Insomnia Treatment
Cognitive behavioral therapy can effectively be applied in an internet-delivered format. For those treatments to be effective, it is essential that exercises are carried out. However, adherence to these exercises remains a problem. A possible solution for improving the adherence to the exercises is shared decision making (SDM). In this paper, SDM is used as a persuasion strategy that is applied in behavioral change coaching for assisting coachees (human patients) with behavioral intervention adherence. The implemented SDM results in a set of commitments made after a negotiation process containing mutually acceptable activities. We have formulated an algorithm toward a negotiation framework for behavior

change coaching in the field of insomnia (CBT-I), developed an automated e-coaching application on smartphones and applied the algorithm in conversations between e-coach and coachee. After verification of the content of the negotiation conversations by sleep experts, data from a randomized controlled trial was used to analyze negotiation behavior of coachees.
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Lisette van Gemert
Data Driven Persuasive Coaching: Challenges for Personalized Healthcare
Big Data are the key towards personalized medicine and healthcare. Big data confronts us with new challenges to develop personalized and persuasive coaching systems. In this presentation I will highlight the implications of big data to develop personalized and persuasive eCoaching systems on the basis of our current research projects.
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Rim Helaoui, Koen de Groot, Aki Harma and Arlette van Wissen
Lifestyle-Optimized Intervention Plan for Physical Activity Coaching
This presentation is about an automated approach to generate lifestyle-optimized intervention plans for personal health programs. The framework uses optimization techniques allowing the integration of explicit knowledge and the output of actionable and tailored intervention plans that minimize the inconvenience to the user. Concretely, such explicit knowledge is introduced, for example, through establishing a cost of performing a particular type of activity during a specific moment of the day. Based on optimization techniques, a health plan is provided that can bring the user to a particular behavior change target (such as losing weight) while minimizing the burden of that change.
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Corine Horsch, Jaap Lancee, Robbert Jan Beun, Mark Neerincx and Willem-Paul Brinkman
The Downward Spiral of Ambivalence: Doubts about Insomnia, Cognitive Behavioral Therapy, and a Pre-Treatment Motivation Module
This study investigated how to support users to get ready-to-change in a self-help setting. An interactive coach was developed to help users progress through the trans-theoretical model (TTM) stages. This digital coach was compared to a paper workbook that contained the same exercises. The tool was a stage matched self-reflection program that aimed to solve ambivalence. The experiment had a mixed design with within-subject pre-post measures, and between-subject paper versus interactive tool conditions. Thirty-three participants were randomly assigned to one of the conditions, and were asked to work with their tool at least twice in a period of four weeks. The results showed however that only about half of the participants met this requirement. Qualitative data revealed that users are ambivalent not only about their behavior change, but also about the interventions and tools that support these change processes. The results suggest that non-adherence can still occur because of tool ambivalence, even though a virtual coach is stage-matched and uses persuasive strategies. This suggest that a virtual coach should take the user's ambivalence towards itself into account, for example by reducing usage 'costs', increasing the perceived benefits, or tailoring the intervention to personal drives.
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Bart Kamphorst, Sanne Nauts, Denise De Ridder and Joel Anderson
Too Depleted to Turn In: The Relevance of End-of-Day Resource Depletion for e-Coaching Aimed at Reducing Bedtime Procrastination
Bedtime procrastination – an important predictor of sleep insufficiency in the general population (Kroese et al., 2014) – is self-undermining behavior that requires the type of tailored and timely interventions that e-coaching systems can offer. In this talk, we will present data from a retrospective survey study with 218 participants that was performed as part of an effort to design a comprehensive e-coaching intervention strategy. The data indicates that resisting temptations during the day predicts bedtime procrastination in the evening, suggesting that, after having a particularly taxing day, people may be more likely to procrastinate about going to bed.
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Michel Klein, Saskia te Velde, Anouk Middelweerd, Julienka Mollee and Adnan Manzoor
Stimulating Physical Activity Among Young Adults: The Active2Gether System
Involvement in sufficient physical activity declines rapidly during later adolescence and young adulthood. Since the majority of young people use the (mobile) internet for social networking activities, the Active2Gether project aimed to make use of web-based social networks and modern mobile technology to provide cues to promote development of and engagement in physical activity and empower people to be more physically active. We developed a proof-of-concept of such a smart phone system, using evidence-based strategies for behavior change, an off-the-shelf activity tracker, a connection to Facebook, and a model-based reasoning technique for determining which coaching messages should be send to the user. In this way, the system provides coaching that is tailored to a user's personal situation and context, its opinions and attitudes around physical activity and its actual behavior. In addition, the social environment of the user is used to create and strengthen social support. A user study has been performed to evaluate the usability and the effectiveness of the system. This has resulted in lessons for future applications aiming at stimulating physical activity.
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Mieke Kleppe and Erik de Vries
Assessing Digital Skills in Healthcare and Wellbeing Professionals
For a successful implementation of e-coaching applications in healthcare and wellbeing settings it is important that the professionals possess the skills to use such applications. For example, they need to be able to explain the value of such applications to patients and fix e-coaching related problems. In this study we performed interviews to identify the relevant skills for these professionals and developed and tested a questionnaire to assess these skills with over 400 healthcare professionals. Results of this study indicated that basic computer skills are a boundary condition for more advanced skills such as being able to trust technological applications (including e-coaching) and to explain the benefits and use of these systems to patients. Furthermore, results indicated that digital skills vary widely between professionals and correlate highly with computer anxiety. This study showed that many healthcare professionals need additional training before they can effectively apply e-coaching applications in their work.
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Hendrika van Lier, Mira Oberhagemann, Jessica Stroes, Niklas Enewoldsen, Marcel Pieterse, Jan Maarten Schraagen, Marloes Postel, Miriam Vollenbroek-Hutten, Hein de Haan and Matthijs Noordzij
Evaluating Design Decisions for an Observational Real Time Alcohol Craving Study Using Physiological and Psychological Measures

The current study was a pilot for an observational real time study, in which alcohol craving will be monitored in addicted persons with a biosensor (E4-Empatica) and ecological momentary assessment. The aim was to explore the variability and completeness of the physiological and self-reported craving data, and to measure the intrusiveness and user acceptance of the E4 biosensor. Because of the exploratory nature and small sample in this pilot no statistical tests was used. However, multiple graphs for every participant to visualize the variability and completeness of the data. Two design decisions that could influence this variability and completeness were evaluated: the perceived burden of and compliance with an interval-contingent versus a signal-contingent design was studied. Additionally, the user-acceptance of the E4 biosensor was explored on three aspects: usability, comfort and perceived stigmatization.

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Aldert Nooitgedagt, Robbert Jan Beun and Frank Dignum
E-Coaching for Intensive Cardiac Rehabilitation: A Requirement Analysis

In this paper, the rationale and requirements are presented for an e-coaching system in the domain of intensive cardiac rehabilitation. It is argued that there is a need for a personalized program with close monitoring of the patient based on medical needs and needed lifestyle changes in a setting with other participants such as family and a human coach. Two roles are distinguished for the e-coach: support of the organizational process of the program (e.g. collecting and analyzing data) and support of the patient's process of making life-style changes (e.g. triggering and motivational support). Motivational interviewing is introduced as a means to minimize the discrepancy between undesired behavior and future goals of the patient. It is concluded that digital products that offer e-coaching support for these types of programs should coexist with human coaching.

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Simon Provoost, Jeroen Ruwaard, Koen Neijenhuijs and Heleen Riper
Improving Adherence to Ecological Momentary Assessment with Visual Feedback: A Paradigm to Study the Relationship Between Support, Motivation, and Adherence

Persuasive System Design predicts that dialogue support is positively correlated with eHealth adherence, but Self-Determination Theory suggests this relationship is moderated by users' intrinsic motivation. Users low on intrinsic motivation may benefit from support, while the reverse may hold for those with high intrinsic motivation. We present a paradigm to test the predictions that dialogue support has a positive effect on adherence, and that this effect is moderated by intrinsic motivation. In a three-week smartphone-based ecological momentary assessment study, N=85 healthy participants received automated dialogue support by a virtual character mirroring their reported 2-dimensional mood states. Participants were randomly assigned to a feedback or no-feedback condition at study onset. This procedure was repeated after two weeks to control for feedback history, and such that adherence during the first two weeks could be used as an objective measure of intrinsic motivation. The study has been completed and results will be presented. s.j.provoost@vu.nl

Anne Roefs, **Gerasimos Spanakis**, **Bastiaan Boh, Lotte Lemmens, Chantal Nederkoorn, Gerhard Weiss and Anita Jansen**
Think Slim! Using Network Analyses for Tailoring CBT-Based Weight-Loss Treatment
"Think Slim" is a tailored e-coach-intervention for overweight people that is based on cognitive behavioral therapy (CBT). In study 1, we examined predictors of food consumption in 57 overweight (BMI > 25) and 43 healthy-weight people (BMI < 25). Ecological momentary measurements (via iPhone-app) occurred prior to each eating-moment and on 8 random moments throughout each day for a 2-week period. Performing a graph-based analysis, we identified which variables had the strongest effect on the networks. Based on the data of study 1, we created sets of rules (learned by decision-trees) that predicted eating behavior for subsets of participants, for the purpose of semi-tailoring in a healthy-eating CBT-intervention. In a randomized clinical trial, Think Slim (n = 46) was compared to a diet-only control group (n=50) that received no support. Think Slim (6 weeks) consisted of an iPhone app and ten web-based CBT sessions. Preceding the intervention phase, participants collected EMA data for a week, including approximately the same variables as in study 1, to achieve the semi-tailoring. After the intervention was finished, another week of EMA data collection followed, to be able to study the change in the networks of variables related to eating behavior from pre to post treatment.

Outcome measures included: BMI, self-reported dysfunctional cognitions and emotions/states, eating styles, eating disorder psychopathology, psychiatric symptoms, and self-esteem. In addition, change in networks of variables related to eating behavior as quantified by graph-based analysis was investigated. BMI, eating disorder psychopathology and self-liking improved in both conditions, with no significant advantage for Think Slim. Think Slim, as compared to the control group, led to a greater reduction in dysfunctional cognitions related to food intake, emotional eating, and external eating. Higher dietary adherence was associated with greater BMI reduction. The cognitive and emotional improvements achieved by Think Slim may aid in long-term weight-loss maintenance. Results of graph-based analyses, which are now ongoing, will also be presented.
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Heleen Rutjes, Martijn Willemsen, Elisabeth Kersten - van Dijk, Boris de Ruyter and Wijnand IJsselsteijn
Better Together: Opportunities for Technology in Health Coaching from the Coach's Perspective
Health coaching is an interpersonal process, where communication and the relation between the coach and the client are central aspects. Still, new technologies offer a variety of interesting opportunities, in both measurement as well as intervention. To understand the coaching process and to explore the possible added value of technology, we conducted semi-structured interviews with health coaches and performed a thematic analysis on the data. Based on the daily practice and the needs of the coaches, we extracted opportunities and requirements for technology. We found that humans can easily express empathy and are sensitive to evolving goals and underlying motives, whereas technology can consistently measure behavioral data and can predict effectiveness of interventions by learning from large datasets. We conclude that the strengths of humans and technology are complementary and map to different aspects of the coaching process.
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Poster Presentations and Demos

Thomas van den Broek, Lenneke van Genugten, Kiek Tates, Steffen Pauws and Aart van Halteren
Is a Structured Digital Support Tool Likely to be Adopted?
Health coaching has emerged as an effective intervention for chronic disease management. When scaling up the reach of coaches these coaches need support to sustain high quality structured coaching. We focus on hybrid coaching, in which human soft skills are strengthened with objective technology based guidance. The intervention integrates into the clinical workflow, so to assess, monitor and act upon the coaching's conversation. A coach tool has been developed, based on the principle of motivational interviewing for self-management. The tool uses real-time instructions and questions during the coaching session. Instructions are delivered via four topics, namely discussion, problem solving, considerations, and reporting. Currently we are conducting a small study with health coaches and chronically ill patients in a in a telehealth program. We assess determinants of acceptation of technology including perceived ease of use, perceived usefulness, and self-efficacy. These results will be presented at the conference.
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Pepijn Van Empelen, Wilma Otten, Hanneke Molema, Jolanda Keijsers and Ronald Mooij
Digital Health: Increasing the Impact with Personalized Design
Personalized digital health empowers users to manage their own health and make autonomous, informed choices, especially if users receive timely support in vulnerable situations. This poster discusses technical developments needed to personalize digital health design. Tailoring of digital health is necessary, because current impact of digital health does not extract all value deemed possible. Our view is that most digital interventions or applications are not personalized (enough) to provide effective support, and help people to manage their health in the face of physical, social, mental and social challenges. We develop techniques and knowledge to improve personalized design. In this poster, we focus on design to enhance and retain use and sustain behavior that promotes health. We introduce four design aspects we work on: 1) Include effective (sustaining) behavioral change strategies; 2) Include interaction strategies for preventing drop-out; 3) Making timely and adaptive interventions; 4) Systematic, design-integrated solutions.
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Priscilla Esser and Janna Alberts
Behaviour Coaching for MCI Prevention in Seniors
CoME is a European Ambient Assisted Living (AAL) project focusing on seniors suffering from Mild Cognitive Impairments (MCI) and their informal caregivers. CoME aims to monitor seniors' physical and cognitive health status, in order to detect trends in an early stage, and to consequently support informal caregivers with advice and training. To prevent further development of cognitive impairment, seniors are also encouraged to set health behaviour goals in the categories of nutrition, water intake, sleep, physical exercise, and cognitive exercise. All health trends and behaviour goals are monitored by care professionals, allowing personalisation of coaching strategies to the specific needs of the senior. The ultimate goals of the CoME platform is to increase wellbeing and independence of seniors and their informal caregivers in their own environment.
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Fiemke Griffioen-Both and Robbert Jan Beun
The SleepCare System
The SleepCare system supports an insomnia therapy on a smartphone. The role of a human coach was substituted with a cooperative virtual coach that is able to interact with a human coachee in natural language dialogue. In the interface of the system, we distinguish between a set of personalized conversations and specialized modules that form a coherent structure of input and output facilities. The system offers the therapy on an Android smartphone that includes a variety of exercises: relaxation, sleep restriction and sleep hygiene. Basically, it gives personalized advice to the coachee to do certain exercises, makes appointments for consultation and gives feedback with respect to the current state of the coachee and progress in the therapy. In addition, it includes a variety of persuasive strategies that are targeted at improving the coachee's adherence to the therapy.
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Elaheh Homayounvala and Sanaz Alavian Ghavanini
Tracking My Mood for e-Coaching, Comparing User Acceptance of Self-Report Mood-Tracking and Automatic Mood Detection from Facial Expression
Mood-tracking mobile applications are among novel m-health approaches that can be utilized to create mood-journals for e-coaching. Mood-journals can increase users' self-awareness and consequently emotional self-management and also is a valuable tool for communicating moods to coach. Interaction design or human-computer interface of such mobile health apps plays an important role in acceptance of such applications. In this paper we compare self-reporting and mood detection from facial expression as an automatic mood tracking method. Our research question is finding which one of these two input methods is considered more acceptable by users. To answer this question, two mobile mood-tracking applications are selected and then their user acceptances are compared. The applications are introduced to participants before completing technology acceptance questionnaire. The results show that self-reporting app is considered more useful.
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Naomi Jacobs
The Quantified Baby: What Are the Ethical Concerns?
Following the success of adult activity trackers such as Fitbit and Strava, companies are developing new technologies to track and monitor the activities of babies. These new "baby wearables" give parents information about their baby's heart rate, breathing, temperature, movement, and sleeping patterns, and are aimed to allow first-time parents to reflect and improve their parenting based on data. The use of new tracking technologies for babies, however, gives rise to ethical concerns regarding privacy, data reliability, transparency, and parental intuition. They also raise the issue of the moralization of decisions that were previously seen as mere preferences and are now being framed as subject to moral evaluation, judgements of responsibility, and blame.
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Randy Klaassen, Rieks Op den Akker, Dirk Heylen, Harm Op den Akker, Monique Tabak, Hermie Hermens and Ernst Bohlmeijer
Centre for Monitoring and Coaching

The UT/CTIT research centre "Centre for Monitoring and Coaching" (CMC) is a multidisciplinary centre of expertise in health and wellbeing, combining telemedicine, human media interaction and psychology. The centre's ambition is to create smart, innovative technological solutions that:

- Support people in active healthy aging;
- Decrease the load on intramural care by supporting self-management;
- Enable elderly to live as long as possible in their own environment.

The focus is on smart monitoring and coaching systems following the concept of "High Tech Care with a Human Touch". This poster presents 4 flagship projects within the CMC:

- PERGAMON - virtual coaching and serious gaming for adolescents with T1DM
- eWall - Caring Home Environments based on advanced sensing and reasoning in an unobtrusive way
- SenseIT - e-coach on emotional arousal for borderline personality patients
- Virtual Rehab - Personalized VR treatment for clients with MID and SUD

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Michel Klein, Saskia te Velde, Anouk Middelweerd, Julienka Mollee, Adnan Manzoor
Active2Gether: An Intelligent Android-App for Stimulating Physical Activity

The Active2Gether smart phone system aims at promoting engagement in physical activity of young adults and and empowering them to become more active. The system is developed as an Android application that can be combined with an off-the-shelf activity tracker. It uses GPS and data from questionnaires to provide personalized coaching towards choosing for active transport, being involved in sporting activities, and using the stairs instead of an elevator. The system provides an overview of the progress of a person's physical activity and regularly sends motivating messages. It can be connected to Facebook to present the physical activity level of friends. The system can also pose questions to the user. A model-based reasoning technique is used for determining which coaching messages should be send to the user.

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Marjolein Lanzing
Self-tracking, Personalized Feedback and Privacy

Self-tracking technologies are becoming increasingly popular, especially in the domain of health and fitness. Devices such as FitBit, Strava and LoonCup and applications such as Apple Health Kit, Sleep Cycle, Rise and MySugr offer users personalized feedback that persuades users to change their behaviour in order to improve their health and fitness. In order to enable the much-valued personalized feedback for behavioural change, large swaths of personal data are continuously collected, monitored and processed real-time. The algorithmic analysis of data patterns creates a personalized technology experience that enables 'hypernudges': powerful and persuasive kinds of personalized feedback that adapts real time to the behaviour and decisions of the user. The continuous (self-) surveillance it requires and the personalized steering of behaviour enabled by (self-) surveillance raises two types of privacy-ethical issues: informational and decisional privacy. Both of these are instrumental to the value of autonomy.

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Mike Ligthart and Mark Neerincx
Evaluating an Autonomous and Responsive Avatar for Diabetic Care: The Pitfalls Of Questionnaire Based Research with Children
For the Horizon2020 PAL project we developed a digital diabetes diary with an avatar that responds autonomously to the added content. Elements of the self-determination theory are operationalized in the form of avatar behavior. The avatar's job is to support the diary adherence of diabetic children. Children benefit from a structured lifestyle where insulin use is regularly monitored. During the evaluation we discovered and circumvented two pitfalls of questionnaire based research with children. Firstly, children have the tendency to not give enough thought about their answer. This is strengthened by difficultly phrased questions or (long) lists of questions. Secondly, questionnaires do not always reveal important contextual information. Results of the evaluation showed that the social quality of the avatar behavior is an important factor for its success. However, an important modulator for social quality was not revealed: user expectations. In our poster we will discuss our solution for both pitfalls.
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Sumit Mehra
Harnessing the Potential of Persuasive Technology: Getting Older Adults to Exercise at Home with a Blended Intervention
Ageing is associated with a decline in daily functioning and mobility. An active lifestyle and physical exercise can minimize the decline of daily functioning and improve the quality of live. Persuasive technology can assist older adults to attain those health benefits. Based on preliminary focus groups (N=48), instructional videos were recorded and an app for a tablet was developed. The app was designed to support self-regulation by providing goal-setting, a tailored exercise schedule, self-efficacy enhancing videos and the ability to track progress. Furthermore, for a blended approach users can be guided by a remote coach via a live video connection. A usability test (N=15) showed that first-time users ranging from 66 to 99 years old were able to use most features without many problems. In future work long-term usage will be investigated in a randomized controlled trial (N=240) which will also determine the extent actual health benefits are attained.
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Jan-Pieter Meijering
Healthy Lifestyle Innovation Agenda
The foundations Health Valley (HV), ICT for Brain, Body & Behavior (i3B) and Food Valley NL (FV) work together in the C.I.A.L.E. project: Connect, Innovate, Accelerate, Improve and Expand. This cooperation forms the largest SME network in the Eastern region of the Netherlands. The objective of C.I.A.L.E. is to establish and expand cooperation among SMEs, to encourage interaction between SMEs, large companies and/or knowledge institutions and to stimulate valorization in the field of ICT, Brain, Cognition and Behavior, Nutrition and Health with impact on the Eastern region of the Netherlands. To achieve this, the C.I.A.L.E. partners have established the 'Healthy Lifestyle Innovation Agenda'.
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Geerte L. Paradies, Roos Delahaij and Iris de Hoogh
Wearable Resilience Monitoring Technology: A Usability Study
A resilience monitoring and feedback application for employees was developed by TNO. This application integrates the use of a smart watch, daily questionnaires on smart phone and personalized feedback to enhance resilience. It was expected that the combination of these tools would enhance motivation to use the application and awareness about stress and resilience. Goal of this study was to evaluate usability on these aspects. In total, 36 professional athletes participated by using the application in two trials of 3 and 4 weeks. Interviews and questionnaires were used to assess usability. Participants reported that the tool was easy to use and not too time-consuming. In addition, the participants reported that the tool raised awareness about potential useful behavioral change. However, they missed guidance on how to actually change their behavior. Future research should focus on how to facilitate behavioral change.
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Wilma Otten and POWER2DM Consortium
Power2DM to Empower Diabetes Patients to Co-Manage their Well-Being
POWER2DM is a Horizon 2020 project that started in February 2016. The consortium consists of clinical, technical and behaviour change experts from five European countries. The main objective of POWER2DM is to develop and validate a personalized self-management support system (SMSS) for Type-1 and Type-2 diabetes patients that combines and integrates: (i) a decision support system (DSS) based on interlinked predictive computer models; (ii) automated e-coaching and advice functionalities based on Behavioural Change Theories; and (iii) real-time personal data processing and interpretation. The SMSS will provide automated personalized action (care) plans in terms of lifestyle changes and therapy adjustments for optimal metabolic control. The specific self-management goals are articulated in a consultation between the patient and the physician. In this first shared decision making phase the results of prognostic models is incorporated. POWER2DM will be evaluated in 3 pilot studies in 3 different EU countries: Spain, Germany and The Netherlands.
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Shayesteh Shokoufefard, Mohamad Ali Mazaheri and Elaheh Homayounvala
Development of a Novel Serious Game for the Assessment of Maternal Sensitivity and e-Coaching Mothers of 1 to 5 Year-Old Children
A large part of the stability of child's internal working model of attachment depends on his/her relationship with caregiver. Mother's responses to child's needs can be different in various situations and developmental stages. The main point of all the available sensitivity measurement is exact observation of target behaviors in natural circumstances like home by a completely educated observer, which causes many limitations. In light of the importance of identifying the different situational requirements in mother-child relationship and providing urgent interventions, development of a serious game gives us the possibility of simulating mother-child interacting situation as in real life and by considering various contexts and circumstances. This game will be installed on smartphones and tablets, with the mother as a user, who plays the game and interacts with a child in different situations. The system's feedback, in the form of the child's reactions in the game, provides e-coaching for the mother regarding how to adopt a more sensitive approach toward the child.
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Franci Suni Lopez and Nelly Condori-Fernandez
Can Software Services Be More Persuasive Exploiting Physiological Data? The Case of Medication Adherence
Currently there are many applications that aim to enhance the medical adherence (e.g. health-care game). However there are still limitations and challenges to make them more adaptable to actual user needs. In this poster, we introduce the inference engine of an adaptive persuasive mobile application, which exploits physiological data in order to deliver messages/recommendations at different persuasiveness levels.

Our inference engine consists of i) a fuzzifier responsible of determining a stress level based on EDA values and ii) a neural network responsible of determining the hypertension health risk (HHR) based on physical activity, temperature and EDA. The persuasive level is derived from the outcomes combination of the two modules of the inference engine. A preliminary test using one-hour data from the Empatica repository was carried out (17840 logs). The obtained results are consistent with the expected values.
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Roelof Anne Jelle De Vries, Khiet Truong and Vanessa Evers
Tailoring Motivational Text Messages in eHealth Coaching Technology for Physical Activity
Developing eHealth coaching technology to support long-term behavior change is a challenge. A solution is to incorporate insights from behavior change theory and tailor to individual users. As part of ongoing research, we investigate whether behavior change theory can be effectively represented by motivational text messages in the context of physical activity and how we can tailor to potential eHealth coaching technology users to increase how motivating these messages are perceived. So far, we carried out studies to: investigate whether the processes of change, from the Transtheoretical Model can be effectively represented by motivational text messages, we crowdsourced peer-designed and expert-designed text messages and coded them into categories based on the processes of change, and evaluated whether people perceived peer-designed or expert-designed messages as more motivating depending on their stage of change, personality and gender. All of these factors were found to be influential for different process-of-change motivational text messages.
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Luuk van Wel, Anke Huss, Philipp Bachmann, Marco Zahner, Hans Kromhout, Jürg Fröhlich and Roel Vermeulen
Context-Sensitive Ecological Momentary Assessments; Integrating Real-Time Exposure Measurements, Data-Analytics and Health Assessment Using a Smartphone Application
Modern sensor technology makes it possible to simultaneously collect vast amounts of environmental, behavioural and health data. These are often linked to separately collected contextual information with considerable time lag, leading to complications when assessing transient and/or highly spatially variable environmental exposures. Context-Sensitive Ecological Momentary Assessments (CS-EMAs) could be used to address this. We present a case study using radiofrequency-electromagnetic fields (RF-EMF) exposure as an example for implementing CS-EMA in environmental health research. Participants installed a custom application on their smartphone and carried an RF-EMF exposimeter for 48 hours. Questionnaires were triggered based on a continuous data stream from the exposimeter. After two days participants completed an evaluation questionnaire. 74% of all CS-EMAs were completed with minimal influence on daily activities. There were no effects found between

well-being and the level of RF-EMF exposure. We show that is it feasible to use a CS-EMA based method in environmental research.

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Linda Wesselman, Ann-Katrin Schild, Nina Coll-Padros, Wieke van der Borg, Rosalinde Slot, Lena Sannemann, Lorena Rami, José Luis Molinuevo, Femke Bouwman, Frank Jessen, Wiesje van der Flier and Sietske Sikkes
Improving Brain Health Through an Online Lifestyle Program: Preferences of Cognitively Normal Elderly
Aim: To investigate the preferences in cognitively normal elderly for an online lifestyle program (OLP) targeting brain health.
Methods: This study is part of the European Euro-SCD study. We recruited cognitively normal participants with subjective cognitive decline from the VUmc Alzheimer Center Amsterdam, the Netherlands. We distributed a 29-item online survey.
Results: A total of 114/166 (69%) participants completed the survey. Almost all respondents reported that lifestyle could contribute to brain health (98%) and reported willingness to use an OLP targeting brain health (93%). Nutrition (80%), cognitive activity (79%) and physical activity (78%) interested most participants. The majority reported 'trustworthiness', 'up-to-date information' and 'easy-to-use' as motivating factors to use an OLP, whereas 'having contact with others', 'account needed' and 'assignments/homework' were reported as barriers.
Discussion: There is a need for an OLP targeting brain health. As a next step, we will investigate applicability to other European countries.

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Arlette Van Wissen, Daniel Schulman, Joyca Lacroix and Cliff Laschet
A Generic Behavior Change Engine for Learning and Adapting
For behavior change programs to be effective they should be able to adapt to the changing needs of the user. When users feel the program is not supporting them sufficiently to meet their health goals, their engagement with the program often rapidly declines. One way to remedy this is to maintain a dialogue between user and the system. In this demo, we demonstrate a generic reasoning engine called 'LeAd' (for Learn&Adapt). The engine is able to learn at what times and locations a user is most likely to respond. The engine uses those learnings to adapt the scheduling of dialogue prompts in order to optimize the likelihood of maintaining a successful dialogue with the user. LeAd can be configured to operate on top of existing behavior change programs, and will be evaluated for effectiveness in the context of two existing Philips behavior change solutions.

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J.E. van der Zwan, W. de Vente, A. C. Huizink
Time2Breathe: An E-Based HRV Biofeedback Program to Reduce Stress in Pregnant Women
Prenatal stress and anxiety can negatively affect birth outcomes and the developing child. Therefore, interventions that address stress and anxiety are necessary. Heart rate variability (HRV) biofeedback has been proven to reduce stress and increase adaptation to stressful situations in people reporting stress-complaints, including anxiety and mood problems. In addition to that, HRV biofeedback is easy to learn. To make this technique more readily available for mothers-to-be who want to reduce their stress level, we developed an e-based

HRV biofeedback self-help program: Time2Breathe. Time2Breathe constitutes an 8-week program consisting of psycho-education on stress and HRV-biofeedback, daily breathing exercises using a HRV biofeedback tool (~20 minutes/day) and behavioral exercises to enhance relaxation. Furthermore, it includes weekly pregnancy-related information. We are currently piloting Time2Breathe in a non-pregnant sample. Our next step is to assess whether Time2Breathe is effective in reducing stress and in improving well-being and attentional control in pregnant women. If effective, Time2Breathe can be utilized by midwives, general practitioners, hospitals and other institutes that deal with stressed pregnant women.
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