



Editorial: Special issue on health behavior change support systems



This special issue of the International Journal of Medical Informatics is on *Health Behavior Change Support Systems (HBCSSs)* [1]. The use of technology to change behavior for health and wellbeing is rapidly increasing and academic research plays an important role in helping to understand why HBCSSs may or may not work and instructing in how to improve such systems. The goal of this special issue is to showcase different approaches to develop and evaluate HBCSSs. When assisted by HBCSSs, health behavior change emerges from the interplay of technology, content, and contexts of use, and such change can only be fully understood when looked at from the systemic viewpoint. All seven articles in this special issue do just that: They represent the combination of technology, content, and context in focus. One article presents a viewpoint on exactly this issue, four of the articles describe a study around a specific HBCSS and two of the works represent a meta-analysis and a systematic literature review. We strongly believe that study of HBCSSs as systems is essential to be able to gain insights in their proper construction for maximal effectiveness.

This special issue starts with a paper called 'Health Behavior Change Support Systems as a research discipline; a viewpoint' by Saskia Kelders, Harri Oinas-Kukkonen, Anssi Oörni, and Julia van Gemert Pijnen [2]. This viewpoint argues for the establishment of the study of HBCSSs as an independent research discipline, where theories need to be adapted or developed to explain the phenomena that are encountered. The paper gives an overview of existing research from multiple disciplines on HBCSSs and shows the need and value for a more integrated approach. It also provides examples of and recommendations to achieve such an integrated approach.

The second article in this special issue, titled 'iLift: A health behavior change support system for lifting and transfer techniques to prevent lower-back injuries in healthcare' by Derek Kuipers, Bard Wartena, Boudewijn Dijkstra, Gijs Terlouw, Job van't Veer, Hylke van Dijk, Jelle Prins, and Jean Pierre Pierie, focuses on creating a HBCSS to reduce lower back problems in nursing personnel [3]. The authors show that by starting with a broad focus (lower back problems) in a specific context, the content can be adapted to the specific needs of the target group. In their study, this meant a shift in the goals of the system from educational (how to lift and transfer) to behavior change (how to support nurses in implementing this behavior in daily practice). Furthermore, the specific focus on the system has led to a persuasive game that has already showed the desired training effects.

The third article, "Development of an integrated e-health tool for people with, or at high risk of, cardiovascular disease: The

Consumer Navigation of Electronic Cardiovascular Tools (CONNECT) web application" by Lis Neubeck, Genevieve Coorey, David Peiris, John Mulley, Emma Heeley, Fred Hersch and Julie Redfern, describes a user-centered development process of a HBCSS integrated with the primary care health record and aimed at cardiovascular risk reduction [4]. They demonstrate how a user-centered design approach can be used to better integrate needs into the concept, specifications, development and refinement of a responsive web application for risk factor reduction and disease prevention.

The fourth contribution to the special issue is 'Making time for mindfulness' by James Laurie and Ann Blandford [5]. The authors report the results of an interview study, which focuses on how people experience mindfulness programs. The authors gain many useful insights into why such an app succeeded or did not succeed in changing the behavior of the users. A central finding is that mindfulness apps need to fit the busy lives of the users to be successful. To achieve this, the apps need to be designed to fit the lifestyles of different users. Yet, it seems to be just as important that designers should incorporate features that support the user in fitting the app into their lifestyles.

'Persuasive user experiences of a health Behavior Change Support System: A 12-month study for prevention of metabolic syndrome' by Pasi Karppinen, Harri Oinas-Kukkonen, Tuomas Alahäivälä, Terhi Jokelainen, Anna-Maria Keränen, Tuire Salonurmi and Markku Savolainen is the fifth article of this special issue [6]. The authors focus on how people experience the persuasive features of a system. As a large scale longitudinal study, this article provides unique insight into how the relative importance of persuasive features in a HBCSS vary as a function of the use context. For example, the study shows unobtrusiveness is important in all stages of the intervention, while it seems that the need for social support grows along the duration of the intervention.

The sixth article is titled 'Understanding persuasion contexts in health gamification: A systematic analysis of gamified health behavior change support systems literature' [7]. This article by Tuomas Alahäivälä and Harri Oinas-Kukkonen clearly shows the importance of taking the context of HBCSSs into account. The authors review 15 gamified health intervention studies and show that they are very diverse: they focus on different behaviors, use a multitude of technologies and methods. By making these differences explicit and presenting the concepts to do so, the authors take a first step towards systematically comparing gamified HBCSSs. They present a compelling argument for future research to compare the different combinations of contextual factors, theories, gamified

strategies and the study outcomes to understand how to achieve the best results in all areas of healthcare. With this new knowledge, development of gamified HBCSSs can transform from an ad-hoc approach to an evidence-based decision for certain strategies.

The seventh and last article of this special issue is titled 'The Relationship between Persuasive Technology Principles, Adherence and Effect of Web-Based Interventions for Mental Health: a Meta-Analysis' and is by Gina Wildeboer, Saskia Kelders, and Julia van Gemert-Pijnen [8]. This study focuses on whether persuasive technology principles are related to the adherence and effect of HBCSSs for mental health. The authors have performed a meta-analysis on studies on 48 interventions targeting mental health that have been derived from a previous systematic review. The results show that there is a relationship between the number and combinations of persuasive technology principles and the effectiveness of interventions. For the total number of principles and the number of dialogue support principles, it seems that including more principles leads to higher effect. Furthermore, the study shows that there are certain combinations of principles, like tunneling and tailoring, that are more effective than others, which is useful for developers of future HBCSSs.

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Saskia M. Kelders*

Harri Oinas-Kukkonen

Anssi Oörni

Julia E.W.C. van Gemert-Pijnen

University of Twente, Centre for eHealth and Wellbeing Research, Department of Psychology, Health and Technology, Enschede, The Netherlands

University of Oulu, Oulu Advanced Research on Service and Information Systems, Faculty of Information Technology and Electrical Engineering,

Oulu, Finland

Abo Akademi University, Turku, Finland

University of Twente, Centre for eHealth and Wellbeing Research, Department of Psychology,

Health and Technology, Enschede, The Netherlands

Health and Technology, Enschede, The Netherlands

*Corresponding author at: University of Twente, Room Cu B114, P.O. Box 217, 7500AE Enschede, The Netherlands.

E-mail address: s.m.kelders@utwente.nl (S.M. Kelders)