Original Article

Digital Health and Computer-Tailoring: Opportunities and Challenges in Moving the Field Forward

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In present times, digital health interventions are pervasive. This is not surprising, as the Internet is accessible 24/7, available independent of a person's location, and the most consulted medium when people need health related information (van de Belt et al., 2013). As described in another article published in the European Health Psychologist (Smit et al., 2019), we define Digital health as *"the use of digital information and communication technologies to improve health and increase the chances of sustainable healthcare for all"*. According to this definition, digital health interventions include but are not limited to eHealth, mHealth, telemedicine as well as wearable devices.

Computer-tailoring is an inherent part of many digital health interventions. This is achieved through the programmed delivery of intervention materials that are tailored – or adjusted – based on an assessment of the characteristics, beliefs and/or behaviour of each individual user (de Vries & Brug, 1999). In contradiction to generic forms of digital health communication (e.g., health information websites), computer-tailored interventions provide participants with personally relevant information. In line with what is described in the Elaboration Likelihood Model (Cacioppo & Petty, 1984), this information is consequently more likely to be read, to be used and engaged with, and to be processed in depth. This results in beneficial outcomes such as greater recall and enhanced initiation or continuation of the communicated health behaviour (change) (Cacioppo & Petty, 1984; Kreuter et al., 1999; Nikoloudakis et al., 2018; Ritterband et al., 2009).

A convincing amount of evidence exists showing that computer-tailored digital health interventions can (cost-)effectively change health behaviour for the better (Cheung, Wijnen, & de Vries, 2017; Lustria et al., 2013; Schulz et al., 2014). While this has led to calls for wide-scale implementation of digital health interventions, the modest effect sizes obtained from studies of efficacy remind us that there is still room for improvement. This also extends to applications targeting intermediaries (e.g., health care professionals, de Ruijter et al., 2018) and intermediate behaviours (e.g., smoking cessation support tool uptake, Gültzow et al., 2021). Furthermore, new technologies such as artificial intelligence bring about new opportunities as well as challenges that need attention if we are to ultimately bring the field forward.

With all this in mind, and to join forces in moving the digital health field forward, a new Special Interest Group (SIG) on the topic of Digital Health and Computer-Tailoring was launched during the 2019 annual conference of the EHPS (Smit et al., 2019). The mission of this SIG is *"to advance digital health and computer-tailoring research and to provide a forum for EHPS members to discuss new evidence, underlying mechanisms and specific components of digital health interventions that may lead to enhanced behavioural outcomes"*. The guest-editing of this special issue in the official EHPS bulletin, i.e., the European Health Psychologist, is one of the steps we have taken

since the SIG's launch in 2019, to provide such a forum.

We are very proud of the final collection of articles included in this special issue, covering a wide range of aspects related to digital health and computer-tailoring. To elaborate, Villinger et al. (2021) present the results of a smartphone-based Ecological Momentary Assessment study that aimed to assess health as well as risk behaviours and COVID-19 related risk perception in a real-world setting, capturing daily variations and changes over time in the context of the COVID-19 pandemic, to understand how variations in risk perception relate to behaviours. The main findings of their study were that perceived likelihood of having contracted COVID-19 was significantly higher on days when participants had had more in-person social contacts and left their homes for multiple reasons. Furthermore, there was substantial variation in health-related behaviours, including eating healthy foods, unhealthy snacking, alcohol consumption, physical activity, sedentary behaviour, and overnight sleep not only between, but also within individuals and on a daily basis.

The latter finding of the study by Villinger et al (2021) relates to the framework presented in the second article of our special collection, authored by Marques and Guastaferro (2021). They argue that MOST – which stands for Multiphase Optimization Strategy – can provide a valuable contribution to the development of behavioral interventions. MOST is an engineering-inspired framework to support the development, optimization and evaluation of multicomponent behavioral interventions. The framework includes three phases: Preparation, Optimization and Evaluation. In particular, the authors argue for the integration of the optimization phase within the standard intervention development process in order to increase the likelihood that resultant interventions are effective, parsimonious, and able to be readily implemented. By putting emphasis on optimization, MOST values the empirical process of identifying an intervention that produces the best expected outcome obtainable given key constraints imposed by the need for affordability, scalability, or efficiency. The MOST framework lends itself to the use of adaptive experimental research designs during the evaluation phase. These include for example, Just-In-Time-Adaptive-Interventions (JITAIs; Nahum-Shani et al., 2015) that are especially designed to consider daily fluctuations in health-related cognitions and behaviors, e.g., as described in the article by Villinger et al. (2021).

This brings us to the third article included in this special issue, in which Wunsch et al. (2021) provide a conceptual overview of JITAI research and discuss the challenges and opportunities with a focus on physical activity interventions. In their position paper, the authors describe key advantages of JITAIs as constituted by the potential to 1) tailor interventions to individual users' needs in real time to deliver support at the most promising moment, 2) adapt to input data, 3) be system-triggered, 4) deliver goal-oriented interventions, and 5) allow for customization depending on the users' preferences. Because of these characteristics, JITAIs may increase engagement with and effectiveness of health behavior interventions. Nevertheless, the authors also argue that most existing JITAI research shows considerable methodological shortcomings, with the most prominent being that JITAIs are not described in a standardized fashion which complicates extracting information on effective components of the interventions to inform future research and practice. The authors conclude their work by stating that although JITAIs are a promising feature in mHealth applications, a sound theoretical basis is still lacking and interdisciplinary expert-panels are needed to refine development, implementation, and evaluation of JITAIs and to keep pace with technological innovations – as described by Marques and Guastaferro (2021), MOST might be a framework that is helpful here.

The last paper in this special issue refers to technological developments as well, detailing how routinely collected data and novel self-assessment methods can be used in computer-tailoring to measure psychological constructs and address the key challenges of low levels of engagement and high attrition that are likely caused by the high perceived user burden when completing the long, theory-based self-report questionnaires needed for the individual assessment that forms the basis for computer-tailored feedback generation. Building upon novel technological possibilities, Short et al. (2021) describe several examples of how routinely collected data can be used as input for computer-tailoring, one being that it may be possible to deduce exercise habits using a smartphone by combining automatically collected data on behavior frequency (e.g., using accelerometers, GPS or movements between cell towers) with data on contextual cues (e.g., location, time of day, interactions with specific people). They also describe several novel ways in with data can be purposively sampled in a less burdensome manner as compared to self-report questionnaires, one example being the adoption of game-based elements such as avatar selection to assess real as well as ideal user self-perceptions. The authors conclude their article by discussing the challenges one may encounter when using the proposed methods for routinely collecting data and/or self-assessment, and providing multiple recommendations for future research and practice, which are hoped to stimulate further momentum in this area.

All in all, we have very much enjoyed putting together this special issue about digital health and computer-tailoring and hope it will provide food for thought and scholarly discussion, so that we, as a community, can ultimately move this exciting field forward by taking advantage of the (technical) opportunities and overcoming the challenges we will encounter.

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