

Failures in Technology-Based Public Health Interventions

Position Paper for “Failed yet successful - Learning from discontinued civic tech initiatives”

Jochen Meyer

OFFIS – Institute for Information Technology, Oldenburg, Germany, meyer@offis.de

Wilko Heuten

OFFIS – Institute for Information Technology, Oldenburg, Germany, wilko.heuten@offis.de

1 INTRODUCTION

Worldwide, societies are challenged by, an ageing society, drastic increases in behavior-related diseases such as cardiovascular diseases, and by financial and personal shortages in nursing and healthcare [1]. Public initiatives aiming to improve individual’s health are therefore a major building block contributing to sustainable future societies [4]. Since more than a decade, technology is researched and now more and more deployed as a tool in personal public health initiatives [5].

We as the authors and their colleagues have conducted many years of research in this field ourselves, and of course, we are excited about the opportunities. However, when it comes to the “reality check” we must admit that there is a gap between the research ambition and the practical effects and relevance.

Here, we present the case of the “PROMOTE” study where activity trackers were embedded in an intervention to motivate physical activities for elderly persons. While the study itself provided interesting insights and resulted in multiple publications, e.g. [2,7,8], from a public health perspective it might be considered a failure, as the use of activity trackers showed no significant improvement over the control group without such devices.

2 THE PROMOTE STUDY SETUP

The PROMOTE intervention-study was conducted as part of the larger and ambitious AEQUIPA¹ [3] interdisciplinary regional prevention research network comprising seven universities, two research institutes, one regional health economy organization and one municipality centered around North-Western Germany. PROMOTE [9] aimed to understand the effects of web-based and wearable technology in a 10-week program for the initiation and maintenance of regular physical activity of older adults. The first PROMOTE study, conducted 2016-2017 in the region of Bremen, North-Western Germany, used an expert-driven approach to develop a technology-based physical activity promotion intervention. A study with 589 older adults aged 65-75 years compared the effects of a technology-based intervention with a web-based intervention plus activity tracker use on physical activity and with a delayed intervention control group. In the second

¹ <https://www.aequipa.de/>

PROMOTE study, conducted 2019 in the same region, the technology-based interventions were adapted based on experiences gained in the first iteration. An additional print-based intervention with similar content to the web-based interventions was newly developed. In the subsequent study, the effectiveness of both interventions for promoting physical activity was compared in 242 initially inactive older adults aged 60+.

3 HOW WAS THIS A FAILURE?

Concluding from the study results, we would like to highlight three points that might be considered failures:

- (1) The technology-based intervention did not perform better than the control group. While in general falsifying research hypotheses should not initially be considered a failure, it is still disappointing that our long-held conviction that technology is helpful is not so readily true.
- (2) Technology was not just viewed critically, but often also treated unfair or even plainly rejected. This was not just a matter of acceptance in the target group, but also an issue in the project team where we as technology designers and developers had difficulties to advocate our ideas to the study supervisors which subsequently may have lead to inappropriate presentation of technology to the participants.
- (3) Due to project and study concepts, we had to design our technology relatively early and relatively fast with relatively few resources. While our main ideas were thus well reflected in the final study system, it was always a little regrettable to see over multiple years how our simple system was used in an extensive study while we so new and cool new prototypes and had so many ideas how our system could be improved, if only we had the time.

4 WHAT DID WE LEARN

Summing up our experiences from the PROMOTE and other technology-based studies in the AEQUIPA project, we identified three main lessons learnt [6]:

- (1) Designing technology for public health interventions requires a complex design project where (a) involvement of multiple scientific disciplines is necessary, but also challenging, that (b) must be used-centered to as best as possible address the requirements of the intervention's target group and (c) must be conducted iteratively to ensure that with limited resources the best-possible result can be achieved.
- (2) An extremely high awareness of the target groups and their specific needs and requirements are absolutely necessary for the success of real studies and must be addressed in recruitment processes, but also in support of participants for uptake of the and adherence to the study. This is particularly true when addressing elderly persons that often are considered slightly difficult, but is most likely true for any target group of any study.
- (3) Make sure to understand the implications for technology-based interventions: what barriers are there to access the technology and what solutions can be implemented to lower them? Be aware that particularly in real-life participants must be treated appreciative also by the technology, which particularly means that technology must keep the participants in the loop by giving them feedback. Tailor the intervention to the participant's lives. And – particularly for elderly people –be aware of physical needs and restrictions, due to age-related functional decline.

REFERENCES

1. Catherine P Benziger, Gregory A Roth, and Andrew E Moran. 2016. The global burden of disease study and the preventable burden of NCD. *Global heart* 11, 4: 393–397.
2. I Bragina, S Lippke, C Pischke, J Meyer, S Muellmann, E Rost, H Zeeb, and C Voelcker-Rehage. 2017. PROMOTE: Tailoring Physical Activity Interventions to Promote Healthy Ageing. *Innovation in Aging* 1, suppl_1: 221. <https://doi.org/10.1093/geroni/igx004.828>
3. Sarah Forberger, Karin Bammann, Jürgen Bauer, Susanne Boll, Gabriele Bolte, Tilman Brand, Andreas Hein, Frauke Koppelin, Sonia Lippke, Jochen

- Meyer, Claudia R Pischke, Claudia Voelcker-Rehage, and Hajo Zeeb. 2017. How to Tackle Key Challenges in the Promotion of Physical Activity among Older Adults (65+): The AEQUIPA Network Approach. *International Journal of Environmental Research and Public Health* 14, 4.
4. Robert S Gordon Jr. 1983. An operational classification of disease prevention. *Public health reports* 98, 2: 107.
 5. Predrag Klasnja, Sunny Consolvo, David W McDonald, James a Landay, and Wanda Pratt. 2009. Using mobile & personal sensing technologies to support health behavior change in everyday life: lessons learned. *AMIA ... Annual Symposium proceedings / AMIA Symposium*. *AMIA Symposium* 2009: 338–342.
 6. Jochen Meyer, Tiara Ratz, Alexander Pauls, Sandra Hellmers, Susanne Boll, Sebastian Fudickar, Andreas Hein, Jürgen M Bauer, Frauke Koppelin, Sonia Lippke, Manuela Peters, Claudia R Pischke, Claudia Voelcker-Rehage, Hajo Zeeb, and Sarah Forberger. 2022. Designing and applying technology for prevention—Lessons learned in AEQUIPA and its implications for future research and practice. *Frontiers in Public Health* 10. <https://doi.org/10.3389/fpubh.2022.832922>
 7. Saskia Muellmann, Christoph Buck, Claudia Voelcker-Rehage, Inna Bragina, Sonia Lippke, Jochen Meyer, Manuela Peters, and Claudia R Pischke. 2019. Effects of two web-based interventions promoting physical activity among older adults compared to a delayed intervention control group in Northwestern Germany: Results of the PROMOTE community-based intervention trial. *Preventive Medicine Reports*: 100958. <https://doi.org/https://doi.org/10.1016/j.pmedr.2019.100958>
 8. Claudia R Pischke, Claudia Voelcker-Rehage, Manuela Peters, Tiara Ratz, Hermann Pohlabein, Jochen Meyer, Kai von Holdt, and Sonia Lippke. 2020. Implementation and Effects of Information Technology-Based and Print-Based Interventions to Promote Physical Activity Among Community-Dwelling Older Adults: Protocol for a Randomized Crossover Trial. *JMIR Res Protoc* 9, 4: e15168. <https://doi.org/10.2196/15168>
 9. Tiara Ratz, Sonia Lippke, Saskia Muellmann, Manuela Peters, Claudia R Pischke, Jochen Meyer, Inna Bragina, and Claudia Voelcker-Rehage. 2020. Effects of Two Web-Based Interventions and Mediating Mechanisms on Stage of Change Regarding Physical Activity in Older Adults. *Applied Psychology: Health and Well-Being* 12, 1: 77–100. <https://doi.org/10.1111/aphw.12174>

Short bio of authors

Jochen Meyer received his diploma in Computer Science and his PhD from the University of Oldenburg, Germany. After an employment as a software developer in Hamburg, he works at OFFIS Institute for Information Technology in Oldenburg, Germany, where he first was active as a research assistant. From 1998 to 2008 he was director of the division “Multimedia and Internet Information Services”, from 2008 to 2022 director of the "Health", and since 2022 director of the newly founded division "Society" whose goal is to research and develop novel technologies for an inclusive and democratic society. He is responsible for about 30 researchers working in regional, national and international projects. His research areas include technologies for wellbeing and prevention, ambient assisted living, and personal use of multimedia data.

Wilko Heuten is senior principal scientist at OFFIS – Institute for Information Technology in Oldenburg, Germany. His research interests are the design and development of multimodal mixed reality technologies. He received his PhD with the title “Non-visual support for navigation in urban environments” in September 2007. Wilko Heuten is leading the group Mixed Reality at OFFIS. The group develops and investigates new interaction methods to create immersive support of everyday life activities, social connectedness and work. Wilko Heuten leads and co-ordinates several research and industrial-driven projects.