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Technostress among health professionals

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IMPACT

In the introduction to this thesis, the case stories of Dora, Marc, and Alice are presented. These describe how and why health professionals can experience stress when working with technology. This so-called technostress can lead to health problems and a lower commitment to the job for health professionals. Dora, Marc, and Alice have in common that they experience technostress to some extent. They all show other dominating technostress creators that originate from their individual characteristics, such as, for Dora, age and gender or the technology itself, or, for Marc, having to work with unreliable technology. Alice feels less satisfied with her job because of the technostress she experiences, and shows a lower commitment to the job. In this thesis we mainly focused on the experience of health professionals. Their responses highlighted the role they play in this blame game between health professionals and technology. The extent of technostress depends on where you work and what your job is, since, in particular, physicians and nurses in clinics and secondly in psychiatric hospitals showed higher technostress. Up to now, little has been known about technostress and its inhibitors, such as digital competence, in the healthcare setting. The thesis addressed this knowledge gap by giving an overview of the extent of technostress and digital competence, embedded in a comprehensive framework. Although the technostress measured was moderate, we may expect it to increase along with the ongoing digital transformation of healthcare. Thus, this topic will gain in relevance for science and society in the coming years, as digital health is often mentioned as the solution for the future for delivering high quality and sustainable care.

Scientific impact

This thesis generates new knowledge about the extent, association, and further influencing factors of technostress and digital competence among health professionals. Until now, no comparison across health professional groups and settings for this topic was available. The thesis also contributes to the discussion in stress research, showing that technostress should be incorporated in future research and also that positive reactions (techno-eustress) are of concern. Although this thesis focused solely on the distress of technology use, the underlying model allowed a complex phenomenon

with reciprocal influences to be investigated, indicating several inhibitors of technostress. Our findings show that digital competence is an inhibitor of technostress, as is social support, and this gives guidance about suitable measures to reduce technostress. Furthermore, we developed and validated a 12-item Digital Competence Questionnaire for nurses in clinical practice, which is available in English and is free to use. The questionnaire is added to this publication as an additional file. Researchers can use the questionnaire and address the implications for further research mentioned in the relevant chapter. The questionnaire is already attracting international interest. Another research group from Turkey has meanwhile shown interest and requested permission to translate and psychometrically test the questionnaire.

One important scientific impact is achieved through the dissemination of the findings. The R scripts developed in this thesis are being used in a Master's degree program in nursing to teach the preparation and analysis of data in the statistics program R. All the articles were submitted to open access journals, with two having been published and one having been accepted and being available as pre-print. The chosen journals are focused either on informatics in healthcare or on health professionals. The published articles have already been cited multiple times. Furthermore, Chapters 2 and 3 were presented at three different international conferences with different audiences: (1) European Conference on Mental Health in 2021, (2) 3Länderkongress Psychiatrie in 2022 and (3) European Doctoral Conference in Nursing Science in 2019. The publication of Chapters 2 and 3 led to a request for the author to be a keynote speaker at a nursing-specific conference in Germany "5. Clusterkonferenz Zukunft der Pflege" in 2022. The keynote speech was followed by an interview, which is presented on the website of the German Federal Ministry of Education and Research. All peer-reviewed publications and the pre-print were distributed via ResearchGate and linked on social media platforms, and are available on the repository of the Bern University of Applied Sciences. For nurses and the interested public, a blog post about sustainable digitalization in healthcare is available. Managers of the participating health organizations were offered a presentation of their results. Some managers decided to proceed with this topic, and workshops were organized to discuss their digitalization strategy and define the next

steps, which resulted in follow-up project ideas on fair and participatory shift planning with new technology and integrated care models with technology such as a database and interface for interprofessional information exchange. Furthermore, the developed R script for the text mining analysis is freely available as an additional file to the pre-print, which will allow other researchers to use the full script or parts of it for comparable research questions and to retrace the analysis process. All publications and the most relevant findings are presented and available on the author's private website at christophgolz.ch.

Societal impact

Society depends on a well-functioning health system. With the increase in digital solutions in everyday life, there are also expectations regarding the level of digitalization in the healthcare system. Patients want more autonomy and to be empowered to manage their own health. Technology has a key role in making this possible. To meet patients' expectations, health providers should have the necessary technologies, along with digitally competent health professionals. These competences go beyond the use of technology, as patients need to be shown which suitable solutions exist and to be guided in their use.

The thesis shows that it is not very easy to implement a new technology in healthcare because of reciprocal influences and consequences. The different preconditions of health professionals, and the development of technologies that bypass the health professionals' needs, lead to a discrepancy between the possible added value and the experienced reality. The thesis serves as a basis for players from society to raise awareness of technostress and digital competence, and to establish measures to intervene in healthcare. The players may be developers in health technology companies, managers of health organizations, health professionals, health professionals' educators, or policy makers. All these play a role in the development, implementation, and maintenance of technology at work in healthcare.

Developers are responsible for prototyping soft- and hardware, and managers for the digitalization strategy of their organization as well as the decision in

favor for or against a particular technology. Raising awareness is intended to make them realize the consequences of their previous actions for health professionals. As described in the section on quadruple aims, managers should also focus on the experience of health professionals, besides lower costs, improved patient experience and better outcomes [1]. As the thesis shows, health professionals struggle with the unreliability of technologies that are implemented (Chapter 4). Furthermore, health professionals want to be involved in a co-creation process, and to cooperate actively in the development and implementation of technology. Developers and managers could contribute to positive experiences with technology among health professionals if they involved health professionals in the development and implementation phase.

For health professionals, this thesis supports a better understanding of the technostress they themselves experience at work. They can see that in this thesis they are heard and taken seriously. Health professionals should understand that their opinion is crucial in the digital transformation of the healthcare system. Nurses can use the questionnaire developed in this thesis to gain insight into their digital competence. The different perspectives in this thesis show that, although they are the ones affected by technostress, they can also play a part in reducing it and in improving digital competence. As described earlier, health professionals are not aware of how they will be influenced by the ongoing digital transformation. Thus, this thesis contributes to preparing health professionals for the future, through raising awareness. The awareness-raising can already begin in education to achieve a uniform starting position for health professionals regarding digital competence. The thesis provides evidence that higher levels of education lead to higher levels of technostress. On the one hand, this may be due to the associated professions. On the other hand, there seem to be higher expectations of digital competences for physicians and nurses at tertiary level, which are currently not being met. This is a challenge that health education organizations need to meet. Various measures are already being implemented for this purpose. In modules of the Master's degree program in nursing on knowledge transfer, research management and seminars on the Master's thesis, the thesis can serve as a basis for explaining scientific

dissemination and for preparing and analyzing data in the statistics program R. Additionally, topics for Master's degree theses are suggested. Furthermore, involvement in the development and implementation of technologies requires technological knowledge and, if necessary, an expanded vocabulary to talk with developers and medical and nursing informaticists. For this, there are the first approaches towards cooperation, with a study program already on the curriculum in medical informatics that can match medical informaticists and nurses. In the first phase, module assignments for medical informatics students are now supervised by me.

For policy makers, the thesis underlines international recommendations to improve health professionals' digital competence, along with technologies tailored to health professionals' needs. The Digital Skills for Health Professionals Committee of the European Health Parliament recommends offering better incentives for health organizations and investment in the improvement of health professionals' training [2]. Regarding the generational differences in digital competences, policy makers are asked to involve technology-savvy young people in the transfer of those recommendations into practice [3]. At the national level, policy efforts are in their infancy. Only last year, a motion was submitted in Switzerland by Ettlin [4] to drive forward the digital transformation in healthcare. In exchanges with health politicians at public events, I was able to explain the relevance of the topic. The topic is gaining widespread interest in society. Even during the writing of this thesis, conferences on the topic of digitalization in healthcare and the impact on health professionals were organized by employers' associations, and I was invited to these to speak alongside health politicians.

References

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