Technostress and digital competence among health professionals in Swiss psychiatric hospitals: a cross-sectional study

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Abstract

Background: Psychiatric hospitals are increasingly becoming digitized because of the disruptive increase in technical possibilities. This digitization leads to new tasks and demands on health professionals, which can have an impact on technostress. It is unclear whether digital competence reduces technostress and how technostress affects the health professionals' mental and physical health.

Objective: The aims of the study were to assess the association between digital competence and technostress, considering individual characteristics as well as the association between technostress and the long-term consequences for health professionals.

Methods: Cross-sectional data from three Swiss psychiatric hospitals was analyzed using multiple linear regressions. The dependent variables for the models were (1) digital competence, (2) technostress and (3) long-term consequences (intention to leave the organisation or the profession, burnout symptoms, job satisfaction, general health status, quality of sleep, headaches and work ability). For each long-term consequence, one model was calculated. Mean scores for technostress and digital competence could range between "0" fully disagree to "4" fully agree, whereas a high value for technostress indicated high technostress and a high value for digital competence indicated high digital competence.

Results: The sample consisted of 493 health professionals in psychiatric hospitals. They rated their technostress as moderate (M = 1.30, SD = 0.55) and their digital competence as high (M = 2.89, SD = 0.73). Digital competence was found to be significantly associated with technostress (? =-0.20, P < .001). Among the individual characteristics, age (? = 0.004, P = .03) and profession were revealed to be significantly associated with both digital competence and technostress. Technostress is a relevant predictor for burnout symptoms (? = 10.32, P < .001), job satisfaction (? = -6.08, P < .001), intention to leave the professions (? = 4.53, P = .002) or the organization (? = 7.68, P < .001), general health status (? = -4.47, P < .001), quality of sleep (? = -5.87, P < .001), headaches (? = 6.58, P < .001), and work ability (? = -1.40, P < .001).

Conclusions: Physicians and nurses who have more interaction with digital technologies rate their technostress higher and their digital competence lower than the other professions. Health professionals with low interaction with digital technologies appear to overestimate their digital competence. With increasing digitization in psychiatric hospitals, an increase in the relevance of this topic is expected. Educational organizations and psychiatric hospitals should promote the digital competence of health professionals proactively in order to manage the expected disruptive change.

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Introduction

Psychiatric hospitals are increasingly becoming digitized because of the disruptive rise in technical possibilities [1,2] as well as legal requirements like the obligation to use nationally shared electronic health records [3]. Moreover, the COVID-19 pandemic has underlined the need for additional digital services such as telemedicine or remote-monitoring in mental health to avoid social exclusion through lockdowns or due to living situations in remote regions [4,5]. Health professionals are thus increasingly confronted with digital technologies for clinical practice and interaction with patients as well for administrative tasks.

Hence, digitalization creates new tasks for health professionals and places demands on them that are not part of their education and training. These include for example the management of data privacy [1] or digital competences to enhance appropriate patient communication online [6]. In addition, new tasks make demands such as increasing time spent with documentation [7,8] or with low usability electronic health records [9], as well as technical support among colleagues [10], which were previously beyond the scope of health professionals' work.

The demands for digital competences and associated changes in one's professional role also require a change in perception of and attitude towards digital resources in everyday work [11]. Consequently, this transformation may have a stress-inducing effect on health professionals, especially since psychiatric health professionals tend to be hesitant regarding new technologies because of expected deleterious effects on the relationship between the health professional and the patient [12,13]. They may, for example, feel more disturbed by the digitization of their daily work than their colleagues in settings which are traditionally more digitized, such as acute care with its intensive care units.

The phenomenon called technostress is "a reflection of one's discomposure, fear, tenseness and anxiety when one is learning and using computer technology" [14]. The term was introduced in 1984 by Brod [15] as "a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner" during the rapid emergence of technology in everyday life. Studies on technostress among health professionals are scarce [16,17]. Recent study has revealed that psychiatric health professionals experience a moderate level of technostress [16].

Technostress is known to have an effect on professionals' working life [10], such as reduced job satisfaction [18,19] but also on their private life such as psycho-physiological reactions like headaches and fatigue [20,21] or burnout symptoms [22]. Being exposed to stress-inducing technology can even result in reduced ability to work and an intention to leave the job, which could exacerbate the already existing shortage of health professionals [23].

An important factor in technostress is expected to be an individual's digital competence, since higher digital competence has been identified as having a mitigating association with technostress [10,24]. However, it was found that professionals with high digital competence tended to feel particularly stressed by the non-availability or unreliability of the technologies used at work [24]. Research on digital competence among health professionals has quite a strong focus on the knowledge and skills of using digital technologies at work [25] or on specific sub-groups in nursing, such as nurse leaders [26,27]. The TIGER Nursing Informatics Competencies Model, for example, consists of the three parts: basic computer competences (e.g. using the computer and managing files), information literacy (e.g. evaluating information and its sources critically) and information management (e.g. using electronic health records) [25]. However, additional

factors, such as attitude, motivation and experience of using digital technologies are also thought to be relevant in the context of digital competence. A recent review of research on health professionals' digital competence summarized the key areas of this competence as "sufficient knowledge and skills […], social and communication skills […], motivation and willingness […] and support for positive experiences in digitalization" [28]. Hence, besides insufficient knowledge and skills for proper implementation and use of digital technologies, a lack of motivation and prejudice against digitalization are, for example, associated with reduced technology use. Moreover, health professionals must adapt their communication style, depending on whether they are communicating face-to-face or via telemedicine [28]. Therefore, behavioural determinants are crucial to enhanced digital competence in addition to knowledge and skills [29].
Unfortunately, findings on digital competence and its association with technostress are not specific to health professionals in psychiatric hospitals. Yet it is especially for these health professionals that information on their digital competence and technostress is needed, since they are considered to be reluctant adapters of digitization, despite increasing calls for its adaptation to new tasks and requirements to keep up with their profession. These contradictions of reluctance and ongoing change need to be addressed at an early stage.

This paper therefore aims to answer the following research questions:

(1) How do health professionals in psychiatric hospitals rate their digital competence?
(2) How do health professionals in psychiatric hospitals rate their technostress?
(3) What is the association between health professionals' digital competence and their technostress, considering the health professionals' individual characteristics?
(4) What is the association between technostress and long-term consequences for health professionals?

Methods

This cross-sectional study was conducted in three psychiatric hospitals in the German-speaking part of Switzerland as part of the STRAIN study "Work-related stress among health professionals in Switzerland" [23]. That study is based on a cluster randomized controlled trial (Clinical Trials registration: NCT03508596) consisting of three measurements (baseline, first, second) and investigating work-related stress among health professionals in Switzerland.

Sample and recruitment

The study sample of the STRAIN study included acute care and rehabilitation hospitals, psychiatric hospitals, nursing homes and home care organizations. Detailed information on the STRAIN study sample has been published elsewhere [23]. For this study, a request to participate was sent to the 12 psychiatric hospitals that had already participated in the STRAIN study. The internal coordinators of the psychiatric hospitals were contacted by email and asked whether their institution's health professionals might participate in this study, which would focus on technostress and digital competences. The project was then presented to the decision-makers at the psychiatric hospitals. Health professionals from the following work categories were included in this study: nursing staff, physicians, psychologists, medical therapeutic professionals and social workers. Participants who labeled themselves as "researcher" or "administration" in the additional free text field were excluded. Overall, 1767 health professionals were eligible for participation.

Data collection

The study was conducted along with the second measurement of the STRAIN study between June and September 2020. The questionnaires for the health professionals from the institutions that had

agreed to participate were expanded to include topic-specific scales measuring technostress and digital competence.
The internal coordinator of the participating psychiatric hospitals disseminated the information for participants and the survey to the health professionals. Participation in the study was possible via paper or online questionnaires in German. For the paper questionnaires, a pre-stamped envelope was enclosed to return the questionnaire to the project team. For the online questionnaire, the link to the online survey using SurveyMonkey® and UmfrageOnline® was either sent individually by email or published on the organization's intranet by the coordinator. A reminder to complete the questionnaire was sent electronically or on paper two weeks afterwards by the internal coordinator.

The questionnaires

The three questionnaires used in this study comprised a technostress questionnaire [24], an in-house developed digital competence questionnaire and the STRAIN questionnaire [23]. The questionnaire was estimated to take 45 minutes overall to complete.

Technostress questionnaire

For the measurement of technostress, the scale created by Gimpel et al. [24] was used. The scale, which shows satisfactory reliability (Cronbach's alpha = 0.91), is based on Ayyagari et al.'s [30] technostress model, a model widely used in research on technostress. It consists of 12 items using a five-point Likert scale, with the endpoints 0 ("fully disagree") and 4 ("fully agree"). For interpretation of the data, a mean score is calculated (min. = 0; max. = 4), in which a high score indicates high technostress. The questionnaire covers the following 12 items, which are derived from the theory's dimensions: uncertainty (ongoing changes lead to uncertainty and constant learning); insecurity (feeling threatened about losing one's job); unreliability (unreliability of technology used); overload (technology forces users to work faster and longer); invasion (employees can be reached anytime); complexity (users feel inadequate regarding their competences); performance control (feeling of being monitored and compared); ambiguity of the role (technical problems must be solved by oneself); interruptions (malfunctions and unstable systems); non-availability (lack of technology that can reduce workload); no sense of achievement (feeling of lack of progress at work); and invasion of private life (feeling one's private life is affected).

Digital competence questionnaire

To measure digital competence among health professionals, no suitable and compact questionnaire was available that focused on the five key areas of digital competence (knowledge, skills, communication, experience and attitude) for health professionals [28]. Moreover, in order not to lengthen the already long questionnaire excessively and so negatively influence the response rate, a short self-assessment scale measuring digital competence was needed. Hence, for each of the five key areas, an item was developed in-house. The five items covered the following topics: knowledge (e.g. one's own knowledge of digital technologies at work); skills (confidence in using digital technologies at work); communication (e.g. confidence in communication using digital technologies at work); motivation (e.g. motivation to use digital technologies in everyday work); and attitude (e.g. attitude towards potential improvements through digital technologies at work). Items were scored on a five-point Likert-Scale with 0 ("fully disagree") and 4 ("fully agree"). For the interpretation, a mean score was calculated (min. = 0; max. = 4), a high score again indicating high digital competence.
The single items of digital competence were tested for construct validity by conducting exploratory factor analysis and reliability tests. The requirements for factor analysis were met with item correlations above 0.3 and a significant Bartlett's test of sphericity ($\chi^2(4) = 39.36$, $p<0.001$), as well as the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy with acceptable values above 0.6

(KMO = 0.81). A scree plot was used to test for loadings on one factor. The reliability test for the five developed items on digital competence revealed satisfactory internal consistency (Cronbach's alpha = 0.87) (Multimedia Appendix 3).

STRAIN questionnaire

The outcome variables (Figure 1) for the long-term consequences stem from the STRAIN questionnaire [23,31], which comprises well known, valid and reliable scales such as the Copenhagen Psychosocial Questionnaire (COPSOQ) [32], the self-rated general health status [33], the NEXT questionnaire [34], the von Korff questionnaire [35] and the work-ability index (WAI) [36]. The scores from the COPSOQ, the NEXT questionnaire, von Korff and the general health status ranged from a value of 0 ("do not agree at all") to 100 ("fully agree"), or from 0 ("worst imaginable health state") to 100 ("best imaginable health state") for the general health status and from 0 ("no influence") to 100 ("could no longer perform activity") for the von Korff questionnaire. The COPSOQ scale scores were included if at least half of the items had no missing values [37]. The total score of the WAI questionnaire ranged from 7 ("minimum working capacity") to 49 ("maximum working capacity").

Data analysis

The analysis was conducted using R version 3.6.1 [38] and included descriptive statistics for technostress and digital competence. Furthermore, multiple linear regression models were calculated using the MASS package [39]. The predictor and outcome variables were chosen to cover the dimensions of the model of digital stress [24]. The model describes the correlation between technostress, inhibitors of technostress and consequences of technostress. Furthermore, individual characteristics (e.g. age, education, sex) were added to the model, as they have been identified as relevant predictors elsewhere [10]. To answer the research questions, multiple linear regressions were therefore conducted (1) with digital competence as the outcome and individual characteristics as predictors, (2) with technostress as the outcome and individual characteristics and digital competence as predictors and (3) with long-term consequences as outcome variables and technostress, digital competence and individual characteristics as predictors (Figure 1). For each of the following long-term consequences, a separate multiple linear regression was calculated: intention to leave the organization [23], intention to leave the profession [23], burnout symptoms [32], job satisfaction [32], general health status [33], quality of sleep [34], headache [35] and work-ability [36].

To minimize the effect of internal dropouts, missing data were filled in based on multiple imputation expecting data to be missing completely at random, using the mice package [40]. To test for multicollinearity, the variance inflation factor (VIF) was computed (1.06 to 1.70): it is regarded as acceptable to proceed if variables show values below 3 [41]. The assumption of heteroskedasticity was tested with the Breusch-Pagan test. It was met for the multiple linear regressions. Hence, standard errors, p-values and confidence intervals were bootstrapped (r=999, bias corrected and accelerated, 95% CI). For the multiple linear regressions, a stepwise model selection was conducted, based on the Akaike information criterion [42].

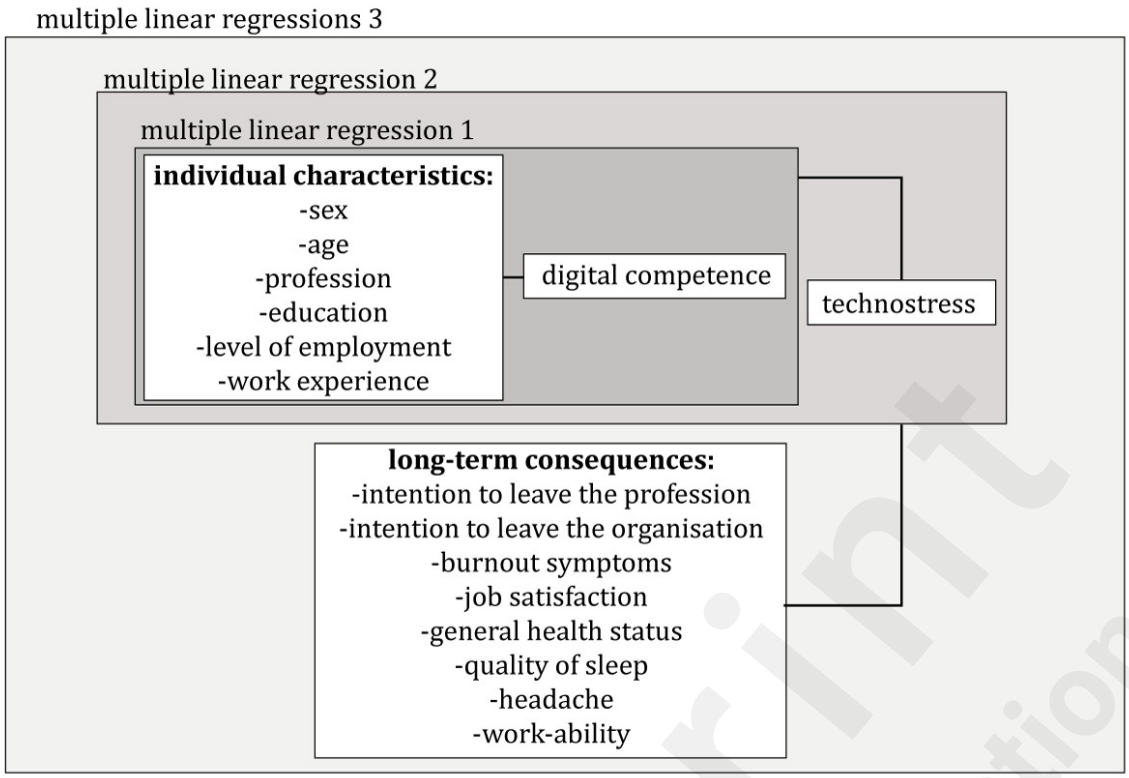

Figure 1: Scales used for the multiple linear regression models

Ethical considerations

The local Swiss ethical board confirmed that the study did not warrant a full ethical application and did not fall under the Swiss Federal Act on research involving human beings (Req-2020-00179). The participants are professionals and can take responsibility for their own participation. They received written information before the start of the study regarding the subject, the aim and the voluntary nature of their participation. Filling in the questionnaire was counted as informed participation. The data were gathered anonymously and could not be traced back to individual participants.

Results

In total, 493 health professionals participated in the study, which corresponds to a response rate of 27.9%. Among the participants 60% (296) were nurses, 12% (61) psychologists, 11% (55) social workers, 9% (43) physicians, and 8% (38) medical-therapeutic professionals. The mean age of the participants was 41 years (SD = 12.33) and the majority was female (71%). For technostress, health professionals reported a moderate mean score of 1.30 (SD = 0.55). Nursing staff (M = 1.41, SD = 0.54) and physicians (M = 1.41, SD = 0.54) revealed the highest score among the professions included, followed by medical-therapeutic professionals (M = 1.23, SD = 0.60), social workers (M = 1.15, SD = 0.57) and psychologists (M = 0.95, SD = 0.40). Health professionals rated their digital competence high with a mean score of 2.82 (SD = 0.76): social workers were found to have the highest score (M = 3.18, SD = 0.57), followed by medical-therapeutic professionals (M = 2.90, SD = 0.84), psychologists (M = 2.89, SD = 0.73), physicians (M = 2.82, SD = 0.66) and nurses (M = 2.71, SD = 0.78).

Technostress

Table 1 summarizes the results of the multiple linear regression with technostress as the outcome variable. The regression model was shown to be significant F(6,486) = 19.81, P <.001 and to explain 20% of the variance (R^2). Being a physician (β =0.22, P = .03) or a nurse (β = 0.17, P = .02) was

shown to have an increasing association with technostress, compared to being a social worker (intercept), while being a psychologist was negatively associated with technostress (β =-0.23, *P* = .01). Digital competence was also revealed to be negatively associated with technostress (β =-0.20, *P* < .001). This means that an increase in digital competence of 1 point, results in a decrease in technostress by -0.20 points of the mean score.

Table 1: Multiple linear regression with technostress as the outcome (observations n=493)

Coefficient	β	Std. Error	T value	p-value (*with bootstrap)	CI (95%)
Intercept	1.63	0.15	10.86	<.001	1.62 – 1.64
Age	0.004	0.002	2.21	.03*	0.004 – 0.004
Physicians	0.22	0.10	2.22	.03*	0.22 – 0.23
Psychologists	-0.23	0.09	-2.53	.01*	-0.24 - -0.23
Nurses	0.17	0.07	2.30	.02*	0.16 – 0.17
Digital Competence	-0.20	0.03	-6.71	<.001	-0.21 - -0.20
Technostress: 0 (no technostress) - 4 (high technostress)					

Digital competence

The multiple linear regression with digital competence as the outcome was shown to be significant F(7,485) = 10.47, *P* <.001 and to explain 13% of the variance (R^2). Being male was shown to be positively but not significantly associated with digital competence (β = 0.11, *P* =.15). Also, level of employment was positively associated with digital competence (β = 0.006 *P* <.001). Age proved to be negatively associated with digital competence (β = -0.014, *P* <.001), meaning that digital competence decreases marginally with increasing age (Table 2).

Table 2: Multiple linear regression with digital competence as outcome (observations n=493)

Coefficient	β	Std. Error	T value	p-value (*with bootstrap)	CI
Intercept	3.25	0.21	15.52	<.001	3.24 – 3.26
Sex: male	0.11	0.08	1.45	.15*	0.10 – 0.11
Age	-0.014	0.003	-5.29	<.001	-0.01 - -0.01
Level of employment	0.006	0.002	3.21	<.001	0.006 – 0.006
Physicians	-0.46	0.15	-3.11	<.001	-0.47 – -0.45
Psychologists	-0.26	0.13	-1.92	.06*	-0.26 - -0.25
Nurse	-0.48	0.11	-4.55	<.001	-0.49 - -0.48
Digital competence: 0 (no digital competence) - 4 (high digital competence)					

Long-term consequences

The results of the multiple regression models with long-term consequences as the outcome variable are shown in Tables 3 and 4. The models indicate that the independent variables predict the outcome 'burnout symptoms' best R^2 = 0.16, F(10,482) = 9.28, *P* < .001, followed by 'intention to leave the organization' R^2 = 0.15, F(13,485) = 6.37, *P* < .001 and 'job satisfaction' R^2 = 0.15, F(12,480) = 5.28, *P* < .001. 'General health status' turned out to have the lowest explanatory power with the included predictor variables R^2 = 0.06, F(3,489) = 9.88, *P* < .001.

In all models, technostress was significantly associated with the outcome variable. The highest

impact was found for ‘burnout symptoms’, with an increase of 10.32 (*P* <.001) associated with an increase in technostress of 1 point. Technostress was also positively associated with ‘headache’ (β=6.58, *P* <.001) and the outcomes ‘intention to leave the profession’ (β=4.53, *P* =.02) and ‘intention to leave the organization’ (β=4.53, *P* <.001). Moreover, technostress was negatively associated with ‘job satisfaction’ (β=-6.08, *P* <.001), ‘general health status’ (β=-4.47, *P* <.001), ‘quality of sleep’ (β=-5.87, *P* <.001) and ‘work ability’ (β=--1.40, *P* <.001).

The predictor variable digital competence was included in six of the eight models. The effect of digital competence was lower than the effect of technostress. Digital competence was positively associated with ‘quality of sleep’ (β = 4.19, *P* <.001), ‘job satisfaction’ (β=2.26, *P* = .02) and ‘work ability’ (β= 0.79, *P* = .002). When interpreting the results, attention must be paid to the possible scores of the outcome variables. Thus, an increase in digital competence of 1 point leads to an increase in work ability’ of 0.79, whereby work ability can range from 7 to 49. An increase of 1 point in digital competence leads to an increase of 2.26 points in job satisfaction on a possible range of 0 to 100.

Discussion

Principal results

Health professionals in psychiatry rate their technostress as moderate and their digital competence as high. Higher digital competence is also significantly associated with lower technostress. The individual characteristics differ in terms of their relevance in the models. Health professionals' age is significantly associated with technostress and digital competence. Older healthcare professionals appear to experience higher technostress and perceive themselves as having lower digital competence. Physicians and nurses appear in the models to have higher technostress and lower competence compared to the other professions surveyed. In particular, being a nurse was shown to have the highest estimates across all outcomes.

To answer the question of the association between technostress and health professionals' long-term outcomes, it should be noted that technostress has a non-negligible impact on long-term consequences, such as burnout symptoms, job satisfaction or headache. Thus, technostress has a measurable association with health professionals' mental and physical health. In addition, technostress promotes intentions to leave the organization or the profession.

Comparison with prior work

The significant association of digital competence with technostress is in line with another study in which 'computer self-efficacy' (i.e. digital competence) is described as an antecedent of technostress [10]. The association highlights the potential of enhanced digital competence to reduce technostress. However, the β-values in the technostress model were equally high for the professions, which could mean that health professionals need to interact with digital technologies to varying degrees at work.
Interestingly, physicians and nurses, who are known to have higher technostress [16] and are thought to have more interaction with digital technologies than other health professionals, were shown to have lower digital competence. This is in contrast with the findings from Kuek and Hakkennes [43], whose study found that health professionals with high frequency digital technology use also showed higher digital competence. However, they argued that the organization in which the study took place was more digitized than organizations in comparable studies. One reason for the reported lower digital competence in the current study could be past experience with digital technologies rather than a lack of knowledge and skills. The past experiences could have been negative due to a lack of "suitable rooms or technical equipment and failing support systems" [28]. Furthermore, it raises the question of whether health professionals who have experienced fewer of these negative interactions rate their digital competence higher because of the absence of digital technologies at work. These results are somewhat at odds with the results of other studies in which people who have little contact with digital technologies show higher levels of technostress because they lack opportunities to adapt and develop their own skills in using them [24]. This phenomenon for the present study's sample could be explained by the Dunning-Kruger paradigm. Studies "repeatedly show that people with little expertise [in the specific field] often grossly overestimate how much they know and how well they perform" [44]. However, the current study does not provide any insights into the extent of health professionals' interaction with digital technologies.

Furthermore, lower digital competence (i.e. computer proficiency) has been found to be one of the barriers to successful implementation of electronic health records in psychiatric hospitals [11]. This would imply for this study that Swiss psychiatric hospitals have a good precondition for successful implementation of digital technologies, since the digital competence of the health professionals was rated high. However, being and active user of electronic health records was among the inclusion criteria for the study, which means that participants self-rated their digital competence on the basis of

having sufficient experience of interaction with digital technologies. According to Staggers, Gassert, Curran et al. [45] there are four different levels of digital competence for nurses. They propose that experienced nurses (level 2) are “highly skilled in using information management and computer technology skills” [45]. This expands understanding of the core competences necessary for consideration as an experienced professional and places a requirement on educational organizations and psychiatric hospitals to support health professionals in fulfilling this aim. Recent findings also highlight the importance of leaders investing in technical support for their employees, such as “receiving low support in learning and using digital tools” [46], which is expected to contribute to enhanced digital competence [28].

Concerning sex, there was no strong evidence as to whether males or females are more affected by technostress. Nevertheless, the model for digital competence indicated that being male is slightly but not significantly associated with digital competence ($p = 0.15$). One reason for this result could be that the clear majority of participants were female (71%), which could have led to an underestimation of the potential difference between the sexes. Regarding the above-described technical support, females seem to compensate for their lower digital competence by relying on the organization’s helpdesk, whereas males tend to exchange expertise [47]. This implies that health organizations might want to invest in a low-threshold helpdesk and to train health professionals with an affinity for digital technologies to become peer supporters.

Evidence for the effects of individual characteristics is inconsistent, in particular regarding age and sex [10]. This study contributes to the discussion by indicating that age is a relevant predictor for both technostress and digital competence. In terms of digital competence, the results of this study appear to confirm that younger healthcare professionals perceive themselves as having higher digital competency [48]. However, recent findings, albeit non-specific to the healthcare setting, indicate that females tend to be more affected by technostress [49]. In this respect, a possible effect of sex should be considered in future studies focusing on healthcare professionals. If it turns out that women are more affected by technostress in the healthcare system, the intended measures must take this possible precondition into consideration.

In terms of the association of technostress and its long-term consequences, other findings from other sectors underline that higher technostress leads to higher intention to leave the profession or organization as well as lower job satisfaction [50]. Furthermore, additional influencing factors in healthcare appear to have a more important impact on long-term consequences for health professionals, such as work-private life conflict or quantitative demands at work [23,51]. However, some aspects of private life conflicts are incorporated in the technostress scale used. One of the themes of technostress is ‘techno-invasion’, measuring the self-perceived aspect that one can be reached at any time. Also, the theme ‘invasion of private life’ is part of the technostress scale, assessing the feeling that one’s private life is affected by digital technologies at work. Although these aspects are included in the technostress scale, the findings in this study do not reach the explained variance of the study indicated above. Therefore, it seems that digital technologies do not currently play a vital role in the context of private life conflicts among health professionals in psychiatric hospitals.

In view of the facts that the Swiss healthcare system is still only partly digitized in terms of international comparison [52] and that psychiatry is not expected to lead the way in digitization, these findings seem logical. However, with a future increase of digitization in psychiatric hospitals [53], the topic’s relevance is expected to rise. A recent study, for example, has described the empowerment / enslavement paradox of digital technologies for surgeons [54]. The study highlights the issue that with an increase in possibilities due to digital technologies, the danger of a misuse

increases, which negatively impacts health professionals' and patients' outcomes. The implication for psychiatric hospitals is therefore that technostress is not a major issue at the moment. However, psychiatric hospitals are encouraged to invest in monitoring their health professionals' digital competence, especially along with implementations of digital technologies and to offer suitable training for their employees. Furthermore, decision-makers should involve health professionals in the development and implementation of digital technologies, since involvement has been identified as crucial for positive experiences with digital technologies, increasing motivation towards innovations and dismantling prejudices [10]. Health professionals have to recognize that they are going to face digitization in their workplace. However, due to many health professionals' rather reserved attitude towards digital technologies at work, decision-makers should approach this process thoughtfully.

Strengths and limitations

This study contributes to the emerging topic of technostress among health professionals in the psychiatric setting. It provides first insights into the association of digital competence with technostress and the association of the two with long-term consequences. The discussion on the potential influence of individual characteristics, such as age, sex, profession and education, is enriched with this study. Furthermore, a digital competence scale with satisfactory properties was developed and evaluated as part of the study. This scale is made available to the community for use in further research (Multimedia Appendix 3).

This study is also subject to several limitations, however. First of all, convenience sampling was used. Of the 12 psychiatric hospitals invited, only three agreed to participate. It cannot be excluded that psychiatric hospitals whose staff generally experience lower technostress agreed to participate because they were more sensitized to the topic. Additionally, the sample does not reflect the typical distribution of health professionals in Swiss psychiatric hospitals. In this study, physicians were underrepresented with 8%, compared to the usual proportion of 17% [55]. This might be because physicians are increasingly reluctant to participate in surveys for reasons like information overload, survey fatigue or privacy concerns [56]. Also, a response rate of 27.9% is considered to be low but rather common for online surveys with health professionals [57,58]. Unfortunately, forecasts indicate even lower average response rates in the near future [59]. Furthermore, participants could decide to use either a paper or an online questionnaire. The comparability of paper and online questionnaires is discussed in the literature. Psychological factors, such as mood state or fatigue during the inquiry can have an impact on responses and can be influenced by "environmental stimuli or distractions" [60]. Especially in healthcare organizations in which the number of computers on the wards is limited and no quiet place is available to withdraw, this could have had a deleterious effect on responses. In addition, one organization opted exclusively for online inquiry. Staff members who feel highly stressed by digital technologies could have been excluded by this decision because they did not want to use the computer unnecessarily for longer than was required by their work. Moreover, no causal conclusion can be drawn, as this study utilized cross-sectional data. These implications need to be considered, when interpreting the results.

Conclusions

Health professionals in Swiss psychiatric hospitals experience moderate technostress at work. They rate their digital competence as high. It might be that health professionals with little interaction with digital technologies at work overestimate their digital competence. Hence, to be able to generate reliable results on this hypothesis in future, the degree of digitization of the organization and the degree of contact with digital technologies on the individual level must be additionally assessed. In this context, research should evaluate whether self-rated digital competence corresponds to an objective assessment of digital competence at work, which would contribute to further development

of the measurement tool for digital competence.

Technostress has been shown to have a relevant association with long-term consequences for staff, especially those with burnout symptoms. Further digitization in psychiatric hospitals is expected to have an increasing impact on the technostress experienced. Additional digital competence will be needed as an inhibitor of technostress for health professionals to sustainably cope with technostress and thus lower the risk of long-term consequences.
Health professionals and professionals in educational organizations do yet not recognize the future digital competences that will be needed. Health and educational organizations are responsible for the adequate preparation of future health professionals, however, which should include training aimed at digital competence.

Psychiatric hospitals can draw a few conclusions based on the results. Since digital competence significantly reduced technostress, further in-house education to promote digital competence should be established. Furthermore, the duties of younger health professionals could be extended to support older health professionals in managing digital technologies at work. Mutual support is demonstrably conducive to acquiring new competences and to strengthening the sense of community in the team. However, this presupposes that such a duty is appropriately appreciated and remunerated.

Psychiatric hospitals in Switzerland are still in their early days in terms of the impact of digital technologies on health professionals. The necessary digital competences will emerge as the digitization process progresses. Researchers must continue to monitor this development and to generate recommendations for measures to reduce technostress and develop suitable educational content on the basis of intervention studies.

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Conflicts of Interest

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the paper.

Multimedia Appendix 1: Table 3: Multiple linear regression models with long-term consequences as outcomes part 1 (observations n=493)
Multimedia Appendix 2: Table 4: Multiple linear regression models with long-term consequences as outcomes part 2 (observations n=493)
Multimedia Appendix 3: Questionnaire Digital Competence

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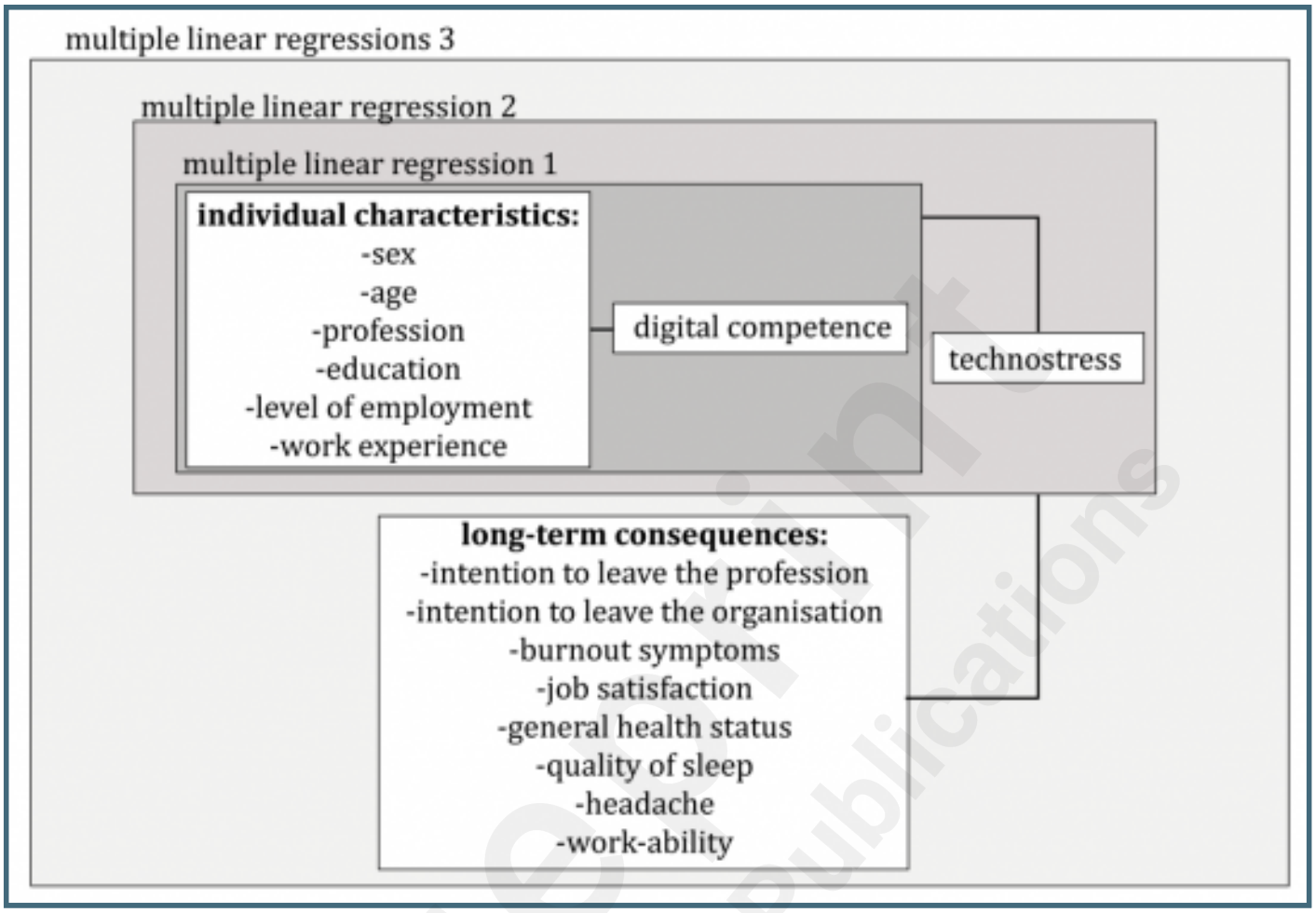
Supplementary Files

Figures

Scales used for the multiple linear regression models.



Multimedia Appendixes

Table 3: Multiple linear regression models with long-term consequences as outcomes part 1 (observations n=493).
URL: http://asset.jmir.pub/assets/328518e6a2dd487abc59a81c25c7c6f7.docx

Table 4: Multiple linear regression models with long-term consequences as outcomes part 2 (observations n=493).
URL: http://asset.jmir.pub/assets/05b061d45fd656cbf5dc9c8b2e4b8159.docx

Questionnaire Digital Competence.
URL: http://asset.jmir.pub/assets/0f5a4ca58c8e6e78ca1eb7ab4cea6dcb.docx