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Examining the Technostress Dimensions and Job Satisfaction in Nursing - A Cross-Sectional Study

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Abstract. The healthcare system is increasingly being digitized. Besides expected benefits, the transformation can negatively affect nurses with increasing technostress. This study aimed to examine technostress among nurses and its association with job satisfaction. Cross-sectional survey data of 154 nurses working in acute hospitals in Switzerland was analyzed using Welch's ANOVA with the Games-Howell test and multiple linear regression model. Among the technostress dimensions, uncertainty was the most agreed upon by nurses, with a mean score of 2.21 (on a scale ranging from 0 to 4), and it differed significantly from other technostress dimensions. The multiple linear regression showed that the feeling of invasion of private life had the strongest negative association with job satisfaction (β = -0.34). Nurses experience constant changes or new developments in the technologies in their organization. Therefore, health organizations should carefully plan their digital transformation processes to minimize simultaneous technology implementations and allow adaptation time.

Keywords. Technostress, Nurse, Job Satisfaction

1. Introduction

Healthcare organizations face several global challenges, which require the organization to adapt to new circumstances, e.g., working with fewer resources and introducing innovations in human resource management or digitization [1]. The digitization of health systems is on the rise, and it is accelerated by the disruptive potential of technological solutions. This transformation has a direct impact on nurses' daily work. Nurses spend already one-third of their time with technology at work [2]. Despite their time using technology, this does not necessarily mean that the digital transformation in healthcare is significantly advanced or delivers the desired benefits to nurses and patients. The progression of digital transformation within health systems has not reached its potential, considering the predicted opportunities and aimed strategic advancements [1]. Looking at already implemented technologies, the possible consequences of inadequate development and implementation become apparent. The

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use of electronic health records, for example, did not lead to a decrease but to an increase in administrative workload [3], resulting in higher stress and burnout [4]. The nurses' reaction to the negative experience with technology usage is known as technostress. Technostress is "a reflection of one's discomposure, fear, tenseness and anxiety when learning and using computer technology" [5]. There is limited research specifically on technostress among nurses [6]. Technostress was moderate among Swiss health professionals, with physicians reporting the highest technostress, followed by nurses [7]. It comprises 12 dimensions, such as the unreliability or complexity of technologies and the unavailability of suitable technologies [8]. Higher technostress leads to lower job satisfaction and higher intention to leave the profession [7,9]. There are fundamental differences between the dimensions of technostress, resulting in different fields of action for health organizations depending on the extent, such as the unreliability or non-availability of technologies [8]. Therefore, the aim of this study was (1) to describe the extent of the 12 technostress dimensions among nurses and (2) to identify differences between the dimensions. Furthermore, (3) to identify the association of the dimensions with job satisfaction.

2. Methods

The study sample comprised nurses working in acute hospitals in Switzerland. We used convenience sampling by sending e-mails with study information and the survey link to nursing leaders of Swiss healthcare organizations and asking them to forward the invitation to their nursing staff.

2.1. Data collection

The data was collected using an online survey between October and December 2023. The questionnaire was based on the model by Ragu-Nathan et al. [10] and comprised several valid and reliable scales: Technostress consisting of 12 dimensions, and the inhibitors technical support provision, literacy facilitation, and involvement facilitation scales by Gimpel et al. [8] were used. Digital competence was measured using the scale by Golz et al. [7]. All the above scales ranged on a 5-point-Likert scale from 0 ("fully disagree") and 4 ("fully agree"), with a high value indicating high technostress, respectively high inhibitors or digital competence [8]. Job satisfaction was measured using a 6-point-Likert scale global single item, "I am satisfied with my professional situation," ranging from 1 ("Does not apply at all") to 6 ("Fully applicable") [11]. Additionally, socio-demographic information (age, sex, and profession) was collected.

2.2. Data analysis

The analysis was conducted using R [12] and included (1) descriptive statistics and (2) Welch's ANOVA with the Games-Howell test for group comparisons of the 12 dimensions of technostress since the assumption of homogeneity of variances was not met. Further, (3) a multiple linear regression model was calculated with backward variable selection and the Akaike information criterion. The variables were chosen to cover the model by Ragu-Nathan [10]. The model describes the association of

technostress and inhibitors of technostress with job satisfaction. Missing data was excluded listwise. The assumption of heteroskedasticity was significant, so we computed the robust standard errors. The local Swiss ethical board confirmed that the study did not warrant a complete ethical application and did not fall under the Swiss Federal Act on research involving human beings (Req- 2023-01001).

3. Results

Overall, 209 nurses participated in the study. After listwise exclusion, 154 complete cases were included. All results are summarized in Table 1. The mean age was 36.68 (SD = 10.75), and the majority was female (139; 90.2%). Among the participants, 145 were registered nurses (94.1%), followed by nursing aides (9; 5.9%).

Table 1. Summary of the results

Topic	**Mean (SD)**	**Regression**	
		R^2 = 28.2%, $F_{7,146}$=9.59 (P<.001)	
		β	se
Intercept		2.93	0.70***
Age	36.68 (10.75)		
Sex: Male		-0.58	0.26*
Technostress [a]	1.46 (0.51)		
Uncertainty [a, 1]	2.21 (0.96)		
Insecurity [a, 2]	0.85 (0.73)		
Unreliability [a, 3]	1.86 (0.92)	-0.19	0.09*
Overload [a, 4]	1.82 (0.96)		
Invasion [a, 5]	1.05 (0.93)		
Complexity [a, 6]	1.05 (0.92)	0.34	0.12**
Performance control [a, 7]	1.78 (1.04)		
Ambiguity of the role [a, 8]	1.16 (0.93)		
Interruptions [a, 9]	2.00 (1.06)	-0.16	0.08*
Non-availability [a, 10]	1.69 (1.03)		
No sense of achievement [a, 11]	0.73 (0.77)		
Invasion of private life [a, 12]	1.34 (1.11)	-0.34	0.07***
Technical support provision [a]	2.66 (0.97)		
Literacy facilitation [a]	2.33 (0.86)	0.25	0.09**
Involvement facilitation [a]	1.13 (0.98)		
Digital Competence [a]	3.13 (0.65)	0.51	0.17**
Job Satisfaction [b]	4.31 (1.13)		
Significant differences using pairwise comparison [c]			
Groups	Mean difference (CI)		
10 vs. 12	0.42 (0.04 – 0.79) *		
10 vs. 1	0.41 (0.04 – 0.78) *		
12 vs. 4	-0.39 (-0.76 – -0.01) *		
4 vs. 1	0.38 (0.02 – 0.75) *		

[a] Range: 0 (“fully disagree”) and 4 (“fully agree”)
[b] Range: 1 (“Does not apply at all”) to 6 (“Fully applicable”)
Significance level: *P ≤ .05; ** P < .01; *** P < .001; β: estimated beta-values; se: robust standard errors; CI: Confidence Intervals; SD: Standard Deviation
[c] pairwise comparison using the significance level of 0.05 (2-sided) with Games-Howell test.

The mean of technostress was 1.46 (SD = 0.51). Among the 12 dimensions of technostress, uncertainty (ongoing changes lead to uncertainty and constant learning) was the most agreed upon by nurses, with 2.21 (SD = 0.96). In contrast, no sense of

achievement (feeling of lack of progress at work) was the most disagreed with 0.73 (SD = 0.77), followed by insecurity (feeling threatened about losing one's job) with 0.85 (SD = 0.73). Regarding the facilitators, the technical support provision was the most agreed upon at 2.66 (SD = 0.97), whereas the involvement in the planning and implementation phases was the lowest at 1.13 (SD = 0.98). The Welch's ANOVA was significant $F_{11},723.2 = 2.74$ ($P<.001$). The post-hoc test revealed four significant differences between the technostress dimensions. Relevant mean differences were found with other dimensions (overload and non-availability) for the dimension uncertainty. The regression model for job satisfaction explained 28.2% of the variance $F_{7},146=9.59$ ($P<.001$). Among the 12 dimensions of technostress, four dimensions were kept in the model, with the invasion of private life ($\beta = -0.34$) having the highest association with job satisfaction, followed by complexity ($\beta = 0.34$). A higher digital competence was associated with higher job satisfaction ($\beta = 0.51$). Thus, with a one-point increase in digital competence, job satisfaction increased by 0.51 points.

4. Discussion

Technostress among nurses is moderate. This finding aligns with other results (1.46 vs. 1.41) [7]. For digital competence, the mean is slightly higher than other findings of nurses (3.13 vs. 2.71) [7]. The reason for this difference may lie in the difference of the sample since the mean age was lower in this sample than in the compared study, and digital competence was found to be negatively associated with age [7]. No direct comparison is available to differentiate the 12 technostress dimensions for nurses. However, the high extent of uncertainty indicates that the nurses' uncertainty has the highest impact on technostress. This is also shown by Califf et al. [9], who found the uncertainty among nurses the highest. Thus, nurses experience constant changes or new developments in the technologies in their organization. In this context, a health organization's digitalization strategy is crucial [13] because it allows long-term planning of digitalization projects and considers the needed time for nurses to adapt to new circumstances and integrate daily use at work. In this study, we focused on job satisfaction as the associated consequence of technostress. Despite some technostress dimensions showing higher values, the invasion of private life was a significant negative factor. Thus, nurses who fear privacy loss due to technology usage also reported lower job satisfaction. Furthermore, nurses experiencing unreliable technologies at work also report lower job satisfaction. Interestingly, nurses reporting higher complexity showed higher job satisfaction. One reason could be that nurses who indicate higher complexity experience complexity as eustress rather than distress. Techno-eustress can be found among individuals who see using technology as an opportunity to improve their competence and work life [9]. The scale used for measuring technostress does not allow for distinction, as eustress has so far been neglected in technostress research [14]. For example, the item "I find that new employees in my organization know more about digital technologies than I do" could also be considered as the awareness of suitable resources for social support.

5. Conclusions

The findings give a first insight into technostress dimensions among nurses working in acute hospitals. Until now, scarce information was available on which dimension of technostress is the most relevant for technostress. The findings highlight that health organizations should carefully plan their transformation processes to avoid stressing their nurses by increasing uncertainty in too many simultaneous technology implementations without adaptation time. Further research is needed to elaborate on the association of the different technostress dimensions with other long-term consequences, such as burnout or intention to leave the organization.

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