

PERCEIVED TECHNOSTRESS WHILE LEARNING A NEW MOBILE TECHNOLOGY: DO INDIVIDUAL DIFFERENCES AND THE WAY TECHNOLOGY IS PRESENTED MATTER?

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Abstract: *A growing body of research demonstrates that using technology can – despite the obvious benefits – be associated with stress. The aim of this study was to explore how perceived technostress while learning a new pro-healthy technology may be grounded in dispositional anxiety, attitudes towards ICT (Information and Communication Technologies), and the way technology is presented. Verifying the hypotheses, a study was conducted with the participation of $N = 1,037$ individuals, in which the 'technology presentation' was manipulated and selected individual differences were measured. As expected, it was found that presenting the new technology in the form of a popular science article was associated with the perception of this technology as more threatening and overloading compared to the situation in which the technology was presented in the form of a marketing leaflet with an unequivocally positive message. Moreover, it was shown that people characterized by higher dispositional anxiety perceived the new technology as more stressful in terms of examined categories of techno-stressors. Support was also found for the hypothesis that attitudes towards ICT correlate to selected dimensions of perceived technostress in regard to newly learned technology. However, the small extents of the effect obtained in the study indicated the need to continue searching for substantial factors that would predict technostress at the early stages of learning a new technology.*

Keywords: *technostress, dispositional anxiety, attitudes towards ICT, mobile technology.*



INTRODUCTION

Scientists have identified the technostress phenomenon as an adaptive challenge. Technostress seen from that angle stems from one's inability to seamlessly adapt to the demands of implementation or operation of new technology processes. This can be ascribed to one's wrestling with cognitive and social challenges of handling new technologies (Brod, 1982; Shu, Tu, & Wang, 2011; Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007). Although, it may seem that the exacerbated intensity of technostress may stem from more generic beliefs about one's computer skills (Shu, et al., 2011), or the role of computers in society (Beckers & Schmidt, 2001), the most indicative source of technostress is one's negative experience derived from either learning or utilising some specific technological solutions. In this case, learning new technology may be perceived as requiring a lot of effort or even threatening, and as such, quite an overwhelming experience (Day et al., 2019). Information communication technologies become a source of stress because they are complex, require fast and intensive learning (techno-complexity), effortful, ever-changing, force one to multitask (techno-overload), they abound in technical glitches and faults, they may be a source of excessive control or negative treatment (techno-threat), (for techno-creators overview see Ayyagari, Grover, & Purvis, 2011; Fischer, Pehböck, & Riedl, 2019; Tarafdar et al., 2007).

Most research on technostress focuses attention on the conditions, symptoms and consequences of this phenomenon in the workplace (Ayyagari et al., 2011; Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). In the occupational context, the main driver of technostress is the pressure caused by the fear of not meeting expectations and not keeping up with new technologies, which increasingly determine professional effectiveness. However, technostress can be experienced in everyday life (La Torre, Esposito, Sciarra, & Chiappetta, 2019). Concerns about the use of new technologies may accompany learning the telephone, computer or software used in non-work areas. However, to the best of the authors knowledge, research on technostress in everyday life is still rare, especially in the context of the first experiences with new technology. The current study fills the gap in this regard, considering perceived technostress-creators while learning a new mobile application. This study also contributes to the simultaneous consideration of individual and situational variables in predicting perceived technostress.

The main aim of this research is to explore how dispositional anxiety, attitudes towards ICT, and the way technology is presented affects perceived technostress while learning new health mobile app. It is to explicate and test the role of psychological and contextual factors in the perceived technology as stressful in non-work context. The intended aim of the research was achieved through a study, where the presentation of a previously unknown health application was manipulated, while demographic and individual variables were controlled.

Individual Differences and Perceived Technostress

The presumption that people would evaluate the same technology use experience in the same way is quite limiting and biased. According to Lazarus and Folkman's Transactional Model of Stress (1987), different people will perceive the utilization of the same device or application as challenging, threatening, or quite neutral for their wellbeing. Moreover, even if a person's evaluates particular ICT experience as threatening, their emotional reaction will be dependent

on how they estimate their own coping potential in this context. Multiple studies evidence that individual differences shape people's technostress experience (for overview see Maier, Laumer, Wirth, & Weitzel, 2019). Research by Lee and colleagues suggests that technostress associated with excessive smartphone use is positively related to individual differences such as external locus of control, social anxiety, materialism, and the need for touch (Lee, Chang, Lin, & Cheng, 2014). Individual differences, and especially personality traits, may also moderate the relationship between the presence of techno-stressors in the workplace and the job performance. Despite the fact that perceiving technology as stressful is generally associated with negative work outcomes, in the case of people who are highly open-to-experience and extroverted, the presence of techno-stressors may be conducive to achieving positive work results (Srivastava, Chandra, & Shirish, 2015). Previous reports indicate that the personality trait of neuroticism is one of the key predictors of perceived technostress. Individuals high in neuroticism perceive technological advances as threatening and stressful to their daily functioning (Devaraj, Easley, & Crant, 2008; Krishnan, 2017). A particularly useful facet of neuroticism for explaining susceptibility to technostress is dispositional anxiety, understood as individual differences in the tendency to experience an emotion characterized by feelings of pressure, worried thoughts and physical changes like increased blood pressure (see Costa & McCrae, 1992). Dispositional anxiety can play a strong role in shaping cognitive processes associated with human-technology interaction. Anxiety signals the presence of potential threat and promotes responses that help individuals reduce their vulnerability to threat (Barlow, 1988), therefore we hypothesize that individuals high in dispositional anxiety would be more likely to perceive new technology as stressful (*hypothesis 1*). Next reason to expect that anxiety is associated with perceived technostress is that anxiety promotes pessimistic appraisals of future events (Shepperd, Grace, Cole, & Klein, 2005) - anxious individuals typically anticipate high levels of distress in response to an event threatening wellbeing or requiring adaptation.

A distinct category of protective resources shielding a person from technostress, is a set of beliefs one has about IT technologies, including self-efficacy in ICT implementation (Shu et al., 2011), as well as generic beliefs about the role of computers in human life and society (Beckers & Schmidt, 2001). These beliefs, as key components of ICT attitude, directly correspond with one's assumptions about technology experiences. Positive attitude towards ICT and high self-belief in regard to one's practical abilities may on one hand diminish threat reaction to it, and on the other, prompt adaptive coping strategies to handle new challenges better. Thus, we hypothesize that individuals manifesting more positive attitude towards ICT would be more likely to perceive the new technology as less stressful (*hypothesis 2*).

The Way New Technology Is Presented and Perceived Technostress

Although a lot of research has been conducted on the psychological, social and occupational effects of technostress (for systematic reviews see Borle, Reichel, Niebuhr, & Voelter-Mahlknecht, 2021; La Torre, Esposito, Sciarra, & Chiappetta, 2019), research on relationship between the way a new technology is presented and perceived stress-creators regarding this technology is limited. However, it can be expected that the form of the first experience with the new technology may be important in assessing the technology in terms of potential threat, overload or complexity.

When a new technology is introduced into use, information about its basic functionalities begins to reach potential users. This information may be provided, *inter alia*, in writing, e.g., in the form of a brochure, short instruction or reports in the form of a popular science article. The information presentation format, not only content of the message, shapes the first impression of the recipient on the presented information (Kelton, Pennington, & Tuttle, 2010). Information presentation format regards to the layout of the content (e.g., section breakdown), graphics, and also the language. It is well known that the language of science can be exclusive, which may be one of the obstacles to achieving one's scientific literacy (Laugksch, 2000).

One of the main categories of material evaluation is its complexity, which in the case of information on a new technology may be particularly important for shaping the first reaction. Techno-complexity is believed to be one of the main sources of stress regarding first experiences with new technology. Techno-complexity implies the amount of time and cognitive (intellectual) effort exerted by an individual in order to understand and master new technologies indispensable to perform work tasks successfully (Tarafdar et al., 2007). Techno-complexity manifests itself by the extent to which technology application instructions are complicated, the multiplicity of its functionalities is high and concepts describing workings of this technology are inaccessible. Whether one evaluates the new technology as cognitively demanding depends on a large extent of its specific properties but can also be attributed to the fact how this technology is being presented. Providing broad access to all the possible information about the technology can highlight its complexity and thus increase technostress. In order to reduce the perceived complexity of technology, it is advisable to present it in stages and to simplify the information about how this technology operates. Additional aspect which may lower the perceived complexity is the way of presenting the same information through more attractive way using graphs, more accessible language, etc.

Also, the sense of threat posed by new technology may be caused by the way the technology is presented. On the one hand, it may be a consequence of difficulties in understanding the fundamental aspects of technology and thus people perceive it as invasive, insecure or overly controlling. On the other hand, it may result from anticipating changes in the immediate environment due to technological development (general attitude towards ICT). The threat posed by new technology also results from the sense of insecurity a person faces when he or she suspects that others may know more about new technologies than he or she does (Tarafdar et al., 2007). As a result, people who perceive technology as threatening perceive it as a risk of undesirable changes in their lives (e.g., having to give up the current lifestyle, being excluded from social groups or rejected by an important person). Negative connotations with a new technology may intensify in the case of receiving complex or incomprehensible information about this technology, and weaken if this message is more interesting and easier to assimilate.

Following the above, we expect that individuals who are presented with key, brief chunks of information about this technology in the form of a leaflet (condition B) or a graphic simplified instruction (condition C) will perceive this technology as less complex (*hypothesis 3*) and less threatening (*hypothesis 4*) in comparison to individuals who will receive an excerpt from the scientific text about this technology (condition A).

METHODS

Participants

A total of $N = 1,037$ adults (including 741 women, 71% and 296 men, 29%) of the 1200 who were initially contacted (response rate of 86%) participated in the study randomly assigned to one of the three experimental conditions. The age of the respondents ranged from 18 to 78 years ($M = 25.48$, $SD = 11.05$). Most of the respondents had secondary education ($n = 665$; 64%), while the remaining persons had undergraduate ($n = 91$; 9%), graduate ($n = 155$; 15%), vocational or elementary education ($n = 126$; 12%). More than half of the respondents still attended high school or university ($n = 551$; 53%), the other persons were employed ($n = 243$; 23%), were employed and continued their education at the same time ($n = 194$; 19%) or did not work nor continued education ($n = 49$; 5%). The description of the study sample, broken down into three experimental conditions, is presented in Table 1.

Table 1. Sample Composition across Three Experimental Conditions.

Variable	Experimental condition A ($n = 323$)	Experimental condition B ($n = 369$)	Experimental condition C ($n = 345$)
Sex			
Female	232 (72%)	281 (76%)	228 (66%)
Male	91 (28%)	88 (24%)	117 (34%)
Age	$M = 25.19$; $SD = 10.80$	$M = 25.83$; $SD = 11.52$	$M = 25.39$; $SD = 10.79$
Education			
vocational or primary	44 (14%)	47 (13%)	35 (10%)
secondary	206 (64%)	239 (65%)	220 (64%)
undergraduate or graduate	73 (22%)	83 (22%)	90 (25%)
Educational/Professional status			
student	170 (53%)	205 (56%)	176 (51%)
employee	73 (23%)	88 (24%)	82 (24%)
learning and working	65 (20%)	59 (16%)	70 (20%)
leisured	15 (4%)	17 (4%)	17 (5%)

Note. Total sample $N = 1,037$.

Procedure

The study was conducted via an internet platform. Participants received a link to the survey by e-mail. After clicking on the link, each respondent was asked to answer demographic questions and complete a set of questionnaires measuring attitudes towards ICT and personality traits (see *Measures* section). In the next step, the subjects were randomly assigned to one of the three experimental conditions. In condition A participants were asked to read a short popular science article about the new health mobile application 'Felicit'. In condition B participants read a marketing flyer about the same application, and in condition C, participants were given to read an excerpt from the instructions on how to use the same health app, as in previous conditions. In particular

conditions, the content of the information was of the same volume, with a similar amount of text (about 1 page). The descriptions also contained all the key information about the application, they only differed in form (see *Appendix A*). Then, each participant, regardless of the condition, took a knowledge test measuring the level of knowledge of 'Felicita', and then answered the questions of the questionnaire measuring technostress related to this application (see Measures section). The study was conducted as part of a broader research project approved by the Ethics Committee of the Institute of Psychology at the University of Gdańsk (No. 9/2021).

Measures

A new measure of perceived technostress related to learning a new health technology was developed, describing major stress-creating conditions already identified in previous research. We used an item set inspired by the Technostress Creators Inventory (TCI) developed by Ragu-Nathan et al. (2008) and its adaptation to mobile technologies (Westermann, 2017). The original scales conceptualize technostress as being manifested in the five dimensions: techno-overload (too much), techno-invasion (always connected), techno-complexity (difficult), techno-insecurity (uncomfortable), and techno-uncertainty (too often and unfamiliar), (Tarafdar et al., 2011, p. 117). However, for the purposes of adjusting the measure of given new health mobile technology (not technology at all), we chose 14 fitting items, the wording of which was additionally modified. In developing the new scale, we focused on three categories of techno-stressors: overload (e.g., 'This technology would make my life even more complex and challenging'), complexity (e.g., 'It would take me a long time to learn this technology'), and threat as mix factors being a source of negative consequences for everyday life (e.g., 'This technology would be violating my personal life'). Respondents answered using a Likert scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree). The results of the validation study using the modified tool supported three-factor structure are in press (for more details see Olech & Jurek, 2022).

The Attitudes towards Information Communication Technologies Scale (AS-ICT) was used to assess participants' attitudes towards technologies. It is a scale that consists of 23 items measuring 4 dimensions of attitudes towards ICT, i.e.: ICT utility (e.g., 'Using new information communication technologies improves quality of life', 'Without information communication technologies, there would be no social and economic progress'), lack of ICT harmfulness (e.g., 'Internet and information technologies do more harm to society than good' (reversely coded), 'New technologies are primarily tools for manipulating people and spreading fake news' (reversely coded), ICT attractiveness (e.g. 'Using the Internet makes me happy', 'The development of information technology makes life more comfortable for all people'), ICT self-efficiency (e.g. 'I feel comfortable using ICT devices such as a computer, smartphone or tablet', 'I freely use electronic forms payments, e.g., internet transfers, payment by phone'). Respondents used a scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree). The psychometric properties of the scale are presented and described in the technical manual (Olech & Jurek, 2022).

To assess dispositional anxiety, the 'Anxiety' subscale (part of the Neuroticism scale) was used from the Revised NEO Personality Inventory (NEO-PI-R) by Costa and McCrae in the Polish adaptation of Siuta (2009). The 'Anxiety' subscale consists of 8 items (e.g., 'I am often worried that something might go wrong') answered on a five-point Likert scale. The reliability

and validity of NEO-PI-R, including its facets, have been well documented in the literature (e.g., Costa & McCrae, 1992).

Age, gender and education were considered as possible confounding variables. These variables were selected due to previous research suggests that they may impact the individual's perception of technology (La Torre, De Leonardis, & Chiappetta, 2020; Tarafdar, Cooper, & Stich, 2019).

RESULTS

All calculations were prepared using the R environment (R Core Development Team, 2020). Means, standard deviations, internal consistency and intercorrelations (r-Pearson) for variables examined in the study are presented in Table 2. As shown, associations between dispositional anxiety and three techno-stressor categories were weak or not significant. Correlations between attitudes towards ICT and perceived technostress dimensions were mostly significant but lower than .30.

Table 2. Descriptive Statistics and Alpha Coefficient for Variables Examined in the Study.

Variable	M	SD	1	2	3	4	5	6	7	8
1/ Dispositional anxiety	3.30	.82	(.83)							
2/ ICT self-efficacy	4.24	.73	.11**	(.77)						
3/ Lack of ICT harmfulness	3.16	.73	-.09	.26**	(.81)					
4/ ICT utility	3.59	.67	-.09*	.39**	.31**	(.71)				
5/ ICT attractiveness	3.87	.72	-.02	.63**	.32**	.54**	(.78)			
6/ Techno-threat	2.86	.99	.20**	-.09	-.28**	-.08	-.11**	(.84)		
7/ Techno-complexity	2.25	.84	.06	-.30**	-.21**	-.11**	-.27**	.44**	(.83)	
8/ Techno-overload	2.61	.87	.15**	-.13**	-.25**	-.05	-.12**	.67**	.57**	(.75)

Notes. $N = 1,037$; *Bonferroni-adjusted p -values at 0.05, **Bonferroni-adjusted p -values at 0.01. Alpha coefficients are given diagonally (in brackets).

Next, we conducted a set of multiple linear regressions, predicting the three techno-stressor categories while learning new app by a way of presenting technology and individual differences, controlling for gender, age and education level. For all tested models, the assumptions for linear regression were verified. For this purpose, the Shapiro-Wilk normality test of residuals was performed. For techno-threat and techno-overload models, the test confirmed the normality of the residual distribution at the level of $p < 0.010$ (respectively: $W = 0.997$, $p = 0.029$; $W = 0.998$, $p = 0.230$). In the case of the techno-complexity model, the Shapiro-Wilk normality test showed a non-normality of residual distribution ($W = 0.983$, $p < 0.001$). However, inspection of quantile-quantile plot showed slight deviations of residuals from the normal distribution. In addition, for each model the error scatter plots were analysed, which confirmed the fulfilment of the assumptions about the linear character of the relationship between the variables and the homoscedasticity of the error distributions.

As seen in Table 3, significant positive associations between dispositional anxiety and three techno-stressor categories still held even after controlling for the attitudes towards ITC

as well as demographic variables. Thus, it supports the hypothesis 1 that individuals with higher dispositional anxiety perceive new technology as more stressful, i.e., more threatening ($\beta = .15$, $p < .001$), more complex ($\beta = .09$, $p < .01$) and more overloading ($\beta = .16$, $p < .001$).

Table 3. Regression Coefficients for Tested Models.

Predictor	Techno-threat			Techno-complexity			Techno-overload		
	B [95% C.I.]	SE	Beta	B [95% C.I.]	SE	Beta	B [95% C.I.]	SE	Beta
Intercept	3.81***	.29		3.53***	.25		2.87***	.25	
<i>Demographic variables</i>									
Gender (male)	-.10 [-.23, .03]	.07	-.05	-.03 [-.14, .08]	.06	-.01	.04 [-.07, .15]	.06	.02
Age	-.01 [-.01, .01]	.01	-.01	.01** [.00, .01]	.01	.10	.01* [.00, .01]	.01	.09
Education (secondary)	-.07 [-.24, .11]	.09	-.03	-.13 [-.28, .02]	.08	-.07	-.18* [-.33, -.03]	.08	-.11
Education (undergraduate or graduate)	-.05 [-.27, .17]	.11	-.02	-.21* [-.40, -.02]	.10	-.11	-.29** [-.48, -.10]	.10	-.15
<i>The way technology is presenting</i>									
Leaflet (compare with scientific paper)	-.19** [-.33, -.05]	.07	-.09	-.02 [-.14, .10]	.06	-.01	-.12* [-.24, -.01]	.06	-.07
Simplified instruction (compare with scientific paper)	-.13 [-.27, .01]	.07	-.06	.01 [-.12, .12]	.06	.00	.08 [-.04, .20]	.06	.04
<i>Individual differences</i>									
Dispositional anxiety	.18*** [.11, .25]	.04	.15	.09** [.03, .15]	.03	.09	.16*** [.10, .22]	.03	.16
ICT self-efficacy	-.05 [-.16, .06]	.06	-.04	-.23*** [-.31, -.12]	.05	-.18	-.05 [-.14, .04]	.05	-.04
Lack of ICT harmfulness	-.36*** [-.44, -.28]	.04	-.28	-.15*** [-.23, -.08]	.04	-.13	-.26*** [-.33, -.19]	.04	-.24
ICT utility	.08 [-.02, .18]	.05	.05	.10* [.01, .19]	.05	.08	.11* [.02, .20]	.05	.09
ICT attractiveness	-.05 [-.16, .06]	.06	-.04	-.16** [-.26, -.06]	.05	-.13	-.01 [-.10, .10]	.05	.00
Model summary									
Adjusted R ²	.11***			.13***			.09***		

Notes. $N = 1,037$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

It was also found that the stronger belief in ICT low harmfulness the less threatening is the newly learned mobile technology ($\beta = -.28$, $p < .001$), less complex ($\beta = -.13$, $p < .001$) and less overloading ($\beta = -.24$, $p < .001$). Further, results presented in Table 3 show that stronger beliefs about ICT self-efficacy and ICT attractiveness are related to perceiving the new technology as less complex ($\beta = -.18$, $p < .001$ and $\beta = -.13$, $p < .01$ respectively). However, no correlation with these dimensions of attitude towards ICT and techno-threat and techno-overload was noted. Additionally, beliefs in ICT utility marginally were related to techno-complexity ($\beta = .08$, $p < .05$) and techno-overload ($\beta = .09$, $p < .05$), but in direction contrary to those predicted in hypothesis 2. In conclusion, the results only partially supported for the hypothesis put forward in this respect.

Finally, results presented in Table 3 show that the way new technology is presented affected perceived technostress but marginally and only in terms of techno-threat ($\beta = -.09$,

$p < .01$) and techno-overload ($\beta = -.07$, $p < .05$). As predicted, getting to know the new technology through a popular science article increases the perceived technostress compared to the situation in which the new technology is presented in the form of a marketing leaflet. The latter serves also as experimental manipulation check.

Since not all effects in the tested models were significant, in the next step the models containing only significant predictors were repeated. Examination of normality of the residuals distribution provided similar results for all three tested models as previously (techno-threat: $W = 0.996$, $p = 0.014$; techno-complexity: $W = 0.983$, $p < 0.001$; techno-overload: $W = 0.998$, $p = 0.208$). As can be seen in Table 4, after the omitting nonsignificant terms, regression coefficients are almost identical when compared to the previously reported results.

Table 4. Regression Coefficients for Tested Models after Omitting Nonsignificant Terms.

Predictor	Techno-threat			Techno-complexity			Techno-overload		
	B [95% C.I.]	SE	Beta	B [95% C.I.]	SE	Beta	B [95% C.I.]	SE	Beta
Intercept	3.59***	.18		3.51***	.25		2.76***	.22	
<i>Demographic variables</i>									
Age	–	–	–	.01** [.00, .01]	.01	.10	.01** [.00, .01]	.01	.11
Education (secondary)	–	–	–	-.13 [-.28, .02]	.08	-.07	-.19* [-.34, -.04]	.08	-.11
Education (undergraduate or graduate)	–	–	–	-.21* [-.40, -.02]	.10	-.10	-.31** [-.49, -.12]	.09	-.16
<i>The way technology is presenting</i>									
Leaflet (compare with scientific paper)	-.18** [-.31, -.04]	.07	-.09	–	–	–	-.12* [-.24, -.01]	.06	-.07
Simplified instruction (compare with scientific paper)	-.13 [-.27, .01]	.07	-.07	–	–	–	.08 [-.03, .20]	.06	.05
<i>Individual differences</i>									
Dispositional anxiety	.19*** [.12, .25]	.03	.16	.09** [.03, .16]	.03	.09	.15*** [.09, .21]	.03	.15
ICT self-efficacy	–	–	–	-.21*** [-.31, -.12]	.05	-.18	–	–	–
Lack of ICT harmfulness	-.37*** [-.44, -.29]	.04	-.28	-.15*** [-.23, -.08]	.04	-.13	-.27*** [-.34, -.20]	.03	-.24
ICT utility	–	–	–	.10* [.01, .19]	.05	.08	.09* [.02, .16]	.04	.07
ICT attractiveness	–	–	–	-.16** [-.26, -.06]	.05	-.14	–	–	–
Model summary									
Adjusted R ²	.11***			.13***			.09***		

Notes. $N = 1,037$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

It should be emphasized that although the direction of a significant part of the relationships between the studied variables was consistent with the hypotheses and these relationships were statistically significant, the regression coefficients are low, so they should be interpreted with great caution. This concern is supported by the analysis of Adjusted R² values for each model tested, which indicates that these models explain between 9 and 13 percent of the variance of the three perceived techno-stressor categories

DISCUSSION

We conducted the current study to explore associations between individual differences (dispositional anxiety, attitudes towards ICT), the way new technology is presented (presentation format of information about technology), and perceived technostress while learning this technology. Specifically, we examined how people perceive techno-threat, techno-complexity, and techno-overload while learning about a new mobile app they haven't used before. As expected, it was found that people characterized by higher dispositional anxiety perceived the new technology as more stressful in terms of all three examined categories of techno-stressors. It was also found that people with more positive attitudes towards ICT (they see it as less harmful) perceived newly learned technology as less stressful. The other dimensions of attitudes towards ICT turned out to be irrelevant for predicting the perceived technostress (except techno-complexity) while learning a new technology at the early stage. Finally, it was found that presenting the new technology in the form of a popular science article was associated with the perception of this technology as more threatening and overloading (but not complex) compared to the situation in which the technology was presented in the form of a marketing leaflet with an unequivocally positive message.

Although most of the hypotheses were supported by the results obtained, it should be noted that the effect sizes are small and the models explain the marginal variance of the perceived technostress. There are at least two reasons for a weak relationship between dispositional anxiety, attitudes towards ICT, and perceiving the new technology as stressful indicated in the current study. First, a person's reaction to a given technology is primarily driven by their individual experience of using it. Although, it may seem that the exacerbated intensity of technostress may stem from personality and more generic attitudes towards ICT, the most indicative source of technostress is one's negative experience derived from either learning or utilising some specific technological solutions (Day et al., 2019). Only encountering technical difficulties or experiencing negative consequences of the operation of technology (task overload, task pressure, interpersonal misunderstandings, etc.) has the potential to evoke clear emotional and physiological reactions that are signals of technostress. Learning about technology in a theoretical rather than practical manner as arranged in the present study may not be a sufficient impetus to elicit an arousal that detects individual differences in responding to the new technology.

Secondly, the context of using the technology seems to be the key factor for experiencing technostress. In work-related conditions, the usage of technologies is often mandated, employee have no option other than to use them. In private life, the use of ICT serves to meet a different kinds of need, the satisfaction of which usually makes it possible to choose between different technological solutions available. Besides, individuals can typically stop using a technology when they perceive technostress, which obviously does not change the fact that individuals also perceive stress when using IT privately (La Torre et al., 2019). However, the technostress antecedents and its harmfulness may be different depending on the context of use. In our study, the exposed mobile application had a potential use in personal life, in the field of monitoring the user's health. The participants of the study did not face the necessity to use this technology, which probably contributed to an emotionless assessment of this mobile application.

The obtained results support the concept of individual and situational determinants of the perception of new technologies, despite the fact that in the current study small effect sizes were received. At the same time, finding weak relationships between individual differences, the form of technology presentation and technostress in the initial stages of encountering new technology can contribute to planning future research. It can be assumed that the potential perception of technology as a source of stress develops only in the phase of using the technology. Then, not only unique experiences, but individual differences may play a greater role. Thus, cautiously, due to rather low effects size, we suggest the process of learning new pro-healthy app implemented in a smooth, positive way. Descriptions how to use the app might indicate the simplicity of a given technology, its affordability and utility.

LIMITATIONS OF THE STUDY

The first limitation of the study are rather low effects sizes. This unables us to generalize the results on the whole population of Poles. The research however seems to be the first step towards creation of the new manner of implementation new pro-healthy apps. Literature on Virtual Environment (VE) shed light on vast majority of clinical approach to rehabilitation and therapeutic practises, immersed in Virtual Reality (VR) (Wojciechowski, Wiśniewska, Pyszora, Liberacka-Dwojak, & Juszczuk, 2021). The contemporary development requires new, good tools for creative and positive VT implementation.

Second, we designed a study in which learning about a new technology was based on written materials (early phase of contact with technology), while examining technostress may be more rationale when using new technology. Only when trying a new application or device, the user has the opportunity to experience negative emotions related to the difficulties encountered (Day, Barber, & Tonet, 2019). Thus, it is necessary to design experiments in which the participants could face the necessity to actually use new ITC solutions.

Finally, the use of technology in everyday life should be developed in future research. Until now, technostress researchers mainly have focused on experiences of using technology in work or education context, where the choice of users is limited (they must learn a new technology in order to fulfill their responsibilities). We still don't know much about the technostress that accompanies the use of technology in everyday life. Here, the type of pressure exerted may have a different character, e.g., related to belonging to a social group or self-presentation. There is a need to extend research to include such determinants of human-technology interaction.

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Appendix

Three Ways of Presenting the New Technology Used in the Study Condition A



Czym jest Felicit?

Aplikacja Felicit to innowacja medyczna testowana już w kilku krajach (m.in. w Niemczech i Japonii). System składa się z trzech elementów: opaski na nadgarstek (m.in. pomiar tętna i temperatury), aparatu do badania wielu wskaźników fizjologicznych ze śliny oraz aplikacji mobilnej. Pierwszy element jest już standardowym wyposażeniem prawie każdego sportowca. Proponowany w Felicity model jest może nieco bardziej zaawansowany technicznie, ale to nadal solidny standard. Drugi element zestawu to prawdziwe dzieło inżynierii, biochemii i nauk o fizjologii człowieka. Urządzenie SalivamPRO przeprowadza badanie poprzez polizanie paska papieru (dosłownie!). Wynik badania (w tej chwili obejmujący około 20 wskaźników) jest gotowy do odbioru w 5 minut. To wszystko z urządzenia niewiele większego niż pudełko po butach. Trzeci element to aplikacja na telefon komórkowy lub tablet, spajająca oba poprzednie elementy i będąca swoistym centrum dowodzenia systemem.

Jakie są możliwości Felicit?

Zakres i częstotliwość zbieranych przez aplikację danych to kopalnia wiedzy o codziennym samopoczuciu człowieka. Ponieważ Felicit jest sprzężona z systemami instytucji ochrony zdrowia (przychodnie, ubezpieczyciele), to informacje o zdrowiu osoby mogą być błyskawicznie przekazane do jej lekarzy zanim pomyśli się o wizycie.

W szczególnych przypadkach aplikacja będzie wywierać na użytkownika presję, aby zadbał o siebie i skorzystał z konsultacji medycznej. Co więcej, w razie utraty przytomności, system automatycznie łączy się z odpowiednimi służbami ratowniczymi, przekazując im odczyty systemowe. Dzięki temu, nawet jeżeli aktualnie osoba jest sama, służby medyczne niezwłocznie dotrą do niej z pomocą.

Czy dane o naszym zdrowiu mogą być wykorzystane wbrew naszemu interesowi?

Oczywiście przy okazji testów Felicit nikt nie wspomina o tym, kto będzie miał dostęp do tak wrażliwych danych i jak przeciwdziałać by nie trafiły w niepowołane ręce. A katalog informacji gromadzonych przez Felicit jest bezprecedensowo wrażliwy – nawet dane zapisywane w kartach wizyt lekarskich nie są tak dokładne i tak wiele mówiące o naszym codziennym życiu, jak to co będą przechowywały serwery Felicit.

O autorze: Dr Andrew Weber jest lekarzem i socjologiem, od wielu lat prowadzi badania nad bezpieczeństwem danych medycznych.

Condition B

material not sponsored by company

Stan twojego zdrowia pod kontrolą 24 godziny na dobę



Dzięki Systemowi Felicite będziesz 24 godziny na dobę pod opieką lekarzy specjalistów. Na system składa się elegancka opaska na nadgarstek, prosty w obsłudze, lecz bardzo zaawansowany system diagnozy domowej oparty na ślinie SalivamPRO oraz intuicyjna aplikacja mobilna do śledzenia stanu swojego zdrowia.

Jak działa Felicite?

- Dzięki opasce i łatwym do wykonania testom diagnostycznym aplikacja codziennie analizuje stan twojego organizmu i informacje na ten temat bezpośrednio przekazując dane do specjalistów dbających o twoje zdrowie.
- Otrzymujesz rekomendacje dotyczące wizyt u lekarzy pierwszego kontaktu lub specjalistów. W prosty sposób skracasz sobie drogę umawiania wizyt oraz redukujesz czas marnowany zazwyczaj na wstępną diagnostykę twojego stanu zdrowia – przychodzisz do lekarza z więcej niż podstawowym zakresem diagnozy.
- W razie utraty przytomności lub zapaści, system automatycznie łączy się z odpowiednimi służbami ratowniczymi, przekazując im odczyty systemowe. Dzięki temu, nawet jeżeli aktualnie jesteś sam, służby medyczne dotrą do ciebie niezwłocznie, gotowe do udzielenia odpowiedniej pomocy.
- Sam ustalasz zakres diagnozy oraz częstotliwość, z jaką ją wykonujesz. Zalecamy jednak nieprzerwane korzystanie z opaski diagnostycznej oraz wykonywanie badań śliny urządzeniem SalivamPRO co najmniej raz w tygodniu.
- Udostępniasz dane tylko wtedy, kiedy chcesz. Wszyscy ubezpieczyciele i państwowe systemy ochrony zdrowia dochowują najwyższych standardów dbania o prywatność twoich danych. Możesz również samemu ograniczyć zakres danych wysyłanych gdziekolwiek poza twój telefon.
- Pomagasz innym, ponieważ dzięki danym z twojego osobistego systemu diagnozy możemy lepiej zrozumieć wiele schorzeń i uczymy się jak efektywniej dbać o zdrowie twoje i innych.



Po więcej informacji zapraszamy
na naszą infolinię

890 733 733

Materiał sponsorowany

Condition C



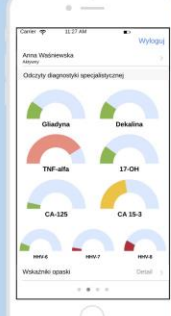
Założ opaskę diagnostyczną na nadgarstek. Nie ma znaczenia czy prawy, czy lewy. Uruchom ją przyciskiem po prawej stronie. Urządzenie natychmiast rozpocznie pracę. Wbudowany moduł Bluetooth wysle sygnał do urządzeń w pobliżu i sprawi, że opaska będzie gotowa do powiązania jej z telefonem lub tabletem, na którym zainstalowano aplikację mobilną systemu Felicit.



W aplikacji zobaczysz również rezultaty diagnozy aparatemSalivamPRO. Zakres proponowanych przez urządzenie analiz będzie z czasem coraz szerszy. Informacje z aplikacji powędrują do specjalnych algorytmów, które m.in. dzięki sztucznej inteligencji będą w stanie ocenić czy któryś z zaobserwowanych wskaźników nie jest zbyt niski lub zbyt wysoki. Analiza tych danych odbywać się będzie na dotychczas niespotykanym poziomie kompleksowości i dokładności.



Aplikacja mobilna systemu Felicit to przede wszystkim mechanizm podsumowywania i rejestrowania historii twoich pomiarów. To platforma, gdzie możesz w wygodny sposób przeglądać, jak kształtowały się parametry twojej fizjologii na przestrzeni czasu – sam określasz jaki okres cię interesuje, sam wybierasz który aspekt twojego funkcjonowania najbardziej cię interesuje



W aplikacji zobaczysz również rezultaty diagnozy aparatemSalivamPRO. Zakres proponowanych przez urządzenie analiz będzie coraz szerszy. Informacje z aplikacji powędrują do specjalnych algorytmów, które m.in. dzięki sztucznej inteligencji będą w stanie ocenić czy któryś z zaobserwowanych wskaźników nie jest zbyt niski lub zbyt wysoki. Analiza tych danych odbywać się będzie na dotychczas niespotykanym poziomie kompleksowości i dokładności.



Wszystkie informacje o tobie posłużą Felicit do dbania o twoje codzienne samopoczucie. W sekcji rekomendacji znajdziesz porady jak ćwiczyć, co jeść, kiedy pracować oraz kiedy spać – wszystko to, aby zachować dobre samopoczucie, kondycję oraz idealne parametry fizjologiczne. Gdy tylko aplikacja wykryje niebezpieczne wskazania, poinformuje cię o tym i pomoże w kontakcie z lekarzem lub służbami ratowniczymi.



Aby zapewnić komfort użytkowania Felicit, dostępny masz szeroki wachlarz opcji zarządzania informacjami gromadzonymi w trakcie diagnozy i codziennego użytkowania. Jeżeli zdecydujesz się na korzystanie z naszych systemów monitorujących, zapewnimy ci daleko idącą transparentność polityki przetwarzania danych oraz dochowamy wszelkich starań, by twoje dane były bezpieczne. Swoją aplikację możesz powiązać z systemem informatycznym swojego ubezpieczyciela (lista współpracujących ubezpieczycieli ciągle się powiększa) i w ten sposób jeszcze bardziej skrócić sobie czas oczekiwania na wizytę, a nierzadko i obniżyć składkę ubezpieczenia zdrowotnego.