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ORIGINAL ARTICLE

Self-Reported digital stress, subjective well-being and the moderating role of age: a cross-sectional study of the general population in Austria

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Abstract

Aim Due to its negative impact on health and subjective well-being (SWB), digital stress is increasingly recognized as a public health concern. While prior research has largely focused on digital stress in specific settings (e.g., the workplace), less is known about its distribution and effects on SWB in the general population, particularly in Austria. This study addresses this research gap while placing an additional emphasis on the moderating role of age.

Subject and methods Analyses are based on data from the representative 2024 Social Survey Austria (N = 1,546) and a newly developed scale on self-reported digital stress (DIST). Ordinary Least Squares (OLS) regression models are used to explore the relationships between information and communication technology (ICT) use, digital stress, and SWB. To address age as a potential moderator, we conduct Conditional Process Analysis to assess whether digital stress mediates the relationship between ICT use and SWB in all age groups.

Results We find that digital stress is highest among individuals aged 16–29, while being generally associated with lower SWB. Although more frequent ICT use also correlates negatively with SWB, it does not predict digital stress in the general population. However, both relationships are moderated by age, with more negative correlates of ICT use observed among younger Austrians. The mediating role of digital stress is only evident for the youngest respondents.

Conclusion In sum, this study highlights the relevance of digital stress in relation to subjective well-being. It suggests that Austrian health policy should take preventive measures to address the negative association between digital stress and SWB, especially among youth.

Keywords Digital stress · Subjective well-being · Moderation analysis · Digital well-being

Introduction

The rise of information and communication technologies (ICT) has made them a common part of everyday life. By 2024, 95% of the population in Austria had access to the internet (Statistics Austria 2024). On the one hand, the use of ICTs is linked to significant advancements across various domains, including communication and the enhancement of operational efficacy. On the other hand, it is not without adverse effects, since it may precipitate an increase in stress and can even lead to addiction (e.g., Greenfield 2007), especially among youth (for psychological outcomes see Steele et al. 2020; Dienlin and Johannes 2020). Recently, this has also contributed to bans of cell phones in schools in an increasing number of countries (UNESCO 2025) and has led to an EU-wide discussion on setting a minimum age for using social media.

Against this backdrop, research has been dealing with the negative well-being outcomes of digital practices such as

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problematic internet use (Çikrıkci 2016). Digital stressors such as constant availability and online social comparison have been shown to affect a growing number of individuals (Midgley et al. 2021). In addition, technological development goes by so fast that not all members of society, and particularly all age groups, can easily keep up with it (Marchiori et al. 2019). Many people are also experiencing difficulties in regulating their consumption of digital content, resulting in practices like digital detoxing and new therapeutical interventions (Büchi et al. 2019; Nguyen and Hargittai 2023; Nguyen et al. 2024). Thus, digital stress is becoming an essential part of research on subjective well-being (SWB) and health (La Torre et al. 2019).

Despite a growing body of research on self-reported digital stress (Fischer and Riedl 2017; Bondanini et al. 2020), previous studies have primarily focused on specific settings such as the workplace (Hefner and Vorderer 2016; Riedl et al. 2023; Dragano and Lunau 2020; La Torre et al. 2019). These studies often fail to encompass larger representative samples and therefore do not allow for comparing specific population segments such as different age groups (Reinecke et al. 2017). Most studies also concentrate on particular stressors, such as problematic social media use (Wolfers et al. 2020; van der Schuur et al. 2019). Consequently, there is a significant research gap when it comes to self-reported digital stress and its impact on subjective well-being in the general population. This also applies to the context of Austria, which can be considered exemplary for a western industrialized country strongly shaped by increasing digitalization (World Bank Group 2025).

Moreover, little is known about how individual characteristics, especially age, moderate the relationship between digital practices and self-reported digital stress and SWB on a broader scale. Previous research shows inconclusive results. While various studies demonstrate the detrimental impact of increased ICT use on health-related outcomes, especially for children and adolescents (e.g., Lederer-Hutsteiner et al. 2024; Ahmed et al. 2024), others highlight the small size of these effects (e.g., Ferguson et al. 2025; Vuorre et al. 2021; Johannes et al. 2024; Godard and Holtzman 2024). Research also indicates that digital practices have positive well-being outcomes for older adults (Nimrod 2020; Yeung et al. 2023). However, older adults may also experience high levels of digital stress, which is partly driven by the need for developing new skills and a lack of confidence when dealing with digital technologies (Marchiori et al. 2019).

The goal of this article is to address these gaps by using representative data from the 2024 Social Survey Austria (Hadler et al. 2024), and a newly developed short scale on general digital stress (DIST), specifically designed for the use in general population surveys. Furthermore, we take up Büchi's (2024) theoretical concept of digital well-being and develop it further by proposing age as an important moderator in the relationships between ICT use, digital stress, and SWB. Thus, the following research questions are addressed:

> **RQ1**: *How are ICT use and self-reported digital stress related to subjective well-being in the Austrian population?*
> **RQ2:** *To what extent does age moderate the relationship between digital stress and subjective well-being, as well as between ICT use and digital stress?*

Section "Literature review" of this article conceptualizes digital stress based on Büchi's (2024) concept of "digital well-being", discusses its effects on subjective well-being, and provides an overview of the current state of research. This section concludes with the formulation of hypotheses. Section "Method" introduces the data and measurements as well as the methods of our empirical analyses. Results are then presented in Section "Results". Section "Conclusion" ties together our findings and discusses limitations, as well as implications for further research.

Literature review

Conceptualization of digital stress

Büchi (2024) underscores the balance between harms (e.g., disinformation) and benefits (e.g., connectedness) of digital technologies, when it comes to effects on SWB. Following this assumption, digital stress[1] can be considered one way by which the interaction with ICTs relates to well-being and health. Thus, it represents an outcome that results from exposure to harmful elements of digitalization, characterized by a high cognitive burden (Hefner and Vorderer 2016). These elements become stressors when individuals appraise them as especially demanding, particularly if they lack adequate coping resources to buffer their adverse effects (Lazarus and Folkman 1984). Büchi (2024) provides a broad sociological framework, also emphasizing the social embeddedness of digital practices, which encompass all types of behaviors related to ICTs and

[1] The distinction between the terms digital stress and "technostress" is not always made explicit in the literature. Both concepts describe stress experiences related to the use of ICTs, including feelings of overload and constant connectivity. While technostress is a well-established construct rooted in organizational and occupational psychology (Salanova et al. 2014¸ Hefner and Vorderer 2016).), digital stress seems to be used as a broader term (Argyriadi et al. 2025) that may also encompass non-work-related digital contexts, for example when it comes to stressors experienced by adolescents (Steele et al. 2020). In line with the latter understanding, we use the term digital stress in this study to refer to stress associated with ICT use more generally.

"*depend on the opportunities and constraints, situational and long-term, afforded by […] social surroundings and technological developments*" (Büchi 2024, p. 182). He therefore connects the macro- and micro-level by proposing interdependencies between societal digitalization and individual digital practice. Furthermore, Büchi (2024) points out that the same forms of digital practice may lead to benefits and harms at the same time, identifying potential areas of tension (Büchi 2024). In addition, he encourages the examination of moderators and mediators which shape the relationship between digital practice and well-being outcomes, and thus specifically asks for conditions under which different kinds of digital practice unfold either harmful or beneficial effects on SWB (Büchi 2024). This perspective is especially useful for general population surveys, as the relationship between stress and SWB always exists in a socially organized environment, potentially leading to an unequal distribution of stressors and coping resources across social groups (Avison and Thomas 2009).

According to the existing literature, there are various types of digital stressors, which may arise in different situational contexts. Riedl and colleagues (2023) distinguish five dimensions of digital stress, which is produced (1.) by aspects related to information and communication (i.e., overload, lack of usability, multitasking, poor work-life balance), (2.) by the permanent change of technologies and software requiring constant learning, (3.) by the unreliability of technology, (4.) by the fact that digital traces can be easily tracked, and (5.) by the fear of job loss due to digitalization. Similarly, current approaches differentiate between stressors such as complexity, invasion, insecurity, overload, and uncertainty (Nastjuk et al. 2024; Sanjeeva Kumar 2024; Nimrod 2017). Aiming to create a conceptualization of digital stress among adolescents and young adults, Steele et al. (2020) identifies four components, "availability stress", "approval anxiety", "fear of missing out" and "communication overload", pointing towards possible age differences when it comes to digital stressors.

Digital practices, digital stress and subjective well-being — central hypotheses

Digitalization and digital practice affect both societal and individual well-being (Büchi 2024). On the macro level, exposure to ICTs has already been shown to be positively correlated with SWB and happiness (Maiti and Awasthi 2020; Ionescu-Feleagă et al. 2022). However, the relationship between ICT use and well-being is complex and ambivalent, since it is mediated by demands, resources, beliefs, psychological functioning as well as the social and physical environment (Castellacci and Tveito 2018; Baumeister et al. 2021). Previous meta-analyses also show inconsistencies in this relationship: while ICT use contributes to work-life conflicts and burnout, it may also promote feelings of autonomy and engagement (Baumeister et al. 2021; Ninaus et al. 2015). While several studies point towards positive correlations between ICT use and SWB (e.g., Nimrod 2020), negative effects on health and well-being are usually reported, once ICT "overuse" (Gui and Büchi 2021) is addressed. Across various national contexts, this has already been shown for high internet use among students and teachers (Kwak et al. 2022; Cazan et al. 2024), problematic social media use (Thomas et al. 2022) as well as general perceived digital overuse (Büchi et al. 2019). As the empirical evidence for effects of overuse is strong, we expect a negative relationship between the frequency of ICT use and SWB. In line with previous research (e.g., Ferguson et al. 2025; Johannes et al. 2024; Godard and Holtzman 2024; Sims et al. 2017), we expect this relationship to be small in magnitude.

H1: *A more frequent use of ICTs is negatively related to subjective well-being.*

Furthermore, studies on work and educational context have already documented various detrimental effects of digital stress (Borle et al. 2021), including general employee health and well-being, role stress and low work performance (Tarafdar et al. 2007; Hang et al. 2022; Riedl et al. 2023), impairments of mental health and burnout (Baumeister et al. 2021; Yang et al. 2024; Wirth et al. 2024) as well as anxiety and depression (Torales et al. 2022; Vallone et al. 2023). Significant associations between digital stress, well-being and health have also been shown in broader settings (Reinecke et al. 2017; Nimrod 2017). A recent meta-analysis concludes that on a population level, the association between digital stressors and psychological well-being is negative (Nastjuk et al. 2024). Based on these findings, we formulate the following hypotheses:

H2*: A more frequent use of ICTs is positively associated with digital stress.*
H3*: Digital Stress is negatively associated with subjective well-being.*

As suggested by Steele et al. (2020) and Büchi (2024), several individual characteristics could moderate the relationship between ICT use, digital stress and well-being. Among various potential moderating factors, age seems particularly relevant as older individuals have often been neglected in previous research on digital stress (Nimrod 2017). Thus, findings on the relationship between age and digital stress are still somewhat unclear. Recent studies indicate that older people may experience more digital stress, partly because they need to acquire new skills, and partly because they feel less confident when using ICTs (Marchiori et al. 2019). Conversely, other studies suggest that younger individuals experience comparably higher levels of stress, due to their more frequent use of digital platforms such

as social media (Nimrod 2017; Thomas et al. 2022; Mayen et al. 2025; Gui and Büchi 2021). In addition, Lauterbach et al. (2023) found a positive non-linear association between digital stress and (squared) age.

Examining age related differences in the impact of communication load and internet multitasking, Reinecke et al. (2017) were among the first to show that the impact of digital stressors on mental health may potentially be moderated by age. Furthermore, Roquet et al. (2024) demonstrate that more frequent internet use among individuals over the age of 65 mitigates stress resulting from changes in personal resources. This is in line with various findings that indicate positive well-being outcomes related to ICT use among older people (Sims et al. 2017; Nimrod 2020; Yeung et al. 2023). In addition, older people have been shown to exhibit more effective coping strategies (Hauk et al. 2019). Conversely, younger people may be especially vulnerable to digital stress due to the ubiquity of ICTs in their lives, potentially leading to forms of overuse and related outcomes such as negative affect and lower sleep quality (Shensa et al. 2017; Alonzo et al. 2021). Therefore, we hypothesize the following moderating mechanisms of age:

H4*: Age moderates the association between ICT use and digital stress.*
H5*: Age moderates the association between ICT use and subjective well-being.*

Lastly, following Büchi's (2024) concept of a mediated link between digital practices and SWB, we propose digital stress as a mediator between ICT use and SWB. While empirical evidence is lacking, the idea that digital stress mediates the association between ICT use and various well-being outcomes has been discussed conceptually by other scholars (Hall et al. 2021; Steele et al. 2020; Khetawat and Steele 2023). These considerations lead to our final hypothesis:

H6*: The relationship between ICT use and subjective well-being is partially mediated by digital stress.*

The hypothesized associations are presented in a path diagram (Fig. 1), summarizing our model structure. Further information on the covariates is presented in Section "Methods".

Methods

Data

Our analysis is based on data from the 2024 Social Survey Austria (Hadler et al. 2024) and consists of a probability-based sample of 1,546 respondents. Participants were selected by simple random sampling from the Austrian Central Population Register. Data was collected via mixed-mode (CAWI and paper) in 2024 using a push-to-web approach. This self-administered mixed-mode design is an effective method for conducting general population surveys (Wolf et al. 2021). The sample consisted of 48.6% male, 50.6% female, and 0.1% diverse respondents, while gender information was missing for 0.6%. The mean age was 49.6 years (SD = 18.1), with 0.6% missing data. 48.4% of respondents did not complete high school ("Matura"), 22.6% finished high school, and 27.2% attained tertiary education; information is missing for 1.9%. More than half of the sample (55%) were employed, with employment status missing for 1.2%. Household income data was missing for 51.4% of respondents, a common issue in population surveys (Jabkowski and Piekut 2024). The available income data were categorized into quartiles: Q1 = 12.1%, Q2 = 14.0%, Q3 = 12.1%, and Q4 = 10.4%. Respondents were also asked whether they could make ends meet with their current household income (2.3% missing), with 4.6% reported finding it very difficult to get by, while 20.1% found it somewhat difficult. A total of 32.7% stated it was neither easy nor difficult, 29.1% found it easy, and 11.3% reported it was very easy to make ends meet.

Measures

Digital Stress Short Scale ("DIST")

To operationalize digital stress, we use a novel instrument with six items ("DIST") that was developed specifically for use in the general population (see Table 3 in the appendix). The main starting point of developing the short scale was the comprehensive and multidimensional measurements of the Digital Stressors Scale (DSS) (Fischer et al. 2021). However, scales like the DSS focus on the work context, while DIST was designed as a short but efficient one-dimensional measurement tool that is potentially suitable for large-scale population surveys. This was achieved by selecting items that relate to relevant dimensions of digital stress, such as overload and availability, but are also broad enough to potentially apply to most situations in which digital technologies are used in everyday life. Exclusively work-related stressors such as disruptions to work-life balance or other digital burdens associated with specific organizational contexts were deliberately omitted to enable comparisons across all population groups regardless of employment status. In addition, efforts were made to include digital stressors that may be somewhat more relevant to certain age groups (such as social comparisons on the internet) (Steele et al. 2020) in a way that does not exclude other potential respondents. The short scale was pre-tested in a

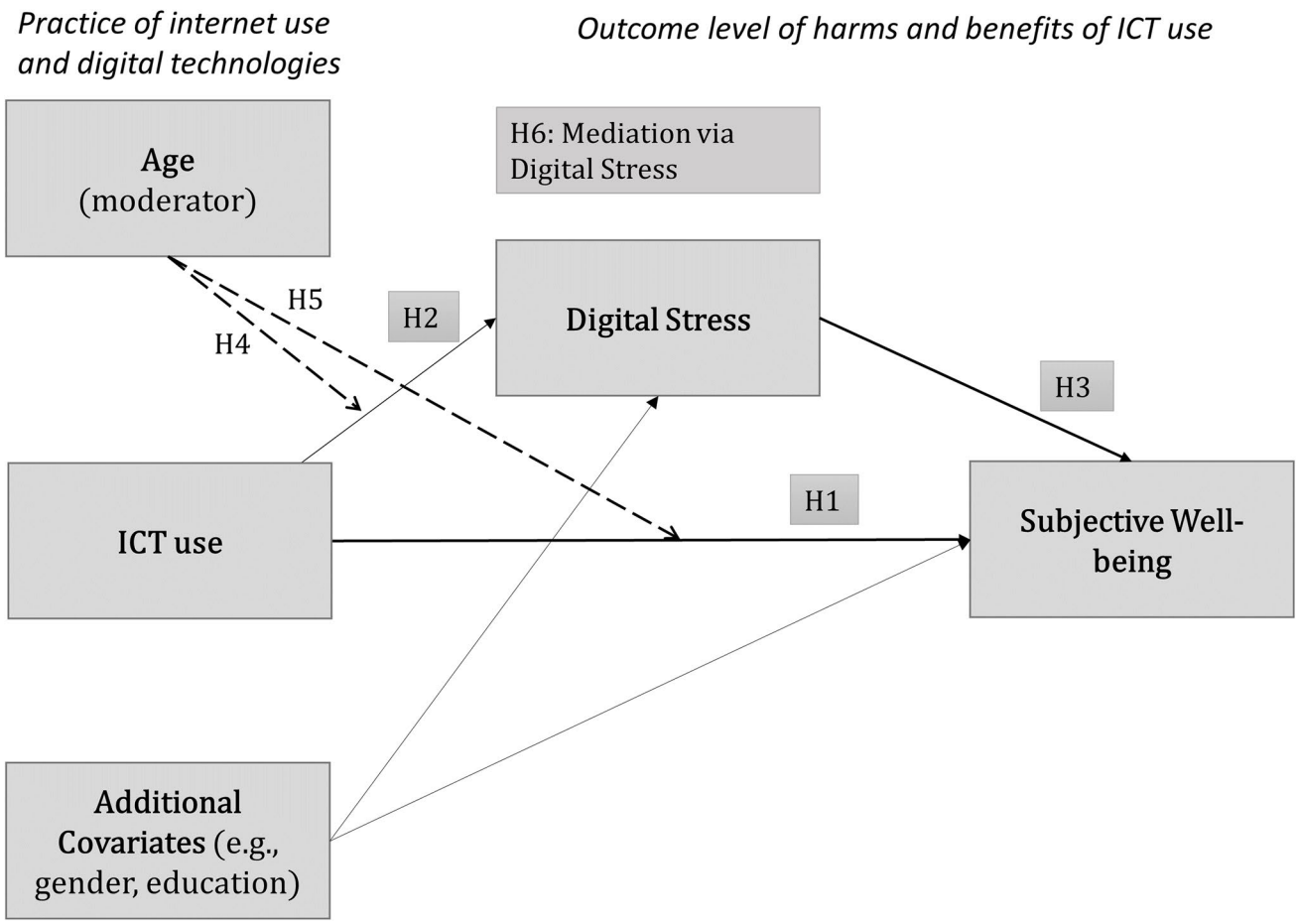

Fig. 1 Structure of the Empirical Model (Path Diagram) and Hypotheses (Source: Authors' own illustration)

convenience sample of 100 respondents[2] drawn from an online access panel in 2023. Based on exploratory factor analysis of the pretest data, the final version of scale was then fielded as part of the 2024 Social Survey Austria,[3] consisting of six items reflecting relevant facets of digital stress: (1) availability stress, (2) concentration problems, (3) social comparison online, (4) constant confrontation with global problems through ICTs, (5) sleep problems and (6) information overload. The items were originally developed in German and translated into English for this paper. Results from the pretest and the Social Survey Austria show high statistical power concerning scale measurement and its validity.[4]

Subjective well-being

SWB is measured using a three-item instrument from the 2024 Social Survey Austria of which the ISSP 2021 "Health and Healthcare II" module (ISSP Research Group 2024) was a part. Respondents were asked to indicate, on a five-point scale, whether they experienced the following feelings over the past four weeks: (1) feeling unhappy and depressed, (2) losing confidence in themselves, and (3) feeling unable to overcome their problems.

Information and communication technology use

ICT use is measured using a four-item scale. Respondents were asked to indicate, on a five-point scale, how often they use the internet for the following activities: (1) communication, (2) searching for information, (3) watching or

[2] Survey monkey realized a quota sample with balancing age and gender (47% were 18—44 years and 53% between 45 and 99 years old; 51% female and 49% male).

[3] Additionally, the scale was also fielded among 2,931 respondents from the Digitize! Panel Study (eighth wave) in 2025 (Pfaff et al. 2022[2025]).

[4] i.e., Cronbach's Alpha of 0.844 in the Social Survey Austria and of 0.837 in the pretest.

downloading music and movies, and (4) shopping, paying bills, and other financial-related matters.[5]

Factorial validity

Factorial validity for the latent variables was assessed using confirmatory factor analysis with robust maximum likelihood estimation, implemented in the R package *lavaan* (Rosseel 2012). The analysis shows a good overall model fit (RMSEA: 0.047, SRMR: 0.040, CFI: 0.967), with only two factor loadings slightly below 0.60 across all four factors. Based on these factor loadings we estimate composite reliability for all four factors (range: 0.75–0.87 and thus > 0.70). Based on both analytical steps, all measures demonstrate promising psychometric properties in terms of factorial validity and reliability. For the analysis, we calculated observed scores for all latent variables by averaging the indicators. Each person with one valid response per scale was assigned a score.

Moderator and covariates

Our key moderator, age, is used as a continuous variable in the models. For better interpretability of the conditional relationships, age and ICT use are mean centered based on the sample average. To address potential confounding, several additional covariates were included in the models. These were selected based on prior literature to minimize confounding bias while avoiding overcontrolling or introducing bias from entering colliders instead of confounders (Wysocki et al. 2022). Covariates include gender (0 = male, 1 = female), education (1 = no matura, 2 = matura, 3 = tertiary education), making ends meet with one's household income (1 = very hard, 5 = very easy), the participants' household income (categorized into quartiles based on the sample distribution), employment status, and self-reported digital skills. Self-reported digital skills are measured using the following indicators: (1) ability to use the internet, (2) do online searches, (3) know which information should not be shared online and (4) learn how to use new software or apps. We applied the same coding strategy as for ICT use and SWB. To reduce the number of missing values, an additional category was included for respondents who did not provide information on household income. Although this approach helps to maintain the statistical power of the model, the estimates of the income coefficient may be biased, particularly if income is missing not at random (MNAR), which is a plausible concern for self-reported income (Pedersen et al. 2017). Because income enters our model solely as a confounder, we do not interpret the income coefficients directly. However, combining income quartiles with a separate missingness category may only partially adjust for confounding by income. To further address this, we also adjust for the perceived ability to make ends meet with one's household income, which has substantially lower item non-response and captures material financial burden directly.

Analytical approach

Our analysis proceeds in three steps. First, we present descriptive statistics on digital stressors in the Austrian population as well as their average levels across age groups. Second, we estimate a series of linear regression models to investigate the hypothesized relationships. We estimate four models, two with digital stress as outcome and two with SWB. We follow a bottom-up strategy by starting with an additive model each and continue by adding the interaction terms. Models are compared using the information criterion AIC and changes in adjusted R^2 to evaluate the impact of the interaction terms. In the third step, we proceed by conducting conditional process analysis to estimate direct and indirect relationships (Hayes and Rockwood 2020). For this, we rely on the mediation R-package (Tingley et al. 2014), which uses a quasi-Bayesian Monte Carlo approximation (Imai et al. 2010), to decompose total relationships into direct and indirect relationships. Our estimations are based on 1,000 simulations for each model. The inputs for these simulations are a mediator and an outcome model, for which we use our most complex model formulation (Table 1: M2 and Table 2: M4).

Results

Descriptive results on self-reported digital stress

Figure 2 provides an initial overview of the occurrence of self-reported digital stress in the Austrian population. It shows that between 18.9% and 35.9% reported some sort of stress according to the selected statements. Being constantly confronted with the world's problems through ICTs (35.9%) represents the most frequently reported stressor, followed by availability stress due to ICTs (29.8%), concentration problems (26.7%), information overload (22.4%), stressful social comparison online (22.3%), and ICT related sleep problems (19.0%).

Figure 3 shows age-related differences regarding overall digital stress. It becomes evident that digital stress is more pronounced among younger Austrians. Respondents between the ages of 16 and 29 (M = 2.97) appear to be more

[5] For both scales, observed scores were calculated by averaging responses across the four items and then reversed for better interpretability. Low numerical values (1) indicate low levels of ICT use/SWB, while high numerical values (5) indicate high levels.

Table 1 Determinants of Subjective Well-being (linear regression models)

	M1: Subjective Well-being		M2: Subjective Well-being	
	Unst	Std	Unst	Std
Intercept	4.77 *** (4.34–5.21)	−0.07 (−0.21 – 0.08)	4.77 *** (4.34–5.21)	−0.02 (−0.17 – 0.13)
Digital Stress	−0.38 *** (−0.43 – −0.32)	−0.32 (−0.37 – −0.27)	−0.37 *** (−0.43 – −0.31)	−0.31 (−0.36 – −0.27)
ICT use (centered)	−0.16 *** (−0.23 – −0.09)	−0.14 (−0.20 – −0.08)	−0.18 *** (−0.25 – −0.10)	−0.16 (−0.23 – −0.10)
ICT use x Age (centered)			0.01 *** (0.00–0.01)	0.09 (0.04–0.14)
Digital Skills (Self-reported)	0.05 (−0.02 – 0.13)	0.05 (−0.02 – 0.11)	0.04 (−0.03 – 0.12)	0.04 (−0.03 – 0.10)
Age (centered)	0.01 *** (0.01–0.01)	0.19 (0.13–0.25)	0.01 *** (0.01–0.01)	0.18 (0.12–0.24)
Sex (ref = male)	−0.15 *** (−0.24 – −0.06)	−0.08 (−0.12 – −0.03)	−0.15 ** (−0.23 – −0.06)	−0.08 (−0.12 – −0.03)
Education: Matura	0.09 (−0.02 – 0.20)	0.09 (−0.03 – 0.21)	0.09 (−0.02 – 0.20)	0.10 (−0.02 – 0.22)
Education: University	0.07 (−0.04 – 0.18)	0.08 (−0.04 – 0.19)	0.07 (−0.04 – 0.18)	0.08 (−0.04 – 0.20)
Getting by with HH-inc	0.15 *** (0.11–0.20)	0.17 (0.12–0.22)	0.16 *** (0.11–0.20)	0.17 (0.12–0.23)
Income Quartile 2	−0.13 (−0.30 – 0.04)	−0.13 (−0.31 – 0.05)	−0.13 (−0.30 – 0.04)	−0.14 (−0.31 – 0.04)
Income Quartile 3	0.09 (−0.10 – 0.27)	0.09 (−0.10 – 0.29)	0.09 (−0.09 – 0.27)	0.09 (−0.10 – 0.29)
Income Quartile 4	−0.09 (−0.28 – 0.11)	−0.09 (−0.30 – 0.12)	−0.09 (−0.29 – 0.10)	−0.10 (−0.31 – 0.11)
Currently Employed (ref = yes)	−0.22 *** (−0.32 – −0.12)	−0.11 (−0.16 – −0.06)	−0.19 *** (−0.28 – −0.09)	−0.10 (−0.15 – −0.05)
Observations	1377		1377	
R^2/R^2 adjusted	0.267/0.260		0.273/0.265	
AIC	3353.945		3344.434	

Statistical significance: *p < 0.05 **p < 0.01 ***p < 0.001; Unst. = unstandardized estimates, Std = standardized estimates, Numbers in brackets are 95% Confidence intervals; Unweighted samples; Coefficients for the non-valid income information category excluded from the table. Source: Social Survey Austria 2024

stressed than the age groups "40—49" (M = 2.66, z = −3.83, p = 0.002), "50—59" (M = 2.68, z = −3.95, p = 0.001), "60—69" (M = 2.54, z = −5.92, p < 0.001) and "70 + " (M = 2.67, z = −3.35, p = 0.010). Moreover, respondents between 30 and 39 (M = 2.90) are significantly more stressed than those between 60 and 69 years of age (M = 2.54, z = −4.67, p < 0.001). This already suggests that digital stress is unequally distributed across age groups in the Austrian population, with younger cohorts being particularly at risk.

Results from regression models

We proceed by presenting results from the linear regression models. Starting with H1, we hypothesized that higher levels of ICT use are associated with lower levels of SWB. This hypothesis is supported by our results (Table 1: M1). The standardized regression coefficient (−0.14, 95% CI: −0.20 – −0.08) indicates that this relationship is small but significant, which is consistent with prior findings (Ferguson et al. 2025; Büchi 2024). Notably, this relationship remains evident even while adjusting for the other covariates.

Turning to H3, we hypothesized that higher levels of self-reported digital stress should be associated with lower levels of SWB. As shown in M1 (Table 1), we find strong empirical support for this relationship; not only is the association statistically significant but also substantial as shown by the standardized coefficient (−0.32, 95% CI –0.37 – −0.27). This result aligns with evidence from a recent meta-study, which found a moderate relationship between various components of digital stress and psychological distress (Khetawat and Steele 2023).

Table 2 Determinants of Digital Stress (linear regression models)

	M3: Digital Stress		M4: Digital Stress	
	Unst	Std	Unst	Std
Intercept	3.44 *** (3.08–3.80)	−0.03 (−0.19 – 0.14)	3.43 *** (3.06–3.79)	−0.06 (−0.22 – 0.11)
ICT use (centered)	0.01 (−0.06 – 0.07)	0.01 (−0.06 – 0.08)	0.02 (−0.05 – 0.08)	0.02 (−0.05 – 0.09)
ICT use x Age			−0.00 * (−0.01 – −0.00)	−0.06 (−0.12 – −0.01)
Digital Skills (Self-reported)	−0.15 *** (−0.22 – −0.08)	−0.15 (−0.22 – −0.08)	−0.14 *** (−0.21 – −0.07)	−0.14 (−0.21 – −0.07)
Age (centered)	−0.01 *** (−0.02 – −0.01)	−0.29 (−0.35 – −0.23)	−0.01 *** (−0.02 – −0.01)	−0.28 (−0.35 – −0.22)
Sex (ref = male)	0.10 * (0.02–0.18)	0.06 (0.01–0.11)	0.10 * (0.01–0.18)	0.06 (0.01–0.11)
Education: Matura	−0.03 (−0.13 – 0.07)	−0.04 (−0.16 – 0.09)	−0.03 (−0.14 – 0.07)	−0.04 (−0.17 – 0.09)
Education: University	0.09 (−0.02 – 0.19)	0.11 (−0.02 – 0.24)	0.09 (−0.02 – 0.19)	0.11 (−0.02 – 0.24)
Getting by with HH-inc	−0.14 *** (−0.19 – −0.10)	−0.19 (−0.24 – −0.13)	−0.15 *** (−0.19 – −0.10)	−0.19 (−0.25 – −0.14)
Income Quartile 2	−0.01 (−0.17 – 0.15)	−0.01 (−0.21 – 0.19)	−0.01 (−0.16 – 0.15)	−0.01 (−0.21 – 0.19)
Income Quartile 3	0.00 (−0.17 – 0.17)	0.00 (−0.21 – 0.22)	0.00 (−0.17 – 0.17)	0.00 (−0.21 – 0.22)
Income Quartile 4	0.02 (−0.16 – 0.21)	0.03 (−0.20 – 0.26)	0.03 (−0.15 – 0.21)	0.04 (−0.19 – 0.26)
Currently Employed (ref = yes)	0.08 (−0.01 – 0.16)	0.05 (−0.01 – 0.10)	0.05 (−0.04 – 0.15)	0.03 (−0.02 – 0.09)
Observations	1381		1381	
R^2/R^2 adjusted	0.117/0.110		0.120/0.112	
AIC	3162.733		3159.812	

Statistical significance: *p < 0.05 **p < 0.01 ***p < 0.001; Unst. = unstandardized estimates, Std = standardized estimates, Numbers in brackets are 95% Confidence intervals; Unweighted samples; Coefficients for the non-valid income information category excluded from the table. Source: Social Survey Austria 2024

Following H2 we assumed that higher levels of ICT use are associated with higher self-reported digital stress. Contrary to this expectation, we find no statistically significant association between ICT use and self-reported digital stress (Table 2).

Consistent with our descriptive results, we find support for H4 and the predicted interaction between ICT use and age. This is further supported by a lower AIC value for the model including the interaction term, indicating a better model fit (Table 2). To enhance interpretability, the left panel of Fig. 4 illustrates the relationship between ICT use and digital stress, conditional on different age values. It allows for a visual examination of the differences in the relationships between ICT use and self-reported digital stress for different age values. If age acts as moderator, we expect the slopes to vary according to age.

As predicted, the relationship between ICT use and self-reported digital stress is stronger for younger people compared to older individuals. For those at + 1 SD above the sample average in age, the relationship is nearly flat. However, it is important to note that, despite being statistically significant, both the visualization and the standardized interaction coefficient (−0.06, 95% CI: −0.12 – −0.01) suggest a small size of the interaction.

We further hypothesized that the relationship between ICT use and SWB would be stronger for younger individuals (H5). As shown in Table 1 (M2), the interaction term is statistically significant, and the AIC value is lower compared to the additive model (M1), indicating a better model fit. The visualization in the right panel of Fig. 4 and the standardized coefficient (0.09, 95% CI: 0.04–0.14) confirm that the magnitude of this relationship is small.

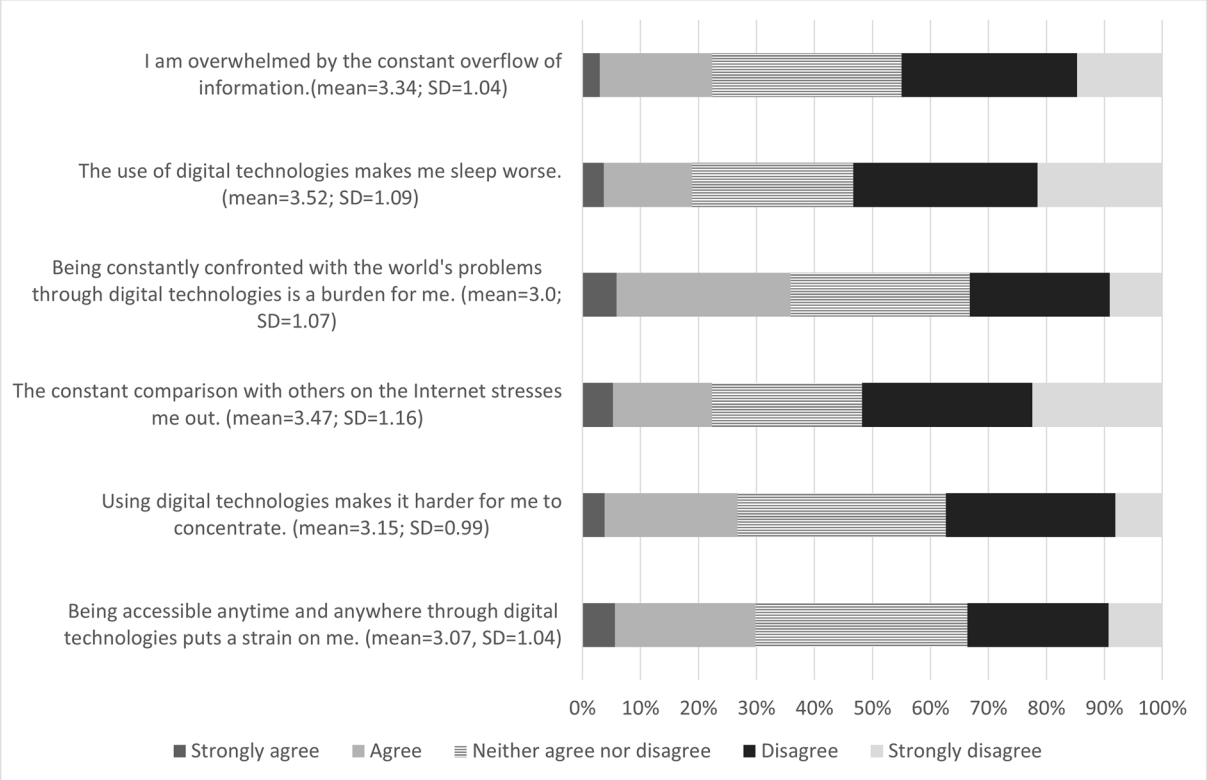

Fig. 2 Experiences of digital stress in the overall population (n = 1,346 to n = 1,457). Source: Social Survey Austria 2024, weighted data

Finally, we address H6 and examine whether digital stress mediates the relationship between ICT use and SWB. From the results above, we already know that the total relationship between ICT use and SWB is small. As displayed in Fig. 5, we find no empirical evidence of an indirect relationship through self-reported digital stress in the general population. However, consistent with our prior results, we observe strong support for a direct relationship. Expanding on this null finding, we estimate a series of exploratory models using age as a moderator of the direct and indirect relationships between ICT use and SWB. Consistent with our previous results, we find that the direct relationship between ICT use and SWB decreases with age. Contrary to the null findings in the unconditional model, we observe statistically significant indirect relationships of ICT use and SWB via digital stress for the youngest individuals ($p < 0.05$) in the sample and for individuals one standard deviation below the sample mean in age ($p < 0.10$) (see Table 4 in the appendix). These exploratory results underscore the heterogeneity in the relationship between ICT use and SWB, and highlight the crucial role of age as a moderating factor in frameworks of digital well-being (Büchi 2024).

Conclusion

Due to the rapid increase of digitalization, understanding the link between ICT use, digital stress and subjective well-being is becoming increasingly important. Previous research indicates that digital stress has a negative impact on SWB (Nastjuk et al. 2024). At the same time, empirical evidence points to age-specific dynamics that require further explanation (e.g., Reinecke et al. 2017). Based on Büchi's (2024) digital well-being concept, the present study addressed the relationships between ICT use and self-reported digital stress with SWB in the Austrian population. Moreover, we examined whether the link between ICT use and SWB is mediated by self-reported digital stress. A special focus was also put on the moderating role of the respondents' age regarding the relationships between ICT use and SWB, as well as self-reported digital stress and SWB. All analyses were based on the Social Survey Austria 2024, a probability-based sample of the Austrian general population, in which a new short scale for self-reported digital stress was fielded.

Our descriptive analyses found self-reported digital stress to be common in the population. Between a quarter and a third of participants claim to be affected by various aspects

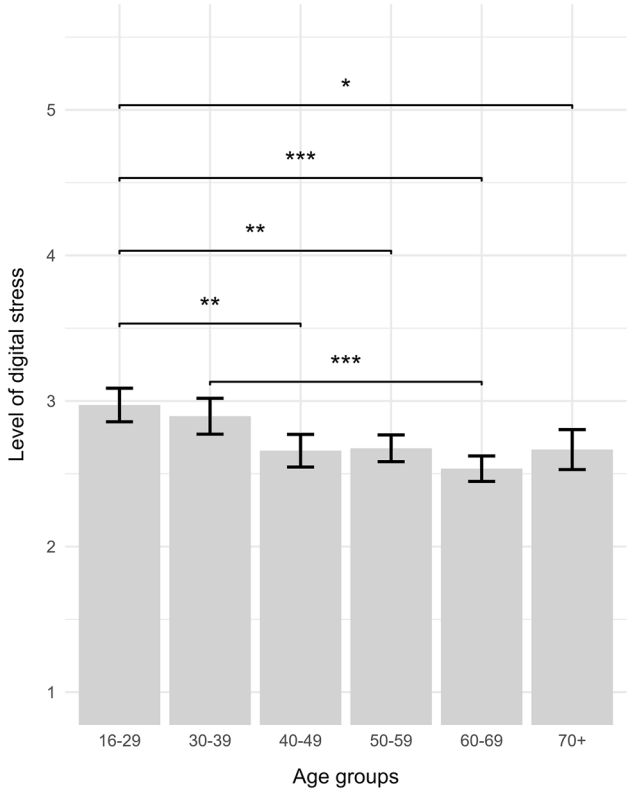

Fig. 3 Self-reported digital stress across age groups (index scores from 1 to 5 and 95%-CI; $n_{16–29} = 288$, $n_{30–39} = 247$, $n_{40–49} = 238$, $n_{50–59} = 283$, $n_{60–69} = 211$, $n_{70+} = 226$). Source: Social Survey Austria 2024, weighted data. Notes: statistical significance: *p < 0.05 **p < 0.01 ***p < 0.001

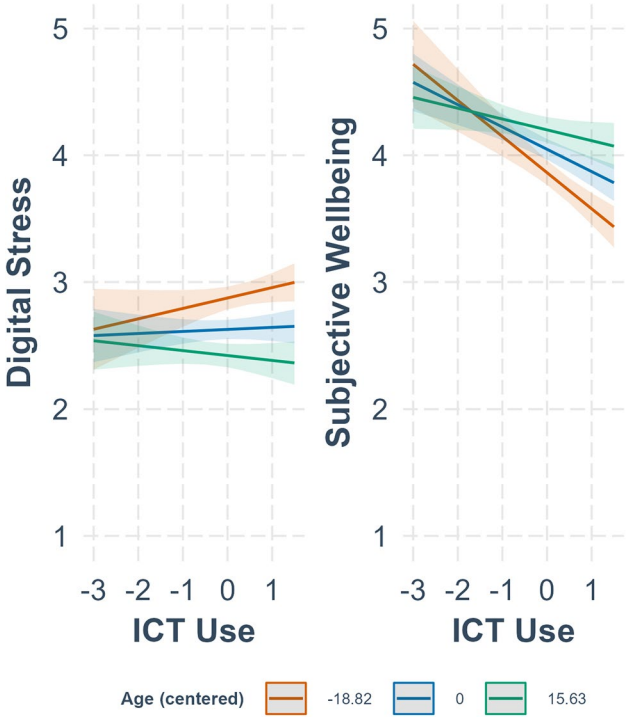

Fig. 4 Moderation analyses based on age (Conditional Effects Plots for Interaction Effects). Note: Predictions based on M4 and M2; all associations controlled for digital skills, age, sex, education, subjective and objective household income and employment status. Source: Social Survey Austria 2024

of digital stress. However, digital stress is also unequally distributed across the age spectrum in the Austrian population, with significantly higher levels found among younger individuals. To address our research questions, six hypotheses were formulated and tested via linear regression models and conditional process analysis. These analyses take up Büchi's (2024) call for moderators and mediators in path analyses to better understand digital well-being. Based on our models, it can be confirmed that more frequent ICT use is associated with lower subjective well-being (H1). At the same time, it should be noted that the magnitude of this relationship is relatively small, as expected based on the literature (Ferguson et al. 2025; Johannes et al. 2024; Godard and Holtzman 2024). Our analyses did not provide evidence for an association between the frequency of ICT use and self-reported digital stress in the general population (H2). However, we found that higher levels of digital stress are indeed related to lower SWB in the Austrian population (H3), which is in line with previous findings (Nastjuk et al. 2024). The moderate negative association between digital stress and SWB ($\beta = -0.37$) is also supported by previous research findings. In a recent meta-analysis, Nastjuk and colleagues (2024) report a confidence interval of −0.81 to −0.22 regarding the average association between technology-related stressors and psychological outcomes in non-working contexts.

Furthermore, our results support the claim that the relationship between ICT use and digital stress is moderated by age (H4). The negative relationship between ICT use and SWB is more pronounced among younger individuals (H5). Previous research explains this moderating role of age by problematic patterns of ICT use such as after-midnight use (Lederer-Hutsteiner et al. 2024) and social media overuse (Thomas et al. 2022; Alonzo et al. 2021). At the same time, current research also points towards more complex dynamics (Mayen et al. 2025). These findings seem to mirror certain "digital divides" (Helsper 2021) in terms of skills and access to ICTs, which result in a higher exposure to digital stressors.

We find no verifiable general indirect relationship between ICT use and SWB mediated through digital stress in the general population, as predicted in H6. However, as indicated by the results of the moderated mediation analysis

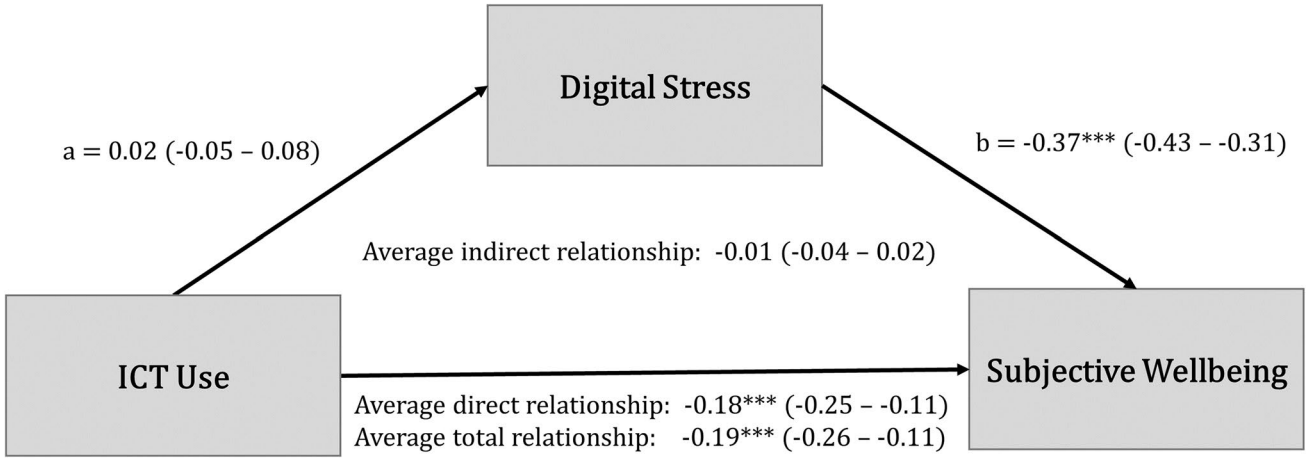

Fig. 5 Direct and indirect relationships between ICT Use, Digital Stress and SWB (Mediation Analysis). Notes: statistical significance: * $p<0.05$ ** $p<0.01$ *** $p<0.001$, Numbers in brackets are 95% confidence intervals, a = Relationship between ICT Use and Digital Stress (M4), b = relationship between Digital Stress and Subjective Well-being (M2), Unweighted samples, all associations controlled for digital skills, age, sex, education, subjective and objective household income and employment status. Source: Social Survey Austria 2024

(Table 4 in the appendix), the indirect relationship via digital stress varies conditional on age. The extent of the indirect relationship is greater for younger individuals, which is plausible considering that ICT use is indeed associated with higher digital stress and lower SWB in this group. These results have implications for research on SWB. As suggested by Büchi (2024), our findings underscore the importance of considering moderators such as age when investigating the relationship between ICT use and SWB. Using conditional process analysis, we demonstrate that this applies not only to direct relationships but also to indirect ones, an aspect that received only limited attention in Büchi's (2024) original framework.

It should also be mentioned that there are limitations to this study. First, the cross-sectional design does not allow for causal interpretations of the presented results. Second, the one-dimensional measurement of self-reported digital stress does not allow for distinguishing between various subdimensions of digital stress. Nimrod (2017) emphasizes that different forms of digital stress may vary in their relevance across age groups. Older people are more likely to experience information and communication overload, as well as feelings of invasion, while younger people tend to report more concerns related to "*inclusion, privacy and complexity*" (Nimrod 2017, p. 1091; see also Reinecke et al. 2017 and Steele et al. 2020). Also, we use a rather broad indicator to operationalize ICT use, which may lack sufficient discriminatory power to capture the nuances of the proposed relationship. This may be problematic for two reasons. First, the indicator does not explicitly include social media use, which may be especially relevant for digital stress and SWB among younger cohorts (Alonzo et al. 2021; Ahmed et al. 2024). Second, the indicator does not measure ICT overuse, which may be even more important to the study of digital well-being than general ICT use (Büchi et al. 2019). These factors could also explain the weak and nonsignificant association between ICT use and digital stress in the general population. Future research should therefore address the links between ICT use, digital stress and SWB by using more differentiated measures to get a better understanding of the underlying mechanisms. An important first step could be to use more granular indicators of ICT use, as well as tools specifically designed to measure perceived digital overuse, as Gui and Büchi (2021) have already demonstrated.

Fourth, our results only apply to Austria and thus relationships could vary between national contexts, especially when considering non-western countries with different degrees of digitalization and ICT use. Future studies should therefore try to replicate the findings of this paper for other national contexts. In addition, longitudinal data is needed to adequately analyze causal relationships between ICT overuse, digital stress and SWB. Moreover, future research should test whether the presented relationships also differ between other population groups and explore other possible moderating factors besides age. Lastly, Büchi's (2024) digital well-being framework assumes harmful and beneficial aspects of digitalization. Since our article focuses on harmful aspects, future studies should try to include positive factors such as digital self-efficacy (Ulfert-Blank and Schmidt 2022) or online peer support (Naslund et al. 2016).

Despite these limitations, our findings underscore a significant and moderate association between self-reported

digital stress and SWB in the Austrian general population. Public health strategies should seek to address age-related disparities in self-reported digital stress, which is highest among young people under the age of 30. Moreover, we find that the magnitude of both the direct and indirect relationships between ICT use, digital stress, and SWB is greater among younger individuals. This points towards an increased vulnerability in this population segment that should be further addressed by public health research. However, as observed associations are mostly small to moderate, our findings do not support alarmist and tech-averse narratives. From a practical perspective, the results underscore a need for more evidence-based interventions, specifically tailored to the needs and practices of younger individuals to ensure equal access to digital well-being for all citizens. As this study shows, the theory of digital well-being (Büchi 2024) could be a suitable framework for guiding such efforts.

Appendix

Table 3 Short scale for Digital Stress (DIST scale; translated from German)

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	I can't say/does not apply
1. Being accessible anytime and anywhere through digital technologies puts a strain on me	o1	o2	o3	o4	o5	o—8
2. Using digital technologies makes it harder for me to concentrate	o1	o2	o3	o4	o5	o—8
3. The constant comparison with others on the internet stresses me out	o1	o2	o3	o4	o5	o—8
4. Being constantly confronted with the world's problems through digital technologies is a burden for me	o1	o2	o3	o4	o5	o—8
5. The use of digital technologies makes me sleep worse	o1	o2	o3	o4	o5	o—8
6. I am overwhelmed by the constant overflow of information	o1	o2	o3	o4	o5	o—8

Source: SSA 2024

Table 4 Moderated-Mediation Analysis

		Moderated Mediation: Age (Centered on Sample Average)				
	Unconditional	Min (-33.57)	-1 SD (-18.92)	Mean (0.00)	+1 SD (15.61)	Max (42.43)
Total Relationship	-0.19*** (-0.26 – -0.11)	-0.41*** (-0.55 – -0.27)	-0.32*** (-0.43 – -0.21)	-0.18*** (-0.26 – -0.10)	-0.08 (-0.17–0.01)	0.12 (-0.05–0.29)
Average Direct Relationship	-0.18*** (-0.25 – -0.11)	-0.36*** (-0.50 – -0.23)	-0.28*** (-0.39 – -0.19)	-0.18*** (-0.25 – -0.10)	-0.09* (-0.17 – -0.00)	0.07 (-0.08–0.22)
Average Indirect Relationship	-0.01 (-0.04–0.02)	-0.05* (-0.10 – -0.00)	-0.03 (-0.07–0.01)	-0.00 (-0.03–0.02)	0.02 (-0.01–0.04)	0.05 (-0.03–0.10)

Statistical significance: *p < 0.05 **p < 0.01 ***p < 0.001; Numbers are unstandardized estimates, Mediator Model = M4 of Table 2; Outcome Model = M2 of Table 1; Numbers in brackets are 95% Confidence intervals; Unweighted samples; Source: Social Survey Austria 2024

Authors' contributions Conceptualization: CE, AE, MP; Methodology: CE, AE, MP; Formal analysis and investigation: CE, AE, MP; Writing—original draft preparation: CE, AE, MP; Writing—review and editing: CE, AE, MP; Supervision: CE.

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Data availability The data used in this study are publicly available from the Austrian Social Science Data Archive (AUSSDA) upon registration using the following link: https://doi.org/10.11587/0VKC5X.

Code availability The code for all analyses in this study will be made available by the authors upon request.

Declarations

Ethics approval In accordance with the rules of the European General Data Protection Regulation, the data was processed and published via AUSSDA (the Austrian Social Science Data Archive), which is part of CESSDA (Consortium of European Social Science Data Archives).

Consent for publication Not applicable.

Consent to participate Not applicable.

Conflicts of interest The authors declare that they have no competing interests.

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