# Determinants of digital well-being

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## Abstract

How can people lead fulfilling lives both thanks to and despite the constant use of digital media and artificial intelligence? While the prevailing narrative often portrays these technologies as generally harmful to well-being, the reality is of course more nuanced—some individuals benefit, while others do not. Existing research has predominantly focused on the general consequences of digital media on well-being, with less attention given to the individual-level antecedents of digital well-being. In the present study, we aimed to identify the traits and characteristics of individuals who use digital tools in ways that promote their well-being. Using a large representative sample from Sweden ($N = 1999$), we explore how digital self-control, digital literacy (objective and subjective), and digital information ignorance predict digital well-being, life satisfaction, and social anxiety. Digital self-control and subjective digital literacy positively predicted digital well-being. Digital self-control also predicted greater life satisfaction. Finally, digital information ignorance predicted increased life satisfaction and social anxiety. Overall, the current study contributes to a growing literature on digital well-being by exploring its antecedents.

**Keywords** Digital well-being · Self-control · Digital literacy · Information avoidance

## 1 Introduction

Digital tools, including AI-based chatbots like ChatGPT and social media platforms, have become deeply ingrained in our daily routines, influencing how we perceive and engage with the world around us. These tools present opportunities to enhance various aspects of life. For instance, AI can improve task efficiency and offer personalized learning experiences. Social media tools can provide emotional support and valuable information that guides decision-making (Chan 2015;

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Utz and Breuer 2017). As noted by Foffano et al. (2023), the European AI strategy emphasizes AI's role as a positive force in society, ultimately aiming to promote human well-being (European Commission 2021).

At the same time, the use of digital tools also introduces potential risks. For instance, excessive use of social media can lead to anxiety, depression, and poorer life satisfaction (Dienlin and Johannes 2020; Orben and Przybylski 2019). Indeed, the current narrative around digital tools (e.g., social media platforms) is often entangled with overgeneralized claims and fears, which has given rise to interventions such as digital detoxification (Syvertsen and Enli 2019) and screen time management apps (Beattie and Daubs 2020). However, the nature of these tools is neither inherently good nor bad; their impact likely varies among individuals.

The pursuit of 'digital well-being' seeks to balance the benefits and risks associated with digital technology. It emphasizes the importance of harnessing digital tools effectively while mitigating potential harms to physical, mental, and emotional health, and has drawn considerable interest from researchers and policymakers (Foffano et al. 2023; Lillywhite and Wolbring 2023). Despite extensive research on the consequences of using digital tools, less attention has been given to understanding how individual traits predict the

extent to which these tools enhance or detract from personal well-being.

To address this gap, our study examines the influence of digital self-control, literacy, and information ignorance on digital well-being. By contextualizing these constructs within the digital context—which have been extensively used in social and economic psychology—we contribute to the growing call for research on well-being within AI and digital technologies (Audrin and Audrin 2024; Busch and McCarthy 2021; Büchi 2024; Lillywhite and Wolbring 2023; Montag et al. 2024).

Additionally, we investigated how these predictors relate to social anxiety and life satisfaction to determine if the skills and behaviors influencing digital well-being also impact these broader aspects of psychological health. This provides a more comprehensive view of the effects of digital competencies on overall well-being.

In the following sections, we discuss digital well-being and explore the potential roles of self-control, digital literacy, and information neglect as factors influencing digital well-being.

## 1.1 Digital well-being

*Digital well-being* refers to the conscious and positive use of technology, which ensures that individuals not only harness the benefits of digital tools but also mitigate potential harms. It is, in essence, a state of personal well-being experienced through the healthy use of digital technology. Büchi (2024) describes digital well-being as being concerned with "individuals' affect (e.g. positive emotions), domain satisfaction (e.g. one's relationships or job), and overall life satisfaction in a social environment characterized by the constant abundance of digital media use options" (p. 174).

Despite the potential for digital tools to enhance well-being, psychological research generally assumes a negative relationship between digital media use and well-being. Indeed, studies have documented various negative consequences of digital media use (for a comprehensive review, see Büchi 2024), such as fear of missing out (Sekścińska and Jaworska 2022), social comparison (e.g., Alfasi 2019; Vries and Kühne 2015), and well-being (Dienlin and Johannes 2020; Odgers and Jensen 2020; Weidman et al. 2012).

However, the practical significance of the relationship between digital media use and well-being has been debated (e.g., see Orben and Przybylski 2019). Additionally, findings are mixed. An 8-year-long study by Coyne et al. (2020) found that time spent on social media did not predict changes in depression or anxiety. Another longitudinal study found that social media use problems (i.e., addiction-like social media use), but not the frequency of social media use, predicted lower mental health 1 year later (Boer et al. 2021). Zhong et al. (2021) found that at

the onset of the COVID-19 virus in Wuhan, people benefited from informational, emotional, and peer support via social media but excessive use of social media led to mental health issues. Yet, other studies have documented positive outcomes, such as connectedness (Chan 2015), social support (Utz and Breuer 2017) and information and advice (Van Ingen and Matzat 2018).

The variability in these outcomes suggests that the relationship between digital use and well-being is complex and not uniformly negative or positive. As Beyens et al. (2020) found, digital media use can increase happiness for some, decrease it for others, or have no effect at all. This variability highlights the importance of exploring which individual traits and characteristics influence these outcomes. Understanding these traits is crucial for identifying who is more likely to benefit from digital engagement and who might be at risk.

## 1.2 Exploring individual-level antecedents of digital well-being

### 1.2.1 Self-control

Self-control is typically defined as the skill to resist immediate impulses or habits, allowing individuals to inhibit undesirable behaviors and prioritize the pursuit of long-term objectives (Carver and Scheier 1981; Metcalfe and Mischel 1999). Trait self-control has been linked to a host of positive outcomes in various domains of life, including work, school, interpersonal relationships, and health (De Ridder et al. 2012), including greater happiness (Cheung et al. 2014), life satisfaction (Hofmann et al. 2013), and well-being (Briki 2018). In a large representative sample in Sweden, Strömbäck et al. (2017, 2020) found that individuals with higher self-control engaged in better financial behaviors (e.g., were more likely to save money from their paychecks) and reported greater financial well-being (e.g., feeling less anxious about financial matters).

The advantages of self-control appear to be, at least in part, driven by the adoption of more adaptive habits, such as those related to eating and academic studies (e.g., Adriaanse et al. 2014; Galla and Duckworth 2015), which likely extend to the use of digital tools too. The ability to manage and regulate one's digital interactions may play a crucial role in digital well-being, as it allows individuals to shape their digital experiences in alignment with their values and goals. There is some evidence indicating that self-control predicts lower social media addiction and problematic social media use (e.g., Du et al. 2018). However, research is needed to examine how self-control in the digital domain predicts well-being specifically. In

addition, studies are needed to test the comparative predictive strength of self-control to other individual-level factors.

### 1.2.2 Digital literacy

Digital literacy, encompassing both objective and subjective proficiency in technological concepts, is an important skill to effectively navigate the increasingly complex digital landscape. This importance became particularly evident during the COVID-19 pandemic when information with significant health consequences flooded from various sources. Digital literacy plays a crucial role in enabling individuals to evaluate the accuracy and credibility of information. In a study on politics and COVID-19 news posts, Sirlin et al. (2021) found that digital literacy predicted the ability to distinguish between true and false information in headline accuracy judgments.

There is limited empirical research examining the relationship between digital literacy and digital well-being, despite some work on literacy and well-being in other domains, such as finance (Gignac et al. 2023). Vissenberg et al. (2022) highlighted the need for more empirical studies on the connection between digital literacy, online resilience, and well-being. An exception is the study by Rivadeneira et al. (2023), which found that digital health literacy during the COVID-19 pandemic predicted higher subjective well-being. However, further research is necessary to test how digital literacy compares to other individual-level antecedents and to investigate the generalizability of these findings across different dimensions of well-being.

### 1.2.3 Information neglect (homo ignorance)

While digital literacy equips individuals with skills to evaluate information accuracy and make informed decisions, some individuals might make the deliberate choice to remain uninformed or disregard certain aspects of available information. This behavioral phenomenon, which has been termed 'Homo Ignorance,' (Hertwig and Engel, 2016), includes tendencies like avoidance of available information, disregard of incongruent facts, or abstinence from making decisions altogether. For instance, an individual who deliberately avoids processing information related to COVID-19 due to heightened anxiety about the pandemic may have a limited understanding of the virus, preventive measures, and the evolving situation, potentially leading to heightened anxiety and disconnection from critical public health information. In a study involving representative samples from the UK and Sweden, Barrafrem et al. (2020a, b) found that financial information ignorance predicted lower financial well-being during the

COVID-19 pandemic. One might expect a similar effect in the digital context, where digital information ignorance might predict lower digital well-being.

## 2 The present study

### 2.1 Aims

In this study, we aimed to explore how various individual-level variables, which have been extensively researched in social psychology and behavioral economics, predict digital well-being. Our focus was on self-control and information ignorance within the digital context, and we also considered digital literacy, drawing on existing research on other forms of literacy (e.g., financial literacy). We expected that both subjective and objective digital literacy, as well as digital self-control, would be positively associated with digital well-being, while digital information ignorance would be negatively associated with it. Additionally, to provide a broader perspective, we conducted exploratory analyses to examine whether these variables also predict social anxiety and life satisfaction, extending our understanding of their impact on overall well-being beyond digital well-being.

### 2.2 Overview

We ran a cross-sectional study among a representative sample from Sweden to identify individual traits and characteristics that predict digital well-being. Our key predictors were digital self-control, subjective and objective digital literacy, and digital information ignorance. We also included other predictors, including online media use, learning problems due to age, general health condition, income, age, and gender. Finally, we also examined how these variables predicted two more outcome variables that are related to well-being, namely, life satisfaction and social anxiety. The study was not preregistered. Data and code can be accessed at https://osf.io/st2yc/?view_only=2cf1df6c03a240f6af76cbaabfd5d858.

## 3 Methods

### 3.1 Participants

Participants were recruited by the survey company Norstat (https://norstat.co) on our behalf. Participants were drawn from a sample of the general adult Swedish population. The survey was conducted online. Our sample size was based on the availability of resources. We nevertheless aimed

**Table 1** Sample characteristics

| N | 1999 |
|---|---|
| Age | 50.1 (17.95) |
| Female | 49.3% |
| Income | |
|   < 20,000 SEK | 21.6% |
|   20,001–30,000 SEK | 23.1% |
|   30,001–40,000 SEK | 27.8% |
|   40,001–50,000 SEK | 15.8% |
|   50,001–60,000 SEK | 7.3% |
|   > 60,001 SEK | 4.4% |
| Education | |
|   Compulsory school | 5.6% |
|   Upper secondary | 29.7% |
|   University < 3yrs | 19.6% |
|   University > 3yrs | 45.1% |
| Digital media use during free time | |
|   None | 0.6% |
|   Less than 1 h per day | 17.2% |
|   1–3 h per day | 56.8% |
|   4–5 h per day | 18.2% |
|   More than 5 h per day | 7.2% |

for a large representative sample that would be sufficient to make conclusions about the general public while also providing high power to detect small associations. There were 2333 complete responses once we had stopped data collection. After the removal of those failing to pass the attention checks, the final sample included 1999 individuals (979 women, 1008 men, 4 non-binary, 8 did not disclose; $M_{Age} = 50.14$, $SD_{Age} = 17.95$; see Table 1 for sample size characteristics).

## 3.2 Materials

### 3.2.1 Digital well-being

We adapted a measure of financial well-being (Lind et al. 2020; Strömbäck et al. 2017, 2020) to assess subjective digital well-being (see items in Table 2). Participants rated to what degree they agreed with six statements on a scale from one to five (1 = *completely disagree*, 5 = *completely agree*). A higher score on the digital well-being scale indicates that the individual feels safe and in control of digital technology and online activities. The Cronbach's alpha was .76 for the digital well-being scale.

**Table 2** The digital well-being scale (DWB)

| Item | Mean | SD |
|---|---|---|
| 1. I feel secure in my online activities | 3.31 | 0.97 |
| 2. I feel secure that my personal data is safe online | 2.69 | 1.00 |
| 3. I feel in control of my digital footprint I leave during my online activities | 2.46 | 1.05 |
| 4. I get unsure by the lingo of IT experts (e.g., cyber security, DDoS attacks, artificial intelligence)[a] | 2.78 | 1.14 |
| 5. I feel worried that vicious persons can use my personal digital data for bad purposes[a] | 3.13 | 1.07 |
| 6. I am worried about how digital technology will influence our lives in the future[a] | 3.02 | 1.16 |
| DWBS average | 2.92 | 0.72 |

The range was 1–5 for all items. Cronbach's alpha = 0.76

[a]Item was reverse coded

**Table 3** The digital self-control scale (DSCS)

| Item | Mean | SD |
|---|---|---|
| 1. I have hard time braking bad online habits | 2.04 | 1.15 |
| 2. I sometimes say/write inappropriate things online | 1.31 | 0.71 |
| 3. I sometimes buy products online just to reach the spending limit for free shipping | 2.48 | 1.35 |
| 4. I often buy products and/or services online even though I cannot afford it | 1.33 | 0.75 |
| 5. I wish I had more self-discipline about my online activities | 2.24 | 1.26 |
| 6. Scrolling at my phone or computer prevents me from my work | 2.16 | 1.25 |
| 7. I have issues with being present in my daily activities when I have my phone with me | 1.75 | 1.00 |
| DSCS average | 4.09 | 0.74 |

The range was 1 to 5 for all items. Cronbach's alpha = 0.80. All items were reverse coded before calculating the average DSC

### 3.2.2 Digital self-control

We developed seven items to assess digital self-control (Table 3), inspired by a short self-control scale within the financial domain (Strömbäck et al. 2017, 2020). Individuals responded to statements such as "I sometimes say/write inappropriate things online" on a five-point scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). A higher value on the digital self-control scale indicated better self-control of online behavior. The Cronbach's alpha was 0.80 for the digital self-control scale.

### 3.2.3 Objective and subjective digital literacy

We measured subjective and objective digital literacy adapted from previous studies on financial literacy (e.g., Lind et al. 2020). Participants first reported their subjective knowledge about online tools, using the item "How would you rate your knowledge about online and digital tools?", on a seven-point scale ranging from 1 (*very low*) to 7 (*very high*).

Next, we measured participants' objective knowledge about digital tools. Participants responded to six multiple-choice questions that asked about cookies, phishing emails, online product recommendations, how free online services are financed (e.g., search engines, email providers, news sites), individual search results, and integrity policies. We counted the number of correct responses on these six items to compute an overall objective digital literacy score, ranging from 0 (low digital literacy) and 6 (high digital literacy). The mean number of correct responses was 4.81 (SD=1.13) and 32.3% of all participants responded correctly to all six questions.

### 3.2.4 Digital homo ignorance

We used eight items to measure individuals' level of digital information ignorance (see Table 4). We adapted the Financial Homo Ignorance (FHI) scale developed by Barrafrem et al. (2020a, b) to relate to online activities. Individuals responded to statements such as "I am often surprised how much time I spend online" on a five-point scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). A higher value on the Digital Homo Ignorance (digital information ignorance) scale indicated higher digital information ignorance. All responses significantly correlated with each other. The Cronbach's alpha was 0.64.

### 3.2.5 Life satisfaction

We assessed individual life satisfaction with the Swedish version of the Satisfaction with Life scale (SWLS; Hultell and Gustavsson 2008). Individuals rated their life satisfaction across five items on a seven-point scale. A higher score on SWLS indicates better satisfaction with life. The Cronbach's alpha was 0.89 (Table 5).

### 3.2.6 Social anxiety

We also assessed participants' level of social anxiety experienced during the week before data collection, using four items from the social situations subscale of the Liebowitz

**Table 5** Satisfaction with life scale

| Item | Mean | SD |
|---|---|---|
| 1. In most ways my life is close to my ideal | 4.32 | 1.40 |
| 2. The conditions of my life are excellent | 5.00 | 1.41 |
| 3. I am satisfied with my life | 5.02 | 1.45 |
| 4. So far I have gotten the important things I want in life | 3.89 | 1.68 |
| 5. If I could live my life over, I would change almost nothing | 4.83 | 1.50 |
| SWLS average | 4.61 | 1.24 |

The range was 1–7 for all items. Cronbach's alpha=0.89

**Table 4** The digital homo-ignorance scale (DHI)

| Item | Mean | SD |
|---|---|---|
| 1. I avoid taking decisions about integrity and security of my personal data online | 2.38 | 1.04 |
| 2. When I am online, I often bookmark content (e.g., products I think of buying, content I would like to read) but never visit them later | 2.26 | 1.22 |
| 3. When I am online, I avoid reading information that could cause unpleasantness | 2.32 | 1.22 |
| 4. I avoid checking my e-mails | 1.24 | 0.64 |
| 5. I just read news from online outlets that share my values | 1.99 | 1.06 |
| 6. I unfollow and/or unfriend people on social media, with whom I disagree | 2.05 | 1.18 |
| 7. I check my social media accounts as soon as I have a couple of minutes free time | 2.93 | 1.41 |
| 8. I often get surprised when I realize how much time I have spent online | 2.63 | 1.35 |
| DHIS average | 2.27 | 0.62 |

The range was 1–5 for all items. Cronbach's alpha=0.64

Social Anxiety Scale (LSAS; Liebowitz 1987). Participants rated their anxiety about calling someone they did not know well, talking to strangers, returning items to a store, and arguing with sales personnel. We chose these specific four items because they capture potential social anxiety related to activities that serve as alternatives to online interactions. For example, instead of conducting bank errands online, a person might call their bank, and instead of shopping online, they might go to a store and interact with sales personnel. Participants responded to these items on a four-point scale. The Cronbach's alpha was 0.81 (Table 6).

### 3.2.7 Other variables

We also collected information about participants' age, gender, education, income, and how much of their free time they spend online daily. We asked participants to rate their general health condition on a five-point scale (1 = *bad*, 5 = *excellent*). Participants also rated how hard it is for them to learn new things due to their age (1 = *not at all*, 5 = *very much*).

### 3.3 Data analysis

We first ran descriptive analyses to examine means, standard deviations, and correlations. Next, we ran three linear regression models with robust standard errors (HC2 type) that differed with respect to the outcome variable. The first model included the key outcome variable of interest, namely, digital well-being. The second and third models included social anxiety and life satisfaction as outcome variables. These two latter models were included to gain a more comprehensive understanding of well-being broadly, beyond just digital well-being. All models included the same set of predictors. Key predictors included digital literacy (both objective and subjective), digital self-control, digital information ignorance, and the extent of online media use. In this model, the dependent variable was digital well-being, and the predictors were objective and subjective digital literacy, self-control, digital information ignorance, and online media use. In addition, all models controlled for age, gender, education, income, general health condition, and learning problems due to age. This allowed us to assess whether the main predictors could explain variance in the dependent variables beyond what could be attributed to these demographic and health-related factors.

All statistical analyses were performed with *R 4.0.3* (R Core Team 2021). Regression analyses were performed using the *lm_robust* function in the *estimatr* package (v1.0.0; Blair et al. 2022). All statistical tests in this study were two-tailed, with a significance threshold set at the standard 0.05 alpha level.

## 4 Results

### 4.1 Descriptives

Table 7 displays the correlations between all included measures and demographic variables as well as means and standard deviations. Simple correlations revealed that digital well-being was positively associated with general life satisfaction ($r = 0.2$, $p < 0.001$, 95% CI 0.15, 0.24), while social anxiety negatively correlated with both digital well-being ($r = -0.15$, $p < 0.001$, 95% CI $-0.19$, -0.1) and life satisfaction ($r = -0.23$, $p < 0.001$, 95% CI $-0.27$, $-0.19$). Moreover, both objective ($r = 0.05$, $p = 0.035$, 95% CI 0.00, 0.09) and subjective digital literacy ($r = 0.36$, $p < 0.001$, 95% CI 0.32, 0.4) were positively correlated with digital well-being. Interestingly, subjective digital literacy had a much stronger correlation with digital well-being in comparison to the correlation between objective knowledge and well-being.

### 4.2 Digital well-being

Next, we ran a set of regression models investigating the impact of objective and subjective digital literacy, digital self-control, digital information ignorance, online media use, and health on digital well-being, general life satisfaction, and social anxiety. The results are summarized in Table 8. Digital self-control and subjective knowledge were positively associated with digital well-being. Interestingly, objective digital knowledge did not reliably predict well-being. Moreover, participants' health (i.e., better general health and less age-related learning problems) was positively associated with digital well-being. Digital media use predicted greater digital well-being, albeit the association was weak. Finally, women reported slightly lower digital well-being in comparison to men.

Figure 1 shows the standardized beta coefficients and 95% confidence intervals, allowing for magnitude comparisons between the measures. Subjective digital knowledge was the strongest predictor of digital well-being, followed by digital self-control, health condition, and then online media use.

**Table 6** Social anxiety scale (LSAS)

| Item | Mean | SD |
|---|---|---|
| 1. Calling someone you don't know very well | 1.83 | 0.92 |
| 2. Talking with people you don't know very well | 1.65 | 0.81 |
| 3. Returning goods to a store | 1.54 | 0.78 |
| 4. Resisting a high pressure salesperson | 1.64 | 0.89 |
| LSAS average | 1.66 | 0.68 |

The range was 1–4 for all items. Cronbach's alpha = .82

**Table 7** Means, standard deviations, and correlations

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Digital wellbeing | 2.92 | 0.72 | | | | | | | | | | | | | |
| 2. Life satisfaction | 4.61 | 1.24 | 0.20** | | | | | | | | | | | | |
| 3. Social anxiety | 1.66 | 0.68 | -0.15** | -0.23** | | | | | | | | | | | |
| 4. Objective knowledge | 4.81 | 1.13 | 0.05* | -0.01 | -0.03 | | | | | | | | | | |
| 5. Subjective knowledge | 4.26 | 1.40 | 0.36** | 0.02 | -0.00 | 0.21** | | | | | | | | | |
| 6. Digital self-control | 4.10 | 0.74 | 0.12*** | 0.20*** | -0.36*** | -0.12*** | -0.15*** | | | | | | | | |
| 7. DHI | 2.23 | 0.62 | -0.12*** | -0.07*** | 0.33*** | -0.03 | 0.07*** | -0.60*** | | | | | | | |
| 8. Age | 50.14 | 17.95 | -0.05* | 0.12*** | -0.34*** | -0.20*** | -0.29*** | 0.48*** | -0.36*** | | | | | | |
| 9. Female | 0.49 | | -0.19*** | 0.04* | 0.09*** | -0.19*** | -0.24*** | -0.05* | 0.23*** | 0.05* | | | | | |
| 10. Income | 2.77 | 1.38 | 0.14*** | 0.22*** | -0.12*** | 0.19*** | 0.19*** | 0.05 | -0.04 | -0.02 | -0.24** | | | | |
| 11. Education | 3.04 | 0.98 | 0.00 | 0.08*** | -0.00 | 0.20*** | 0.11*** | -0.13*** | 0.08*** | -0.09*** | 0.08*** | 0.28** | | | |
| 12. Media use | 3.14 | 0.80 | 0.05* | -0.24*** | 0.29*** | 0.09*** | 0.21*** | -0.40*** | 0.28*** | -0.39*** | -0.04 | -0.09*** | 0.03 | | |
| 13. General health | 3.19 | 0.93 | 0.18*** | 0.51*** | -0.13*** | 0.06* | 0.13*** | 0.06*** | -0.03 | -0.12*** | -0.06*** | 0.25*** | 0.08** | -0.11** | |
| 14. Learning problems | 2.19 | 1.01 | -0.17*** | -0.13*** | 0.05* | -0.14*** | -0.30*** | 0.05* | -0.02 | 0.39*** | 0.02 | -0.07*** | -0.14** | -0.09*** | -0.20** |

M and SD are used to represent mean and standard deviation, respectively

DHI digital homo ignorance

*p < 0.05, **p < 0.01

**Table 8** Summary of results from linear regression models

| Term | Digital well-being | Life satisfaction | Social anxiety |
|---|---|---|---|
| (constant) | 1.39 (0.27)** | 1.65 (0.38)** | 2.48 (0.23)** |
| Objective digital literacy | $-0.03$ (0.02) | $-0.02$ (0.02) | $-0.04$ (0.01)* |
| Subjective digital literacy | 0.16 (0.01)** | 0.01 (0.02) | $-0.03$ (0.01)* |
| Digital self-control | 0.16 (0.03)** | 0.20 (0.05)** | $-0.11$ (0.03)** |
| DHI | $-0.06$ (0.03) | 0.14 (0.06)* | 0.12 (0.03)** |
| Age | 0.00 (0.00) | 0.01 (0.00)** | $-0.011$ (0.001)** |
| Female | $-0.08$ (0.04)* | 0.21 (0.06)** | 0.02 (0.03) |
| Education: gym | 0.13 (0.08) | $-0.17$ (0.12) | $-0.09$ (0.07) |
| Education: uni < 3 years | 0.08 (0.08) | $-0.11$ (0.12) | $-0.06$ (0.07) |
| Education: uni > 3 years | 0.06 (0.08) | $-0.1$ (0.12) | $-0.06$ (0.07) |
| Income | 0.02 (0.01) | 0.1 (0.02)** | $-0.02$ (0.01) |
| Digital media use | 0.06 (0.03)* | $-0.17$ (0.04)** | 0.09 (0.02)** |
| Health: general | 0.09 (0.02)** | 0.63 (0.03)** | $-0.06$ (0.02)** |
| Health: learning problems | $-0.05$ (0.02)* | $-0.10$ (0.03)** | 0.1 (0.02)** |
| *N*.obs | 1662 | 1662 | 1662 |
| Adj.$R^2$ | 0.18 | 0.33 | 0.22 |

*DHI* digital homo ignorance

*$p < 0.05$; **$p < 0.001$

**Fig. 1** Forest plot of coefficients in regression models. Education was included as a covariate in all models but is not shown in the figure. *DHI* digital homo ignorance
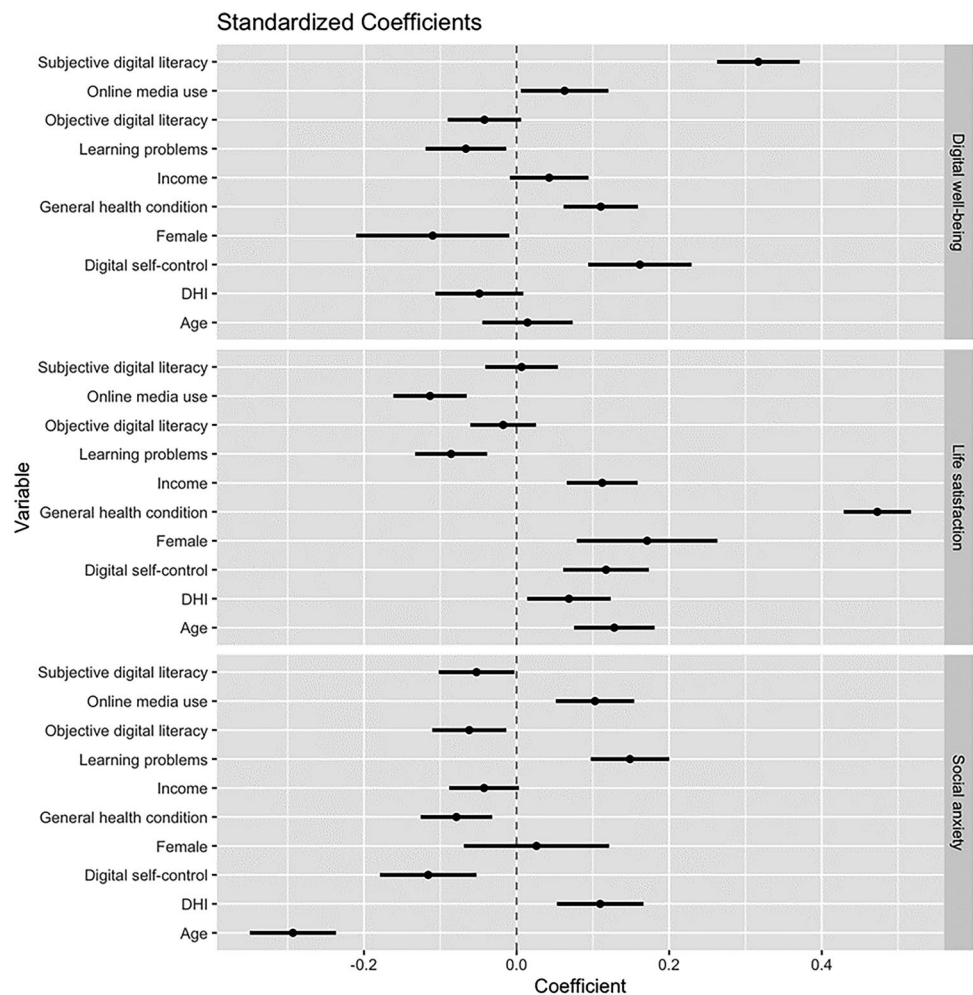
The lack of a significant estimate for objective knowledge indicates that individuals' confidence in their own digital knowledge seemed to be more important than objective knowledge when it comes to digital well-being. In fact, the coefficient for subjective digital knowledge was significantly higher than objective digital knowledge ($F(1, 1648) = 89.15$, $p < 0.001$).

### 4.3 Life satisfaction

The regression analyses indicated that higher digital self-control and lower online media use predicted higher life satisfaction. Interestingly, digital information ignorance was positively associated with life satisfaction with a small effect. Unsurprisingly, participants' health and income were robust predictors of life satisfaction. Moreover, age was positively associated with satisfaction with life. Finally, women reported significantly higher life satisfaction compared to men. The standardized coefficients plotted in Fig. 1 indicate that general health was the strongest predictor of life satisfaction. Online media use, income, self-control, digital information ignorance, age, and gender all had comparable effects.

### 4.4 Social anxiety

Higher objective and subjective digital knowledge and higher digital self-control predicted lower social anxiety. Moreover, a higher score on digital information ignorance and more digital media consumption were associated with higher social anxiety. The results also showed that better health (i.e., general health and age-related learning problems) predicted lower social anxiety. Finally, age was negatively associated with social anxiety.

## 5 Discussion

Drawing on the behavioral economics literature, we examined how digital self-control, digital literacy (subjective and objective), and digital information processing predict digital well-being, along with life satisfaction and social anxiety.

Digital self-control was positively associated with digital well-being and life satisfaction and negatively associated with social anxiety, replicating previous research outside the digital domain (e.g., Hofmann et al. 2013; Strömbäck et al. 2017, 2020). Individuals with high self-control develop adaptive habits (Galla and Duckworth 2015) and may thus intentionally shape their digital behavior to support long-term objectives, rather than succumbing to fleeting impulses. An alternative explanation could be that individuals high in digital self-control report lower social anxiety due to a preference for avoiding in-person interactions. However, these interpretations remain speculative, and we hope to see future studies delve into potential mechanisms underlying these associations.

Subjective digital literacy was positively associated with digital well-being and life satisfaction but did not predict social anxiety. Interestingly, objective digital literacy showed no significant association with any of the three outcome variables, suggesting that personal perceptions and emotional responses may be more important. However, the reliability of this finding is uncertain due to the variable's limited spread or variation.

Digital information ignorance was not associated with digital well-being, but it was positively associated with life satisfaction and social anxiety. This may be because avoiding digital information gives individuals a greater sense of control, contributing to higher life satisfaction. On the other hand, such avoidance could also isolate them from social interactions and important information, potentially increasing social anxiety. Weidman et al. (2012) found a similar pattern of results: Individuals with higher social anxiety preferred online socialization, but they also reported lower well-being with frequent online communication, highlighting the potential drawbacks of relying on the internet as a substitute for face-to-face interactions.

It is unclear why digital information ignorance was not associated with digital well-being. For instance, Barrafrem et al. (2020a, b) found that financial information ignorance was positively associated with financial well-being during the COVID-19 pandemic. One potential reason for the lack of a significant association in the current study is that the variance in digital well-being might be better captured by self-control. The correlation between digital information ignorance and self-control in the current study was $-0.60$, with some items (e.g., items 7 and 8) also being represented in self-control. Moreover, removing self-control from the model predicting digital well-being results in a notably larger coefficient for digital information ignorance. No such change occurs for the models predicting life satisfaction or social anxiety.

Furthermore, while not a key variable of interest in the current study, online media use was positively associated with digital well-being, although, surprisingly, it was negatively associated with life satisfaction and positively with social anxiety. This suggests that the influence of online media use on outcomes related to well-being is more variable, unlike the other key predictors.

Although the associations reported in this study are correlational, preventing causal conclusions, these findings point to valuable directions for future research. Future studies could test these relationships experimentally and longitudinally. A promising direction for future research would be to develop and test interventions aimed at

enhancing digital self-control and digital knowledge and assessing their effects on digital well-being over time.

Finally, some of the associations might vary considerably across different cultures. For example, unlike in Sweden, where individuals are generally proficient with digital tools, the impacts of digital self-control, digital knowledge, and digital information processing may be more pronounced in other countries where such tools are not as prevalent.

**Data availability** Data and code are available at https://osf.io/st2yc/?view_only=2cf1df6c03a240f6af76cbaabfd5d858.

## Declarations

**Conflict of interest** The authors have no conflict of interest to declare. Artificial intelligence tools were used to improve and proof-read the language of this manuscript. The authors take full responsibility for the content.

## References

Adriaanse MA, Kroese FM, Gillebaart M, De Ridder DTD (2014) Effortless inhibition: habit mediates the relation between self-control and unhealthy snack consumption. Front Psychol Eat Behav 5:1–6. https://doi.org/10.3389/fpsyg.2014.00444

Alfasi Y (2019) The grass is always greener on my Friends' profiles: the effect of Facebook social comparison on state self-esteem and depression. Personal Individ Differ 147:111–117. https://doi.org/10.1016/j.paid.2019.04.032

Audrin C, Audrin B (2024) Emotional intelligence in digital interactions–a call for renewed assessments. Personal Individ Differ 223:112613. https://doi.org/10.1016/j.paid.2024.112613

Barrafrem K, Västfjäll D, Tinghög G (2020a) Financial well-being, COVID-19, and the financial better-than-average-effect. J Behav Exp Financ 28:100410. https://doi.org/10.1016/j.jbef.2020.100410

Barrafrem K, Västfjäll D, Tinghög G (2020) Financial homo ignorans: measuring vulnerability to behavioral biases in household finance. Preprint at https://doi.org/10.31234/osf.io/q43ca

Beattie A, Daubs MS (2020) Framing "digital well-being" as a social good. First Monday, 25. https://firstmonday.org/ojs/index.php/fm/article/view/10430

Beyens I, Pouwel JL, van Driel II, Keijsers L, Valkenburg PM (2020) The effect of social media on wellbeing differs from adolescent to adolescent. 10(1):10763. https://doi.org/10.1038/s41598-020-67727-7

Boer M, Stevens GW, Finkenauer C, de Looze ME, van den Eijnden RJ (2021) Social media use intensity, social media use problems, and mental health among adolescents: investigating directionality and mediating processes. Comput Hum Behav 116:106645. https://doi.org/10.1016/j.chb.2020.106645

Briki W (2018) Trait self-control: why people with a higher approach (avoidance) temperament can experience higher (lower) subjective wellbeing. Personal Individ Differ 120:112–117. https://doi.org/10.1016/j.paid.2017.08.039

Büchi M (2024) Digital well-being theory and research. New Media Soc 26(1):172–189. https://doi.org/10.1177/14614448211056851

Busch PA, McCarthy S (2021) Antecedents and consequences of problematic smartphone use: a systematic literature review of an emerging research area. Comput Hum Behav 114:106414. https://doi.org/10.1016/j.chb.2020.106414

Carver CS, Scheier MF (1981) Attention and self-regulation: a control theory approach to human behavior. Springer, New York

Chan M (2015) Multimodal connectedness and quality of life: examining the influences of technology adoption and interpersonal communication on well-being across the life span. J Comput Mediat Commun 20(1):3–18. https://doi.org/10.1111/jcc4.12089

Cheung TTL, Gillebaart M, Kroese F, De Ridder D (2014) Why are people with high self-control happier? The effect of trait self-control on happiness as mediated by regulatory focus. Front Psychol 5(722):1–6. https://doi.org/10.3389/fpsyg.2014.00722

Coyne SM, Rogers AA, Zurcher JD, Stockdale L, Booth M (2020) Does time spent using social media impact mental health?: An eight year longitudinal study. Comput Hum Behav 104:106160. https://doi.org/10.1016/j.chb.2019.106160

De Vries DA, Kühne R (2015) Facebook and self-perception: Individual susceptibility to negative social comparison on Facebook. Personal Individ Differ 86:217–221. https://doi.org/10.1016/j.paid.2015.05.029

De Ridder DTD, Lensvelt-Mulders G, Finkenauer C, Stok M, Baumeister RF (2012) Taking stock of self-control: a meta-analysis of how trait self-control relates to a wide range of behaviors. Personal Soc Psychol Rev 16:76–99. https://doi.org/10.1177/1088868311418749

Dienlin T, Johannes N (2020) The impact of digital technology use on adolescent well-being. Dialogues Clin Neurosci 22(2):135–142. https://doi.org/10.31887/DCNS.2020.22.2/tdienlin

Du J, van Koningsbruggen GM, Kerkhof P (2018) A brief measure of social media self-control failure. Comput Hum Behav 84:68–75. https://doi.org/10.1016/j.chb.2018.02.002

European Commission (2021) Proposal for a regulation on a European approach for artificial intelligence. Communication, COM 206 final. https://digital-strategy.ec.europa.eu/en/library/proposal-regulationeuropean-approach-artificial-intelligence

Foffano F, Scantamburlo T, Cortés A (2023) Investing in AI for social good: an analysis of European national strategies. AI Soc 38(2):479–500. https://doi.org/10.1007/s00146-022-01445-8

Galla BM, Duckworth AL (2015) More than resisting temptation: beneficial habits mediate the relationship between self-control and positive life outcomes. J Personal Soc Psychol 109:508–525. https://doi.org/10.1037/pspp0000026

Gignac GE, Gerrans P, Andersen CB (2023) Financial literacy mediates the effect between verbal intelligence and financial anxiety. Personal Individ Differ 203:112025. https://doi.org/10.1016/j.paid.2022.112025

Hofmann W, Luhmann M, Fischer RR, Vohs KD, Baumeister RF (2013) Yes,=but are they happy? Effects of trait self-control on affective well-being and life satisfaction. J Pers 82:265–277. https://doi.org/10.1111/jopy12050

Liebowitz MR (1987) Social phobia. Mod Probl Pharmacopsychiatr 22:141–173. https://doi.org/10.1159/000414022

Lillywhite B, Wolbring G (2023) Auditing the impact of artificial intelligence on the ability to have a good life: using well-being measures as a tool to investigate the views of undergraduate STEM students. AI Soc. https://doi.org/10.1007/s00146-022-01618-5

Lind T, Ahmed A, Skagerlund K, Strömbäck C, Västfjäll D, Tinghög G (2020) Competence, confidence, and gender: the role of objective and subjective financial knowledge in household finance. J Fam Econ Issues 41:626–638. https://doi.org/10.1007/s10834-020-09678-9

Metcalfe J, Mischel W (1999) A hot/cool-system analysis of delay of gratification: dynamics of willpower. Psychol Rev 106:3–19. https://doi.org/10.1037/0033-295X.106.1.3

Montag C, Nakov P, Ali R (2024) On the need to develop nuanced measures assessing attitudes towards AI and AI literacy in representative large-scale samples. AI Soc. https://doi.org/10.1007/s00146-024-01888-1

Odgers CL, Jensen MR (2020) Annual research review: adolescent mental health in the digital age: facts, fears, and future directions. J Child Psychol Psychiatry 61(3):336–348. https://doi.org/10.1111/jcpp.13190

Orben A, Przybylski AK (2019) The association between adolescent well-being and digital technology use. Nat Hum Behav 3(2):173–182. https://doi.org/10.1038/s41562-018-0506-1

R Core Team (2021) R: a language and environment for statistical computing. R Foundation for Statistical Computing. https://www.R-project.org/

Rivadeneira MF, Salvador C, Araujo L, Caicedo-Gallardo JD, Cóndor J, Torres-Castillo AL et al (2023) Digital health literacy and subjective wellbeing in the context of COVID-19: a cross-sectional study among university students in Ecuador. Front Public Health 10:1052423. https://doi.org/10.3389/fpubh.2022.1052423

Sekścińska K, Jaworska D (2022) Who felt blue when Facebook went down?—the role of self-esteem and FoMO in explaining people's mood in reaction to social media outage. Personal Individ Differ 188:111460. https://doi.org/10.1016/j.paid.2021.111460

Sirlin N, Epstein Z, Arechar AA, Rand DG (2021) Digital literacy is associated with more discerning accuracy judgments but not sharing intentions. Harv Kennedy Sch Misinf Rev. https://doi.org/10.37016/mr-2020-83

Strömbäck C, Lind T, Skagerlund K, Västfjäll D, Tinghög G (2017) Does self-control predict financial behavior and financial well-being? J Behav Exp Financ 14:30–38. https://doi.org/10.1016/j.jbef.2017.04.002

Strömbäck C, Skagerlund K, Västfjäll D, Tinghög G (2020) Subjective self-control but not objective measures of executive functions predicts financial behavior and well-being. J Behav Exp Financ 27:100339. https://doi.org/10.1016/j.jbef.2020.100339

Syvertsen T, Enli G (2019) Digital detox: media resistance and the promise of authenticity. Convergence 26(5–6):1269–1283. https://doi.org/10.1177/1354856519847325

Utz S, Breuer J (2017) The relationship between use of social network sites, online social support, and well-being: results from a six-wave longitudinal study. J Media Psychol 29(3):115–125. https://doi.org/10.1027/1864-1105/a000222

Van Ingen E, Matzat U (2018) Inequality in mobilizing online help after a negative life event: the role of education, digital skills, and capital-enhancing internet use. Inf Commun Soc 21(4):481–498. https://doi.org/10.1080/1369118X.2017.1293708

Vissenberg J, d'Haenens L, Livingstone S (2022) Digital literacy and online resilience as facilitators of young people's well-being? Eur Psychol 27:76–85. https://doi.org/10.1027/1016-9040/a000478

Weidman AC, Fernandez KC, Levinson CA, Augustine AA, Larsen RJ, Rodebaugh TL (2012) Compensatory internet use among individuals higher in social anxiety and its implications for well-being. Personal Individ Differ 53(3):191–195. https://doi.org/10.1016/j.paid.2012.03.003

Zhong B, Huang Y, Liu Q (2021) Mental health toll from the coronavirus: Social media usage reveals Wuhan residents' depression and secondary trauma in the COVID-19 outbreak. Comput Hum Behav 114:106524. https://doi.org/10.1016/j.chb.2020.106524