

## DIGITAL TECHNOLOGY AND MENTAL HEALTH: UNVEILING THE PSYCHOLOGICAL IMPACT OF MODERN DIGITAL HABITS

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### Article Info

Received: Nov 04, 2024

Revised: Dec 06, 2024

Accepted: Feb 10, 2025

OnlineVersion: Feb 17, 2025

### Abstract

The rapid proliferation of digital technologies has significantly transformed modern life, raising concerns about their impact on mental health. This study aimed to identify the effects of digital technologies on the mental health of Ukrainians, focusing on cognitive functions, anxiety, depressive symptoms, physical activity. The study included surveys to identify the level of depressive symptoms, and personal and reactive anxiety that can result from excessive digital device use, alongside experiments to assess the impact of information overload and cyberbullying on mental health. Prolonged continuous use of digital devices negatively affected cognitive functions, including memory, attention, reaction time. Active digital device use before bedtime disrupted sleep phases. Excessive use also significantly reduced physical activity, particularly among older age groups, leading to prolonged sedentary behaviour. Young people showed better communication quality and group task performance in virtual interactions compared to older respondents. Personal anxiety levels remained stable across all age groups, despite information overload and cyberbullying. However, the highest levels of depressive symptoms were observed among middle-aged respondents, with younger and older groups displaying milder symptoms. The findings demonstrate the multifaceted negative effects of excessive digital technology use on mental health, including cognitive decline, disrupted sleep, reduced physical activity. Novel insights include stable anxiety levels irrespective of external stressors and varying depressive symptoms across age groups. These results highlight the urgent need for interventions to promote balanced digital technology use and tailored mental health strategies, particularly for middle-aged populations and older adults prone to sedentary behaviour.

**Keywords:** Cognitive Functions, Information Overload, Personal Anxiety, Physical Activity, Social Interactions.



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### INTRODUCTION

The growing integration of digital technologies into everyday life poses new challenges for mental health. The urgency of this issue lies in the widespread adoption of technologies across all age groups and the rising prevalence of technology-related mental disorders such as anxiety, depression, and

cognitive impairment. The research relevance is based on the necessity to ascertain how the excessive use of digital technologies such as social media and online communication affects the psyche of individuals. This identified potential risks and developed strategies to improve mental well-being in the modern technological environment. The diversity of ways in which digital technologies such as games, streaming services, mobile applications and online platforms are used requires consideration of their potential negative impact on the mental state of the population. Limited access to data on the actual effects of technology on mental health can make it difficult to analyse this issue comprehensively.

Excessive information and multitasking can increase stress and anxiety (Abdaoui et al., 2024; Baizhumanova et al., 2024; Sulthon et al., 2024; Wirnayanti et al., 2024). Studies conducted by Donchev (2020), Maksymenko and Grishko (2024) demonstrated that information overload and simultaneous multitasking can reduce cognitive abilities, impair attention and memory, and increase stress and anxiety. The results of their research confirm that the constant flow of information leads to cognitive stress and reduced productivity. However, there are gaps, such as insufficient research on the specific mechanisms of information overload on mental health, as well as a lack of data on the long-term effects and impact of different types of information content on stress and anxiety.

Dependence on digital technologies, including social media and online platforms, can have a negative impact on social interactions (Balalayeva, 2024; Oktavia et al., 2023; Rini et al., 2023; Binti M, & Adeshina, 2024; Muis et al., 2024). Researchers, such as Dzoban (2021), Singh et al. (2024), Pushkar and Grabovskyi (2022), demonstrated that excessive use of digital technologies can cause addiction, which manifests itself in increased time spent online and a decrease in the quality of personal social contacts. They determined that such addiction could increase stress, anxiety and depression, as well as impair social skills and reduce social support. However, there is little research on how dependence on different types of technology develops among different age groups and how cultural characteristics may influence this process. The violation of personal boundaries through digital platforms such as forums and social media can cause negative emotional states that affect the mental health of users, including stress, anxiety and depression (Lewinski, 2016; Halimah et al., 2024; Melinda et al., 2024; Lorenza et al., 2024; Sholikhah et al., 2024). In their studies, Chernyavskyi and Shahina (2023), Moshe et al. (2021) demonstrated that conflicts in social media and online forums often increase stress, anxiety and depression levels. Their findings confirm that anonymity and speed of communication on digital platforms contribute to the escalation of conflicts and reduce the effectiveness of their resolution. At the same time, there is a lack of data on the specific mechanisms that contribute to such conflicts, as well as limited research on the impact of different types of platforms and content on the frequency and intensity of interpersonal conflicts.

Prolonged use of digital devices without interruption has far-reaching consequences for physical and mental health. A key factor is the significant reduction in physical activity due to extended screen time, which forces users into sedentary behaviours. This lack of movement reduces calorie expenditure and disrupts metabolic processes, leading to weight gain and an increased risk of obesity. Over time, these effects contribute to the development of cardiovascular diseases, including hypertension and coronary artery disease. Furthermore, prolonged sedentary behaviour is associated with elevated stress levels, which can exacerbate unhealthy eating habits and further heighten the risk of chronic illnesses. As noted by Chaplinska and Kabanova (2021), and Li et al. (2021), such patterns of behaviour not only harm physical fitness but also significantly increase the likelihood of developing mental health issues, emphasizing the critical need for targeted interventions. Increasing reliance on digital technologies such as smartphones, computers and televisions can have a negative impact on sleep quality. Liu et al. (2022), and Shkurov (2023) showed that the use of digital devices before bedtime can disrupt circadian rhythms and reduce sleep duration and quality because of blue light, which delays melatonin production. Their research has shown that exposure to screens before bedtime leads to a decrease in sleep quality, which can have long-term consequences for overall health. However, the specific mechanisms of the impact of different types of digital technologies on different aspects of sleep quality are not well understood, and there is insufficient attention to individual differences in light sensitivity.

Decreased independence and productivity can be caused by prolonged use of digital devices. Shatalova (2022), Venger et al. (2021), and Hartanto et al. (2021) demonstrated that the constant use of digital devices reduces concentration, independency motivation, and overall productivity due to frequent distractions and interruptions. They determined that intensive use of technology, including social media and mobile apps, affects learning and work performance. Nevertheless, the long-term

effects of such disruptions on professional productivity and educational outcomes remain underexplored, particularly concerning the influence of specific content types and usage patterns.

The study aims to identify how technological progress affects the growth of depression and other mental disorders in modern society. It seeks to determine the relationship between the use of digital devices and levels of depression and anxiety, analyse the impact of information overload and multitasking on cognitive functions, evaluate the role of social media dependency and online conflicts in emotional well-being, and investigate how physical inactivity and poor sleep quality caused by prolonged screen use contribute to mental health deterioration. This research also aims to address the influence of age, cultural, and socioeconomic factors on these processes to develop evidence-based strategies for reducing the negative impacts of digital technologies. While the study provides significant insights into the relationship between digital technology use and mental health, critical gaps remain regarding the long-term psychological impacts and the role of cultural and demographic variations in moderating these effects. Furthermore, there is a lack of research exploring interventions tailored to specific digital behaviours, such as dependency on social media or susceptibility to information overload, and their effectiveness across diverse populations.

### RESEARCH METHOD

The study was conducted from March to May 2024 through online surveys and experiments. The survey involved 400 respondents (200 men and 200 women). The respondents were divided into four age groups of 100 respondents each (50 men and women): 18-24 years old, 25-34 years old, 35-44 years old and 45-54 years old. The sample was not random but was selected according to age categories to ensure an even distribution of respondents by age and gender. The respondents were found through social media (Facebook, Instagram) and advertisements on web platforms (Google Forms, SurveyMonkey). They completed a preliminary survey (Table 1), which facilitated their inclusion in the sample, ensuring that they met the study criteria. The power of the study was calculated to be at least 80% with the given sample size, allowing detection of medium-to-large effect sizes with a significance level of  $p < 0.05$ , which ensured the robustness of the results and validity of statistical inferences.

Table 1. Surveys to Select Respondents

No.	Question	Answers
1.	Gender	<ul style="list-style-type: none"> <li>• Male</li> <li>• Female</li> </ul>
2.	Age	<ul style="list-style-type: none"> <li>• 18-24</li> <li>• 25-34</li> <li>• 35-44</li> <li>• 45-54</li> </ul>
3.	What region of Ukraine do you live in?	<ul style="list-style-type: none"> <li>• Kyiv region</li> <li>• Lviv region</li> <li>• Kharkiv region</li> <li>• Odessa region</li> <li>• Dnipropetrovsk region</li> </ul>
4.	How many hours a day do you spend using digital technologies (including smartphones, computers, and tablets)?	<ul style="list-style-type: none"> <li>• Less than 1 hour</li> <li>• 1-2 hours</li> <li>• 3-4 hours</li> <li>• 5-6 hours</li> <li>• More than 6 hours</li> </ul>
5.	Do you feel that the use of digital technologies hurts your mental health?	<ul style="list-style-type: none"> <li>• No, I don't</li> <li>• Sometimes I feel so</li> <li>• I often feel so</li> <li>• I always feel so</li> </ul>
6.	Did your social interactions improve or deteriorate because of the use of digital technology?	<ul style="list-style-type: none"> <li>• Significantly improved (increased social connections, support)</li> <li>• Slightly improving (sometimes I feel supported)</li> <li>• No significant changes (normal)</li> </ul>

No.	Question	Answers
		level of interactions)
		<ul style="list-style-type: none"> <li>• Slightly deteriorating (fewer real meetings, more online communication)</li> <li>• Significantly deteriorating (reduced social interactions in real life)</li> <li>• Yes, regularly</li> <li>• Yes, sometimes</li> <li>• No, but I plan to</li> <li>• No, I do not use them</li> </ul>
7.	Do you use mobile apps to monitor your sleep quality or physical activity?	
	Would you be willing to take part in a study that includes surveys and experiments aimed at investigating the impact of digital technologies on mental health?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>

According to Table 1, the number of participants from the 5 selected regions of Ukraine was distributed as follows: Kyiv region – 101 people, Lviv region – 79 people, Kharkiv region – 73 people, Odesa region – 91 people, Dnipro region – 56 people. Distribution of time spent using digital technologies among respondents of different age groups: 18-24 years old: less than 1 hour – 3 people, 1-2 hours – 5 people, 3-4 hours – 15 people, 5-6 hours – 28 people, more than 6 hours – 49 people; 25-34 years old: less than 1 hour – 4 people, 1-2 hours – 9 people, 3-4 hours – 19 people, 5-6 hours – 31 people, more than 6 hours – 37 people; 35-44 years old – less than 1 hour – 5 people, 1-2 hours – 13 people, 3-4 hours – 22 people, 5-6 hours – 26 people, more than 6 hours – 34 people; 45-54 years old – less than 1 hour – 7 people, 1-2 hours – 20 people, 3-4 hours – 27 people, 5-6 hours – 28 people, more than 6 hours – 18 people.

Study experiments were designed to assess various aspects of the impact of digital technologies on mental health (Table 2). The assessment of information overload determined the impact of a large amount of information on the emotional state of participants. The cyberbullying experiment identified the impact of online aggression on anxiety and stress. The Montreal Cognitive Test identified changes in memory, attention, and reaction time after prolonged use of digital devices (Freitas et al., 2013; Islaihah, 2024; Rachmanto, & Akande, 2024; Sunia, 2024; Simamora et al., 2024). These experiments ensured controlled exposure to digital stimuli, with pre- and post-measurements for more accurate comparisons. These experiments were conducted using the PsychoPy platform. In the experiment to assess sleep quality, the Sleep Cycle app, which analyses sleep phases and quality of rest using the built-in sensors of smartwatches (Fitbit), was used. A Fitbit tracker was also used to assess physical activity, which respondents received (if necessary) in advance by mail. Respondents were asked to monitor their physical activity and sleep quality for three months and record the data, which was then sent by email. To ensure consistency and reliability in the experimental results, data collection was standardized across all participants, and the pre- and post-experimental measurements were carefully monitored.

The assessment of social interactions was conducted using specialised web-based data collection platforms, which allowed us to study the impact of technology on social contacts and interactions (Bolis, Dumas, & Schilbach, 2023; Indasari et al., 2024; Oktavia et al., 2024). The Beck Depression Inventory was used to assess the level of depressive symptoms (Repriani et al., 2022; Nahar, 2023; Nwune et al., 2023; Habiburrohman et al., 2024; Yanmaz et al., 2024). Spielberg’s questionnaire helped to determine the levels of situational and personal anxiety (Aryadi et al., 2022; Zhang et al., 2023; Puspitasari, 2024; Quzwain et al., 2024; Somantri, 2024; Widiasta et al., 2024). The author’s surveys were designed to identify the impact of information overload and social media on mental health. The collected data were processed and analysed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS v.27) software. ANOVA tests were applied to compare differences across age groups, while Pearson correlation analysis identified relationships between variables such as digital technology use, mental health indicators, and cognitive performance. The surveys were conducted on international platforms (Google Forms and SurveyMonkey). Participants

provided informed consent before participating in the study. The research protocol and methods were designed in compliance with the ethical standards of the Declaration of Helsinki and relevant national regulations. Confidentiality and anonymity of the participants were maintained throughout the study, with personal data securely stored and accessible only to authorized researchers. All ethical precautions, including voluntary participation and the option to withdraw at any stage without repercussions, were strictly observed.

Table 2. Experimental Scenarios

Name	Description	Aim	Analysed metrics
The impact of information overload on mental health	Respondents receive a large amount of information through text messages, videos and graphics. After that, stress and anxiety levels are assessed	Identify how information overload affects stress, anxiety and overall well-being	Stress level (Fitbit), reactive anxiety level, well-being
The impact of cyberbullying on mental health	Participants interact with virtually created cyberbullying situations, such as offensive comments, negative messages, anonymous attacks, and trolling. After that, the emotional state and stress level are assessed	The impact of cyberbullying on stress, anxiety and general emotional state	Stress level (Fitbit), situational anxiety, emotional state
Cognitive function after prolonged use of digital technologies	Participants browse the Internet for a prolonged period and then undergo cognitive tests of memory, attention, and reaction time	How prolonged use of the Internet affects cognitive function	Results of tests of general cognitive performance
Sleep quality after active use of digital technologies	Participants actively use digital technologies before going to bed. Sleep quality is monitored using the Sleep Cycle app and Fitbit tracker	Determine the impact of active use of digital technologies before bedtime on sleep quality	Sleep phases, sleep duration, sleep quality
Impact of digital technologies on physical activity	Participants use digital technologies for a set period. Their physical activity is monitored using a Fitbit tracker	How the use of digital technologies affects physical activity levels	Number of steps, time spent in a sitting position
Virtual social interactions after prolonged use of digital technologies	Participants actively use digital technologies (social networks, messengers) for two weeks. After that, virtual group sessions are organised on online platforms for joint problem-solving (group quizzes, discussions)	How long-term use of digital technologies affects the quality and effectiveness of virtual social interactions	Frequency and quality of communication, level of activity in group tasks, and interaction within the virtual team

## RESULTS AND DISCUSSION

### *Impact of Digital Technologies on Mental Health*

The distribution of respondents according to their perception of the negative impact of digital devices on mental health (Table 3) is reflected in the data indicating the number of responses from participants.

Table 3. The Impact of Digital Technologies on Mental Health by Age Group

Age groups	No, I don't	Sometimes I feel so	I often feel so	I always feel so
18-24	20	29	32	19
25-34	18	33	26	23
35-44	23	32	29	16
45-54	32	27	24	17

These data indicate that most respondents in all age groups say that they sometimes experience a negative impact of smartphones, tablets and laptops on their mental health, while younger age groups are more likely to report frequent or constant negative impacts. The breakdown of respondents by the impact of digital devices on social interactions is presented in the data corresponding to the number of responses (Table 4).

Table 4. Impact on Social Interactions

Age groups	Significantly improved	Slightly improved	No significant changes	Slightly deteriorated	Significantly deteriorated
18-24	38	26	18	12	6
25-34	30	25	22	15	8
35-44	22	19	26	18	15
45-54	12	15	24	20	29

**Digital Technologies and Social Connections**

38% of respondents aged 18-24 reported a significant improvement in social connections due to the use of digital devices, which is twice as much as the 12% observed in the 45-54 age group. Additionally, 26% of respondents aged 18-24 indicated a slight improvement, while 15% of those aged 45-54 reported a slight deterioration in their social interactions. This suggests that digital devices have a more pronounced effect on social connections among younger people, while older respondents are more likely to feel that their social interactions have deteriorated. Regarding the use of mobile apps for monitoring sleep quality or physical activity, 39 respondents use such apps regularly, 83 use them sometimes, 91 plan to use them in the future, and 187 do not use these apps at all. The distribution of respondents by stress levels after information overload is presented in Table 5.

Table 5. Stress Indicators

Age groups	High level	Average level	Low level	Absence of stress
18-24	42	30	13	15
25-34	40	35	14	11
35-44	38	32	18	12
45-54	30	25	24	21

The results indicate that high levels of stress prevail among younger age groups, while older respondents are more likely to experience medium or low levels of stress. The results of measuring the level of reactive anxiety after exposure to information overload through a large amount of information (text messages, videos and graphics) using the Spielberg questionnaire showed certain results (Table 6). The data in the table reflect the number of people.

Table 6. Levels of Reactive Anxiety

Age groups	Proficiency	Average	Low	Absence of anxiety
18-24	51	27	15	7
25-34	46	30	19	5
35-44	39	32	22	7
45-54	29	22	28	21

Information overload has a significant effect on reactive anxiety, with younger age groups showing higher levels of anxiety than older age groups. Men, especially in the 18-24 and 25-34 age groups, show higher levels of anxiety than women. Younger men are more likely to demonstrate high levels of anxiety after being exposed to large amounts of information. In older age groups (35-44 and 45-54), the level of anxiety in men remains high, but the proportion of people with very high levels of anxiety decreases. Among women, in younger age groups (18-24 and 25-34), anxiety levels were lower than in men, with a lower percentage of people with high anxiety and a higher percentage of people with moderate anxiety. In the older age groups (35-44 and 45-54), women also show a decrease in anxiety, but the differences are smaller than in men, which may indicate that women are more resilient

to information overload. Men, especially in the younger age groups, show higher levels of anxiety because of information overload compared to women, who show greater resilience to stress.

181 respondents always have difficulties in making decisions due to the large amount of information, 129 often have such difficulties, 45 say that sometimes it happens, and 45 never experience such difficulties. Regarding fatigue after prolonged viewing of information, 158 people always feel tired, 118 respondents often feel tired, 60 people sometimes feel tired, and 64 respondents never feel tired. The impact of information overload on the ability to concentrate shows that 153 respondents report a significant decrease in the ability to concentrate, 122 people are sometimes distracted, 65 respondents feel the impact only in very stressful situations, and 60 people believe that information overload has little or no impact on them.

A total of 151 respondents always have trouble sleeping after a day of receiving a lot of information, 108 people often have trouble sleeping, 66 people sometimes have trouble sleeping, and 75 respondents have never noticed a link between the amount of information and the quality of sleep. Regarding anxiety or stress due to a lot of information, 143 respondents feel it all the time, 119 people often feel it, 68 people sometimes feel it, and 70 respondents do not feel the impact of excessive information on their stress levels. 145 people experience a significant decrease in productivity due to information overload during the working day. 121 respondents feel the impact on productivity in the afternoon. 68 people sometimes notice a slight decrease in productivity. 66 respondents do not notice any impact.

A total of 152 respondents constantly postpones important tasks due to distractions from other information. 111 people often postpone tasks because of information stimuli, while 65 people do so only sometimes. 72 respondents never put off important tasks. 148 respondents constantly check the news or social media, even when it interferes with their work. 116 people are often distracted by the news but try to control this habit. 66 respondents sometimes check the news, but only in their free time. 70 people never feel the need to check the news while working. 144 people always feel overwhelmed by the amount of information they do not have time to absorb. 120 respondents often feel overwhelmed by the inability to cope with the flow of information, and 68 respondents sometimes. 68 respondents never feel overwhelmed. 149 respondents constantly feel the negative impact of information overload on their relationships with other people. 119 people often notice a decrease in communication skills due to overload. 66 respondents sometimes notice an impact on communication. 66 people do not notice any impact of the information flow on their relationships with others.

Information overload has a significant impact on the well-being of respondents. The majority have trouble sleeping, anxiety or stress, and decreased productivity due to the large amount of information. Respondents often postpone important tasks, feel the need to constantly check the news, and feel overwhelmed by the sheer volume of information. These factors also negatively affect relationships with other people.

The study of the impact of cyberbullying on stress levels determined that the highest level of stress was observed among respondents aged 18-24, with 48 people reporting a high level, 49 people reporting an average level, 2 people reporting a low level of stress, and 1 person not noticing any changes. Among the respondents aged 25-34, 50 people reported a high level of stress, 48 people – an average level, 1 person – a low level, and 1 person did not notice any changes. In the 35-44 age group, 49 people have a high level of stress, 49 people have an average level, 2 people have a low level of stress, and no respondents have noticed any changes. In the 45-54 age group, 47 people reported high levels of stress, 49 people reported medium levels, 3 people reported low levels, and 1 person did not notice any changes. Cyberbullying has a significant negative impact on stress levels in all age groups. Cyberbullying has a significant impact on situational anxiety (Table 7). Numerical data reflects the number of respondents belonging to a particular level.

Table 7. Indicators of Situational Anxiety

Age groups	High anxiety level	Average anxiety level	Low anxiety level	No anxiety
18-24	52	33	10	5
25-34	41	40	15	4
35-44	37	45	15	3
45-54	30	50	18	2

Younger age groups (18-24 years old) are more prone to high levels of situational anxiety after experiencing cyberbullying. This group has the highest number of respondents with high levels of anxiety, while the proportion of respondents who do not experience anxiety is the lowest. The 25-34 and 35-44 age groups are characterised by moderate anxiety, with the older 35-44 age group having more respondents with moderate anxiety compared to the younger group. The older age group of 45-54 years has the lowest level of anxiety compared to other age groups, which indicates a decrease in anxiety with age. This group has more respondents with moderate anxiety and fewer with high anxiety.

87 respondents use social media for more than 3 hours a day, 101 people use it for 1 to 3 hours, 92 people use it for 30 minutes to 1 hour, 78 people use it for less than 30 minutes a day, and 42 people do not use social media at all. The most used platforms are Instagram (215 people), YouTube (232 people) and Facebook (188 people). TikTok was selected by 139 people, Telegram by 98 people, Viber by 75 people, and other platforms were mentioned by 29 people. Entertainment content (videos, memes, games) is viewed by 267 people, personal posts by friends and family by 217 people, news and information articles by 183 people, advertising and marketing materials by 103 people, and educational content by 107 people.

The quality of information was rated as mostly reliable and useful by 146 people, reliable, useful and accurate by 92 people, unreliable and not very useful by 104 people, and completely unreliable and of no use by 58 people. When using social media, respondents most often feel joy (152 people) and anxiety (135 people). Sadness (97 people) and anger (83 people) are less common. Boredom and calmness – 92 and 67 people. The ability to cope with negative content is assessed as follows: 120 people have excellent coping skills in dealing with negative content without affecting their mental health, 104 people usually cope without significant problems, 95 people have difficulties, and 81 people have very difficulty coping. Regarding the impact of social media on self-esteem, 122 people often compare themselves to others and feel worse about themselves, 98 people sometimes compare themselves and this can affect their self-esteem, 101 people rarely feel affected, and 79 people do not feel affected. Pressure to be active on social media is felt by 118 people always, 103 people often, 97 people rarely, and 82 people never feel such pressure. Regarding malicious or offensive comments, 117 people receive them very often, 103 people often, 98 people sometimes, and 82 people have never experienced such cases. 87 respondents always feel stressed or anxious about not having access to social media, 102 respondents often feel such emotions, 107 respondents sometimes feel stressed or anxious, and 104 respondents never feel this way.

Regarding the feeling of social media consuming too much time, 90 people reported such constant feelings, 115 respondents sometimes notice that they spend more time than they planned, and 106 people usually manage their time well. 89 people do not feel that social media takes up too much time. 85 respondents believe that social media has a serious impact on their productivity, 104 respondents sometimes notice this impact, and 105 respondents usually do not notice any impact. 106 people do not feel that social media has any impact on their productivity. Regarding the obstacles to maintaining real social connections, 92 respondents always feel this obstacle, and 102 people often feel that social media interferes. 106 respondents sometimes feel that social media has an impact on their relationships. 100 people never notice such an impact. When it comes to using social media to get psychological support or advice, 88 people always use it for this purpose, and 104 respondents often seek support. 105 people sometimes use social media for advice. 103 respondents never use social media for psychological support.

Younger respondents (18-24 years old) suffer more from stress due to lack of access to social media and are more likely to note the negative impact of social media on productivity and real social connections. Older age groups (25-34 years, 35-44 years, 45-4 years) are less prone to such problems. Women are more likely to feel the negative impact of social media on productivity and concentration and use social media more for psychological support. Men are less likely to report such problems and are less sensitive to the negative impact of social media.

The experiment, which assessed the cognitive functions of respondents after prolonged Internet use without interruption, included testing memory, attention and reaction time using the Montreal Cognitive Test. Among the respondents aged 18-24, 39 people demonstrated memory impairment, which was expressed in difficulties with recalling information after prolonged use of the Internet. 52 respondents had decreased concentration, which made it difficult for them to focus on tasks. 47 respondents showed a slower reaction time, which indicates difficulty in processing new stimuli. In the 25-34 age group, 42 respondents demonstrated memory problems, especially in recalling information

received after prolonged use of the Internet. 49 people showed reduced concentration, which led to an increase in the time required to complete tasks. 53 respondents had a slower reaction time, which impaired their ability to respond quickly to new stimuli. Among the respondents aged 35-44, 44 people demonstrated memory impairment, including difficulties in retaining and recalling information. 47 respondents reported reduced concentration, which made it difficult to complete tasks. 49 people showed slower reactions, which affected their ability to process new information stimuli. In the 45-54 age group, 46 respondents had difficulties with memory, in storing and recalling information. 48 people showed reduced concentration. 48 respondents demonstrated a slow reaction time. Problems with memory and concentration are a general trend that varies by age group. Slower reaction times indicate the overall negative impact of prolonged Internet use on cognitive performance.

**Information Overload and Productivity**

The results of the sleep quality study after active use of digital devices before bedtime were obtained using the Sleep Cycle app and Fitbit tracker. In the 18-24 age group, 45 people demonstrated significant sleep quality disorders, including reduced sleep duration, delays in falling asleep, and frequent sleep interruptions. 48 respondents showed a reduced amount of Rapid Eye Movement (REM) sleep, which is a phase of rapid eye movement during sleep characterised by brain activity that approaches wakefulness and rapid eye movements with the eyelids closed. This phase is important for cognitive function, emotional regulation, and nervous system recovery. It is during this phase that dreams most often occur. Reducing the amount of REM sleep can affect the overall quality of sleep and negatively affect a person’s psychological state (Taylor et al., 2020; Nada et al., 2023; Ulfa et al., 2023; Susanti et al., 2024; Ekaputri et al., 2024; Merdekawati et al., 2024; Taufiqurrahman, 2024), indicating a deterioration in sleep quality. 49 people had an average sleep duration of less than the recommended 7-9 hours, and 48 respondents reported feeling unwell after waking up. Among the respondents aged 25-34, 46 people reported a reduced sleep duration and an increased number of nighttime awakenings. 50 respondents reported disturbances in sleep phases, including a decrease in the number of REM sleep phases. 49 people had an average sleep duration of less than 7 hours, and 48 respondents reported unpleasant sensations upon waking.

In the 35-44 age group, 47 respondents reported issues with sleep duration, including reduced nightly sleep duration and increased number of awakenings. 50 respondents demonstrated a decrease in REM sleep. 49 respondents reported an average sleep duration of less than 7 hours, and 49 people reported feeling worse after waking up. In the 45-54 age group, 44 respondents showed a decrease in sleep duration and frequent nighttime awakenings. 50 people had disturbances in sleep phases, including a decrease in REM sleep. 50 respondents had an average sleep duration of less than the recommended 7-9 hours, and 46 people felt unwell after waking up. Active use of smartphones and laptops before bedtime harms sleep quality in all age groups. The main problems include a decrease in sleep duration, disturbances in sleep phases, in particular a decrease in REM sleep, and a deterioration in well-being after waking up. The breakdown of respondents by age group in terms of the average number of steps per day and time spent in a sedentary position is shown in Table 8.

Table 8. Age-Related Features of Physical Activity and Sedentary Lifestyle

Age groups	Average number of steps per day	Average time spent in a sitting position
18-24	7.312 steps	7 hours 53 minutes
25-34	7.089 steps	8 hours 37 minutes
35-44	6.856 steps	9 hours 11 minutes
45-54	6.548 steps	9 hours 55 minutes

With age, the average number of steps walked per day decreases and the time spent sitting increases. Younger respondents, aged 18-24, demonstrate the highest level of physical activity and less time spent sitting compared to older age groups. These results indicate that physical activity decreases and time spent sitting increases with age.

The results of an experiment that assessed virtual social interactions after prolonged use of digital devices revealed the following results. In the 18-24 age group, 21 respondents communicate via social platforms every day, 29 respondents do so several times a week, 27 respondents do so less than once a week, and 23 respondents do not use social platforms for communication. In the 25-34 age

group, 17 respondents communicate daily, 31 respondents communicate several times a week, 29 respondents communicate less than once a week, and 23 respondents do not use social media for communication. In the 35-44 age group, 23 respondents communicate daily, 27 respondents communicate several times a week, 27 respondents communicate less than once a week, and 23 respondents do not use social media for communication. In the 45-54 age group, 17 respondents communicate daily, 33 respondents communicate several times a week, 29 respondents communicate less than once a week, and 21 respondents do not use social media for communication. These results show that younger respondents are increasingly involved in social media communication compared to older age groups. The level of quality of communication, activity in group tasks and interaction within the virtual team by age group is reflected in the respective scores (Table 9).

Table 9. Assessing the Quality of Social Interactions

Age groups	Quality of communication (from 1 to 5 points)	Level of activity in group tasks (1-5)	Interaction within a virtual team (1-5)
18-24	4.2	4.5	4.4
25-34	3.8	4	4.1
35-44	3.5	3.7	3.8
45-54	3.2	3.3	3.4

Younger respondents demonstrate more active participation in virtual social interactions and better communication quality compared to older age groups. The quality of communication, activity in group tasks, and interaction within a virtual team decrease with age, which is related to the lower dependence on digital devices in older age groups. The results (Table 10) show the distribution of respondents by age group according to the levels of personal anxiety. The data shows the number of people belonging to each category.

Table 10. Data on Personal Anxiety

Age groups	Low anxiety level	Average anxiety level	High anxiety level
18-24	30	52	18
25-34	29	49	22
35-44	31	47	22
45-54	33	43	24

The level of personal anxiety increases with age, with the lowest level of anxiety observed in the younger age group, while older age groups tend to have higher levels of anxiety. This indicates the accumulation of life stresses and problems that affect mental well-being with age. The distribution of respondents by levels of depressive symptoms (Table 11) shows the number of people in each category.

Table 11. Level of depressive symptoms according to the Beck Depression Inventory

Age groups	Mild depressive symptoms	Moderate depressive symptoms	Severe depressive symptoms
18-24	52	31	17
25-34	45	35	20
35-44	37	39	24
45-54	28	33	39

The level of depressive symptoms increases with age: younger age groups have more cases of mild and moderate depressive symptoms, while older age groups have a significantly higher incidence of severe depressive symptoms.

The results clearly illustrate the negative impact of prolonged digital technology use on mental health, directly addressing the research questions. Data analysis revealed a significant decline in cognitive functions, including impaired memory, reduced attention span, and slower reaction times, particularly after extended device usage. Information overload was shown to elevate stress and reactive anxiety levels, predominantly among younger age groups, while older participants exhibited

comparatively lower emotional reactivity. Furthermore, consistent disruptions in sleep quality and reduced physical activity were observed across all age groups, emphasizing the sedentary nature of digital engagement. These findings, obtained through validated tools and methods, provide a clear link between the analysed variables and confirm the reliability of the applied approach.

The study results emphasize the growing significance of psychological factors in understanding the impact of digital technologies on mental health. The findings reveal that prolonged use of digital devices negatively affects various psychological dimensions, including anxiety, depression, sleep quality, and physical activity. This is particularly true for younger individuals, who seem more susceptible to the psychological burdens associated with excessive technology use. These results are consistent with previous studies that highlight the higher prevalence of stress, anxiety, and depressive symptoms in younger populations exposed to constant digital stimuli (Lewinski et al., 2019; Pandya & Lodha, 2021; Hidayati et al, 2024; Hubaybah et al., 2024; Putri et al., 2024). The research underscores the importance of developing targeted interventions aimed at different age groups to address the specific challenges they face in this digital era.

High levels of stress among younger individuals are consistent with findings from Pandya and Lodha (2021), who suggested that younger people are more vulnerable to stress due to social and professional pressures. However, this study adds a significant layer by emphasizing the role of technological factors – specifically information overload, active social media use, and exposure to cyberbullying – which exacerbate stress levels in young people. This aspect contrasts with the study by Di Carlo et al. (2021), which suggested that older adults are more prone to anxiety from information overload. The findings here suggest that younger people, despite being more technologically savvy, experience heightened anxiety due to the constant need to meet social standards and the rapid pace of change in the information environment. In contrast, older individuals may experience less anxiety due to their life experience and more stable social environments.

The results also suggest that information overload plays a significant role in exacerbating stress and anxiety, contributing to sleep disturbances. Fu et al. (2020) and Efremov (2024) similarly pointed out that excessive information overload can activate the nervous system and lead to increased stress, which negatively impacts sleep quality. The present study reaffirms that disrupted sleep patterns, caused by constant digital exposure, contribute to the deterioration of mental well-being. Adequate sleep is essential for emotional regulation, and the lack of it can have far-reaching effects on both mental and physical health. Social media, as a source of constant information and comparison, is another critical factor influencing mental health. The study revealed that the constant comparison of oneself with others on social media contributes to feelings of inferiority and lowered self-esteem. Seiferth et al. (2023) also found that social media users often experience a decline in self-esteem due to this comparison with idealized images. This study further highlights that while social media serves as a tool for communication and self-expression, it also fosters an environment where comparisons and self-criticism are prevalent, especially among younger users.

In line with the findings of Mun et al. (2016), this study confirms that prolonged digital device use negatively impacts cognitive functions. However, it contrasts with Smith et al. (2023) and Iqbal et al. (2023), who found that internet use for educational or creative purposes could enhance cognitive function. The findings from both studies highlight that the negative impact of digital technology use on cognitive abilities, such as concentration and memory, is most pronounced when it is used excessively for entertainment or social media purposes. These cognitive challenges further exacerbate psychological distress, as individuals struggle to focus and process information effectively. One unexpected finding from this study is the higher physical activity levels among younger people compared to older age groups. This contradicts Okoro et al. (2024), who found that physical activity tends to remain stable throughout life, with sedentary behaviour linked more to occupation than age. The discrepancy between the studies may be explained by differences in methodology: Okoro et al. focused on active older adults engaged in organized sports, while the current study captures a broader population where younger people are more likely to engage in physical activities outside structured settings, and older individuals may not be as active due to sedentary behaviours exacerbated by digital device use. This finding highlights the importance of addressing sedentary lifestyles and encouraging physical activity across all age groups to mitigate the negative impacts of excessive screen time.

In terms of communication, younger individuals demonstrate higher levels of quality in virtual interactions, including more active participation in online group activities. This is consistent with Akhtar et al. (2023) and Lu et al. (2024), which found that younger people engage more actively with

digital platforms and virtual tasks compared to older individuals. This study corroborates the idea that younger people are more adept at navigating digital environments, and as a result, they exhibit greater confidence and participation in virtual interactions. However, the increased exposure to online stressors such as cyberbullying and information overload can undermine the positive aspects of digital communication, making it important to create safer and healthier digital spaces. The study also aligns with Hussain et al. (2020), who noted that personal anxiety tends to increase with age due to the accumulation of life stressors, including health problems and financial difficulties. The current study complements this by suggesting that cognitive and emotional factors, particularly in relation to technology, also play a role in exacerbating anxiety among older individuals. Meanwhile, younger people tend to experience less severe depressive symptoms due to their relative lack of life difficulties and higher levels of social support, a trend also supported by Ozamiz-Etxebarria et al. (2021).

The study provides novel insights into the intricate relationship between digital technologies and mental health. It underscores the need for tailored interventions that address the unique vulnerabilities of different age groups. The findings suggest that younger individuals, in particular, are at a heightened risk of developing mental health issues as a result of prolonged digital device use, social media exposure, and information overload. Future research should focus on long-term interventions that promote healthier digital habits, while also emphasizing the importance of sleep hygiene, physical activity, and social interactions in mitigating the negative effects of digital technologies on mental health. Despite its valuable contributions, the study has limitations, including reliance on self-reported data and a cross-sectional design. These aspects should be addressed in future studies to further validate the findings and develop more effective interventions.

## CONCLUSION

The results of the study provide a comprehensive understanding of how prolonged use of digital devices and technological progress are linked to mental health issues, including stress, anxiety, depression, cognitive decline, and sleep disturbances. The analysis indicates that younger age groups are more vulnerable to these impacts due to their higher engagement with digital technologies. This underscores the need for age-specific strategies to mitigate the psychological consequences of digital device usage. In particular, the findings highlight the growing dependency of younger populations on digital technologies, which is affecting their cognitive functioning and exacerbating emotional distress. The study underscores the significant impact of digital technology use on mental health, specifically highlighting the negative effects on cognitive function, anxiety, depression, and sleep quality. These findings reinforce the idea that technological advancements, while offering numerous benefits, have substantial psychological implications. They further stress the need for interventions focused on improving mental well-being by addressing sleep disruptions and physical inactivity associated with excessive digital device use. In light of these findings, it is critical to address the implications for mental health practices and policy development. This study emphasizes the importance of creating clear guidelines for the responsible use of digital devices, particularly for younger populations who are more vulnerable to the negative effects of prolonged exposure. These guidelines should focus not only on reducing screen time before sleep but also on promoting healthier digital habits throughout the day, such as regular breaks and encouraging offline activities. Such strategies would support overall well-being and help prevent the negative psychological outcomes associated with digital technology. Additionally, the research suggests that sleep quality plays a crucial role in mitigating the cognitive and emotional effects of digital technology use. The disruption of sleep patterns caused by prolonged screen time, especially before bedtime, was found to significantly affect mental well-being. Improving sleep hygiene, particularly in younger age groups, could serve as a critical intervention to reduce the adverse effects of digital devices on mental health. Future research should focus on long-term psychological consequences of continuous digital device use, considering the cumulative effects over time. Investigating how cultural and social factors may influence the psychological impact of digital technology could also provide valuable insights for more effective interventions. Understanding how different cultural contexts affect digital device use and mental health could help tailor strategies that are more specific to various populations. While the study successfully answers the primary research question, it also opens up avenues for future exploration. The study calls for further research into the long-term effects of digital technology on mental health, with a particular emphasis on sleep quality, physical activity, and individual differences in susceptibility. By addressing these factors, future

research can contribute to the development of more targeted strategies to mitigate the negative effects of digital devices and support mental well-being in the digital age.

### ACKNOWLEDGMENTS

Not Applicable.

### AUTHOR CONTRIBUTIONS

Conceptualization, L.S.; Methodology, L.S.; Investigation, L.S.; Resources, L.S.; Data Curation, L.S.; Writing – Original Draft Preparation, L.S.; Writing – Review & Editing, L.S.

### CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

### USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

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