EU Kids Online

Tech & Teens

Insights from 15 Studies on the Impact of Digital Technology on Well-Being

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About EU Kids Online

EU Kids Online (EUKO) is a research network dedicated to understanding children's online opportunities, risks, and safety across Europe.

About this report

This report is part of the EUKO report series, which provides evidence-based insights to inform research, policy, and practice. It has undergone editorial and peer review.

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[1] irtis.muni.cz

Abstract

Digital technologies, including smartphones, social media, and online games, have become integral to adolescents' daily lives. But how do they truly impact their well-being? For years, studies have raised concerns about potential harms, yet most relied on methods that could not establish cause and effect. Over six years, the Interdisciplinary Research Team on Internet and Society (IRTIS) conducted 15 rigorous studies in the Czech Republic using advanced methods (longitudinal studies, experiments, and real-time assessments) to uncover how digital technologies impact adolescents' psychological, social, and physical well-being.

Our findings challenge simplistic narratives. First, the impact of technology is not uniform - some adolescents experience increased stress from smartphone use, while others do not. For instance, searching for health information online heightened anxiety in those already prone to it, but not in others. Second, what matters most is how technology is used, not just general screen time. While social media use had small negative effects on psychological well-being, gaming and entertainment apps did not show the same pattern. Third, different aspects of well-being are affected in different ways—while digital technology influenced adolescents' physical self-worth, it had no measurable impact on their social skills.

To conclude, digital technology does not affect all adolescents in the same way, whether positively or negatively. Instead of one-size-fits-all conclusions, our research highlights the need for a more nuanced approach—one that considers individual differences, specific online activities, and the broader context of adolescents' lives. Rather than debating whether digital technologies are 'good' or 'bad,' and providing general bans, policies and interventions should focus on supporting adolescents in developing healthy, constructive ways to engage with them.

Content

Key Findings

We have several key findings that, in many ways, reflect the state of current scientific knowledge in this area. Particularly noteworthy are:

- **Not all adolescents are the same.** Most of our studies confirm that the impacts of technology vary significantly according to individual characteristics (such as gender, age, individual traits, or frequency and type of media use), making it a challenge to provide generalizations for the entire adolescent population.

- **People experience various impacts on different aspects of well-being.** The impacts of technology use vary across the different areas of psychological, physical, and social well-being of adolescents. While the impact may be positive in one area of well-being, it could be negative in another.

- Regarding psychological well-being, we revealed that **increased smartphone use and consistent usage throughout the day can raise stress levels in some adolescents.** Additionally, spending more time on social networking apps slightly decreases positive affect and increases negative affect, though the impact is minimal. In contrast, no causal effect on affect was found for entertainment apps like videos and games.

- **Do not worry about the socialization of adolescents.** For social well-being (i.e., improvement or worsening of social skills, finding social support, and the impact of sexting), we found no negative or positive causal impacts of smartphone use, social media, and other technologies.

- **Gender differences in the impact of digital technology**. Our research revealed variations in how digital technology affects the well-being of girls and boys. For instance, regarding physical well-being, we found that reading comments on social media posts praising idealized beauty standards has a causal impact on body dissatisfaction, but only among adolescent girls. However, differences between boys and girls were observed in only some studies, and these varied depending on the specific aspect of well-being being examined.

- **What adolescents do matters.** Our studies show that it matters how exactly adolescents use social media, smartphones, and other technologies. For example, increased use of social media on smartphones can make adolescents feel worse in some cases, but using entertainment apps (e.g., playing games or watching videos) does not have any causal positive or negative impact on affect.

- **Distinguish short-term and long-term effects.** A distinction needs to be made between the short-term and long-term impacts of using digital technologies. Short-term impact on affect or other characteristics may not be related to long-term life satisfaction and, therefore, cannot be automatically projected onto the long-term effects.

- **Do not panic.** The question of the impact of smartphones, social media, and other technologies on adolescents does not have a simple and straightforward answer. We should avoid the simplistic, hasty conclusions, and moral panics that are often spread in this area.

1 Introduction

In recent years, there has been intense debate among scientists and the public about the effects of smartphone use, social networking, and other new communication technologies on the lives and mental health of adolescents. Although excellent research in this area is increasing, we often come across one-sided statements that emphasize the negative effects, both from journalists and those who present themselves as experts on the subject. However, these attitudes often do not reflect the current state of scientific knowledge and they can do more harm than good.

There is no clear consensus among researchers on the impact of digital technologies on adolescents and adults. At least two issues emerge. First, if we only assess the negative side of the use and ignore the positive, we cannot truly evaluate the overall impact. Second, many findings suggest that, in general, these impacts are not be as large and drastic as often presented. For example, a recent meta-analysis of 141 studies comprising over 145,000 participants of all ages[2] shows that, for almost all indicators of well-being, there are both negative and positive associations between social media use and well-being, with most being minor or insignificant. This meta-study also indicates that there is a lack of research that allows for the causal examination of the impact of technology on people. Therefore, only studies that allow for causal interpretations are included in this report, as explained further in Section 1.1.

In the European context, two important research projects provided important insights into children and adolescents' use of technologies: EU Kids Online and ySKILLS. EU Kids Online project is a wide-scale international network that investigated online risks and opportunities for children in 19 European countries (Smahel et al., 2020) [3]. The research revealed that there are substantial differences in online risks and opportunities for children in different countries. The importance of EU Kids Online lies in the thorough mapping of the prevalence of online risks and opportunities in Europe. This overview is a crucial starting point for understanding technology use across Europe. However, it does not allow us to understand the causal effects of digital technology because it relies on cross-sectional surveys (i.e., surveys conducted in one specific time period) – see the explanation in Section 1.1.

The European project ySKILLS (https://yskills.eu) focused mainly on the effects of digital skills on well-being and partly used a longitudinal approach (Smahel et al., 2023)[4]. The results indicated a very weak relationship between digital skills and psychological well-being (i.e., life satisfaction). Digital skills and social well-being (i.e., social support) also have very weak associations. The results indicate that children with better communication and interaction skills have higher social support from friends. The results of this project found no causal (i.e., within-subject) effects of digital skills on physical activities. ySKILLS research produced important findings, but it allows only limited conclusions about the effects of the broad scale of digital technologies on the different aspects of psychological, social, and physical well-being.

To fill this research gap, the Interdisciplinary Research Team on Internet and Society (IRTIS http://irtis.muni.cz) at Masaryk University conducted a series of studies within two large projects, FUTURE and DigiWELL. These studies investigate the positive and negative impacts of the use of smartphones, social media, and other digital technologies on the well-being of **Czech adolescents**, aged 11 to 18. In this report, we describe the results of six years of work and the findings of 15 recent studies, eight of which were published in prestigious international journals and seven that are currently either being prepared or in the peer review process. Preprints are available for six of the studies that are in progress. An overview of these studies can be found in Appendix 2, including links to the full texts (or preprints).

[2] Godard, R., & Holtzman, S. (2024). Are active and passive social media use related to mental health, well-being, and social support outcomes? A meta-analysis of 141 studies. *Journal of Computer-Mediated Communication*, *29*(1). https://doi.org/10.1093/jcmc/zmad055

[3] Smahel, D., Machackova, H., Mascheroni, G., Dedkova, L., Staksrud, E., Ólafsson, K., Livingstone, S., & Hasebrink, U. (2020). *EU Kids Online 2020: Survey results from 19 countries*. EU Kids Online. https://doi.org/10.21953/lse.47fdeqj01ofo

[4] Smahel, D., Mascheroni G., Livingstone, S., Helsper, E., van Deursen, A.J. A.M., Tercova, N., Stoilova, M., Georgiou, M. A., Machackova, H., Alho, K. (2023). *Theoretical Integration of ySKILLS: Towards a New Model of Digital Literacy*. KU Leuven, Leuven: ySKILLS. https://zenodo.org/records/11242207

The 15 studies in this report employed various methods: longitudinal research with intervals of six months between three or four waves (seven studies); EMA (Ecological Momentary Assessment) studies that collected tracked data from adolescents' smartphones (five studies); and experimental designs (three studies). These methods enable the identification of causal relationships between concepts. Detailed descriptions of these methods can be found in Appendix 1.

In this report, we work with the concept of **well-being**. Well-being incorporates various aspects of the psychological (e.g., affect, depression, stress, anxiety), social (e.g., levels of social support and loneliness), and physical (e.g., sleep quality, body image and physical activity) aspects of adolescent lives. The impact of technology use may vary on these levels, as shown by the results of the studies presented in the following pages.

In this report, we first focus on **psychological well-being**, specifically the impact of smartphone use on adolescents' positive and negative affect (i.e., how adolescents feel at the moment), the impact of playing and watching violent video games on their aggression and empathy, the impact of watching online health content on their health concerns, and the relationship between smartphone use and exposure to sexual content.

We further address **social well-being**, specifically the impact of online communication on adolescents' social competencies, the impact of social media use on social support, and the relationship between online consensual sexting and peer support.

In the section on **physical well-being**, we discuss the impact of social media and smartphones on the adolescents' perceptions of their own bodies and their quality of sleep. In the conclusion, we summarize the key recommendations that journalists, educators, and the general public should follow when discussing the impact of new technologies on adolescents.

In this report, we continue to use the word "**technology**", a general and simplified term, but our research focused primarily on the impact of the use of digital media, such as smartphones, computers, social media, gaming, and, more generally, the use of the media on these platforms.

1.1 Correlation vs. Causality

To understand the research results, it is necessary to distinguish between the terms "correlation" and "causality", which both describe the relationship between two phenomena[5].

Correlation is a connection between phenomena A and B, but it does not determine whether A causes B or, on the contrary, B causes A. Notably, there may be a phenomenon C that causes both A and B. For example, depression rates correlate with social media use in some research, but it is not clear whether depression leads to more frequent social media use or whether frequent social media use causes depression. Another possibility is that both are caused by a third factor, such as an illness. An adolescent who becomes ill may feel depressed and lonely, and the illness may also lead to increased time spent on a smartphone. In this case, while depression, loneliness, and time spent on a smartphone correlate, their common cause is the illness.

Correlational studies typically collect data at only one point in time, usually through surveys. The vast majority of the studies to date that examine the impact of smartphone or social media use on adolescent well-being are based on such survey collected at only one point in time which only allows for an examination of correlation but not causality. Their findings are valuable because they allow for an understanding of the various relationships. However, it is important to remember that they do not show the cause and the consequence, which is crucial for discussions about the impacts of technology use.

Causality refers to a causal relationship, which means that phenomenon A directly causes phenomenon B. Causal studies typically examine whether, for example, social media use actually causes increased depression on a long-term level. Such studies are generally longitudinal, where data are collected at multiple time points, and experimental, where a proportion of the participants are exposed to an intervention that may cause the phenomenon under study.

[5] The terms "correlation" and "causality" in this report are simplifications to explain the results to a wider audience. For longitudinal and EMA research, we use them to refer primarily to the phrases "between person" and "within person" that are tied to different methods and analytical procedures; for experiments, we speak of causality in terms of the strengths of experimental designs. We want to point out that the issue of capturing causality and the possibility of interpreting it is much more complex. However, such a discussion is beyond the scope of this report.

All of the studies in this report are based on causal designs. This allows us to distinguish between mere correlations and causal effects. The methodological approaches used in our studies are described in more detail in Appendix 1. These concepts are also further elaborated upon in the individual studies.

2 Impacts on Psychological Well-being

2.1 Use of Smartphones on Psychological Well-being (Affect and Stress)

Smartphones play an important role in adolescents' lives. Prominent theories suggest that, among other reasons, they do it to manage how they feel (i.e., their positive and negative affect, and stress) – for example, to cope with a stressful situation or feel better after a bad day. However, smartphones can also introduce an overload of information and increase stress or negative affect.

In our research, we focused on the immediate and short-term impacts of using the most common types of smartphone apps on adolescents' well-being. The research was part of the EMA study (see Methods in Appendix 1) in which adolescents had a smartphone app installed to track their activity on their smartphone. This app measured time spent communicating on social networking (e.g., Instagram) and messaging apps (e.g., Facebook Messenger), watching videos (e.g., YouTube), and playing smartphone games (e.g., Clash of Clans). Four times a day, the adolescents used the app to record how they felt at the moment (i.e., their positive and negative affect, like how calm, happy, sad or lonely they felt) and the levels of their perceived stress.

In the research, we addressed how the time spent on a smartphone on social networking and in entertainment apps (i.e., primarily in games and video streaming platforms, like YouTube) one hour before filling in a questionnaire related to the subsequent positive and negative affect, and vice versa, and how

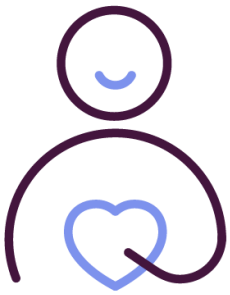
their current affect related to their subsequent use of applications one hour after completing the questionnaire.[6] In a separate analysis, we focused on general smartphone use and perceived stress.[7]

When we focused on **the causal impacts of apps** at the individual level, we discovered that an increase in time spent on social networking apps (compared to average use) was associated with a slightly reduced positive affect and a slightly increased negative affect. Thus, increased use of social networking apps compared to the usual amount of time spent using them led to more negative and less positive well-being. These results were similar for most adolescents, but the size of the effect was very small. We found no impact on adolescents' affect for the use of entertainment apps on smartphones (i.e., videos and games). When examining stress, we found that, for approximately 20% of adolescents, using smartphones increased stress. Interestingly, not only time spent using smartphones but also the pattern of smartphone use was related to perceived stress. Adolescents who used smartphones more consistently throughout the day were more stressed. We found no adolescents for whom using a smartphone would decrease stress.

When we focused on the reverse direction of the relationship (i.e., how positive or negative affect impacts the app use of adolescents), we found that participants who reported an increase in positive affect spent less time on entertainment apps. However, this finding was statistically significant for about 8% of the adolescents; it was exactly the opposite for 2% (i.e., an increase in positive affect meant an increase in time on entertainment apps); and the effect was not significant for 90% of the adolescents. In other words, for 90% of adolescents, the current affect is probably unrelated to subsequent smartphone app use.

At the level of mere **correlation**, we found that the participants who reported more negative affect in general also used more social networking apps, and the participants who reported less positive affect used more apps for entertainment. Adolescents who spent more time using their smartphone did not experience more stress. However, these results do not suggest the causal individual impacts of smartphone apps. Rather, they primarily show the differences between groups of adolescents.

Therefore, the main conclusion of the two studies is that an increase in the time spent on smartphones and the higher consistency of using smartphones throughout the day increases stress in some adolescents. Moreover, more time spent in social networking apps compared to what is usual for that person led to a decrease in positive affect and an increase in negative affect among adolescents. However, this effect was very weak. This means that using smartphones slightly worsens psychological well-being, but the practical impact is very small. On the other hand, we found no causal impact on adolescents' affect for the use of entertainment apps (i.e., videos and games).



[6] Šaradín Lebedíková, M., Lacko, D., Tkaczyk, M., Blahošová, J., Elavsky, S., & Smahel, D. (2025). How Social Networking and Entertainment Apps Impact Adolescents' Affect? An Experience Sampling Study. In preparation, an unpublished study.

[7] Šaradín Lebedíková, M., Beyens, I., Lacko, D., & Šmahel, D. (2024). Are smartphones stress-inducing or stress-buffering for adolescents? An experience sampling study. In preparation, unpublished study available as preprint: https://osf.io/preprints/psyarxiv/c9hxy.

2.2 Violent Games and the Connection to Aggression and Empathy

One of the popular technological scares in public debate and scholarly literature is the alleged harmful effect of violent video games on adolescents. It is usually assumed that playing violent video games increases aggression and decreases empathy in children and adolescents. As with many of the other topics discussed in our publication, scientific knowledge on violent video games remains inconclusive. Our new studies have not changed that. **The direct causal link between playing violent video games and an increase in adolescent aggression is, according to our findings, small, unproven, or even negative.**

Most research to date has focused on short-term experiments. When studies have been conducted over the long term, they usually follow young players at only two-time points, which is insufficient to reliably demonstrate the relationship between cause and effect. Therefore, in 2021, we decided to take a more thorough approach. In a long-term study, we measured the levels of aggression and empathy in adolescents four times over six months and had them report the games that they played most often during that period (e.g., Minecraft, Roblox, and Fortnite, among others, were particularly popular). We rated these games according to their level of violence.[8]

To demonstrate the causal relationship between cause and effect, we focused on the relationship between violent video games and empathy and aggression from both directions (i.e., how games impact empathy and aggression, but also how empathy and aggression impact game choice). We attempted to prove or disprove two common assumptions. First, whether changes in empathy and aggression lead to an increase or decrease in playing violent video games (the so-called selection effect) and, second, whether changes in playing violent video games lead to an increase or decrease in empathy and aggression (the so-called desensitization effect).

The results of our measurement on **the causal level** showed that an increase or decrease in playing violent video games compared to the usual state did not increase or decrease empathy or aggression in adolescents. When we looked at the whole relationship in reverse (i.e. the so-called selection effect), it turned out that increased empathy led to less violent video game play, and an increase in physical aggression was associated with the subsequent playing of violent video games. Surprisingly, both positive and negative results depended on the specific time of the data collection.

In other words, in some periods, the increase in aggression among young players led to an increase in playing violent video games, but, at other times, it led to its decrease. Moreover, the positive relationship (i.e., the effect of the increase in physical aggression on the greater popularity of violent video games), depended on age, and it was statistically significant only for younger adolescents (11-13 years old). These effects were not significantly different for boys and girls.

At the level of **correlation**, this is further complicated by the finding that adolescents who generally play more violent video games are both more aggressive and, surprisingly, more empathetic. While this is not causality, contrary to the above findings, it can still be said that, while more aggressive individuals play more violent video games, playing violent video games alone does not impact aggression.

In terms of a proven causal connection between cause and effect, we have only concluded that the more frequent playing of violent video games cannot be unconditionally linked to an increase in aggression and a decrease in empathy. The effect of changes in adolescents' empathy and aggression on the rate of the subsequent playing of violent video games remains unclear.

[8] Published article: Lacko, D., Machackova, H., & Smahel, D. (2024). Does violence in video games impact aggression and empathy? A longitudinal study of Czech adolescents to sifferentiate within- and between-person effects. *Computers in Human Behavior, 159*, 108341. https://doi.org/10.1016/j.chb.2024.108341

2.3 Social Gaming: Impact on Loneliness and Depressive Mood

For a long time, video games have offered various social experiences. With the widespread availability of online multiplayer features, online gaming has become a common activity among adolescents. The COVID-19 pandemic further highlighted the social role of gaming, as young people turned to these platforms to maintain connections during periods of physical isolation. Despite the growing prevalence of online gaming, its long-term effects on adolescent well-being—particularly in relation to loneliness and depressive mood—remain unclear.

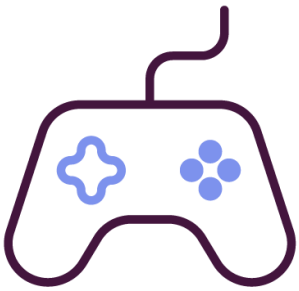
To better understand these relationships, our study employed a longitudinal approach with four waves of data collection that occurred every six months[9]. We assessed social gaming by coding the social interaction potential of the games participants played, focusing on features such as cooperative gameplay, voice chat, the ability to play with friends, and involvement in in-game communities, like guilds. This approach enabled us to examine whether greater engagement in social gaming influences feelings of loneliness and depressive mood over time.

At the causal level, our findings indicate that an increase or decrease in playing socially interactive video games does not lead to significant changes in depressive mood among adolescents. However, an increase in social gaming was associated with a slight decrease in loneliness over time.

Interestingly, these associations varied between boys and girls. For boys, greater engagement in social gaming was linked to lower levels of both depressive mood and loneliness. In contrast, for girls, increased social gaming was associated with higher levels of depressive mood and loneliness. These findings suggest that social gaming may have different effects depending on gender, which reflects possible differences in how boys and girls engage with and experience social aspects of gaming. Further supporting this, we observed that an increase in depressive mood led to a decrease in social gaming among boys, whereas for girls, higher depressive mood was associated with an increase in social gaming.

At the correlational level, the relationships followed a somewhat opposite pattern. Adolescents who generally played more video games with a high level of social interaction reported higher levels of loneliness. Specifically, girls who played more socially interactive video games reported lower overall levels of depressive mood and loneliness, while boys reported higher levels of loneliness without any significant association with depressive mood.

In summary, while our findings suggest that social gaming can help reduce loneliness to some extent, these effects are more nuanced and differ significantly between boys and girls. Further research is needed to better understand the underlying factors that influence these gender differences and the long-term impact of social video gaming on adolescent well-being.



2.4 Streaming: What Does Watching Video Gameplay Do to Children?

Video games have long been an activity in which children and adolescents do not engage alone. In the past decade, the popularity of e-sports and the online streaming of game experiences has grown. This enables crowds of fans to participate vicariously. This creates new ways for young people to be exposed to the violent aspects of video games. Surprisingly, scientific research on streaming is almost non-existent, so we decided to investigate the specific effect of streaming videos on the aggressiveness of their viewers during live streaming.

[9] Lacko, D., Kyslík, F., Smahel, D., & Machackova, H. (in preparation). Within-person effects of social video gaming on loneliness and depressive mood among adolescents: The moderating role of gender and age. In preparation, an unpublished study.

We performed an experiment in which we randomly divided 600 adolescents into three groups.[10] Each of them watched one clip of streaming footage that resembled videos from the popular Twitch.tv platform. In all cases, this was a recording of gameplay from the video game Superhot: Mind Control Delete. The clips differed only in the commentary of the streamer (i.e., the player who live-streams themself and their game to their viewers and responds to their comments or feedback). In one group, the streamer appeared aggressive and encouraging, and enjoyed the violent style of gameplay. In the other group, the streamer was calm and preferred a non-violent playing style. In the control group, the streamer was not shown.

The results of our experiment at **the causal level** showed that neither the presence of a streamer nor his aggressive comments led to an increase in aggression in the adolescent viewers. Importantly, we also found that other personal and environmental factors did not impact the relationship between aggressive comments and viewer aggression. In other words, the effect does not differ for those with higher levels of aggression or empathy. Based on these findings, it appears that short-term exposure to aggressive comments has no significant effect on viewers' aggressive feelings and thoughts (and, conversely, non-aggressive comments do not reduce these feelings and thoughts either).

An interesting correlation that provokes further reflection is that adolescents with generally higher levels of aggression or empathy had increased negative and aggressive emotions regardless of which group they were assigned to. However, it should be repeated that this result is only correlational, and we do not know whether this correlation was caused by watching violent video games or whether only more aggressive and sensitive adolescents, in general, experience higher negative and aggressive emotions.

Thus, we found no effect for watching video game streams in which the streamer behaves aggressively on the aggression and empathy of young viewers, regardless of how aggressive and empathetic the viewers were.

[10] **Published article:** Lacko, D., Macháčková, H., & Dufková, E. (2023). Does aggressive commentary by streamers during violent video game affect state aggression in adolescents? *New Media and Society*. Advance online publication. https://doi.org/10.1177/14614448231182620

2.5 Health Information on the Internet and Health-related Concerns

The internet is a convenient source of health information for adolescents because it allows them to obtain it independently and without the need for contact with parents, teachers, or doctors, and with a sense of anonymity.

Adolescents often research topics related to their developmental needs, like information on sexuality, but also on how to eat and exercise. Puberty is associated with increased attention to one's own body and this can contribute to health anxiety (i.e., concerns about one's health and a reduced ability to distinguish normal physical signs from symptoms of illness).

The amount of information places demands on the seeker, who may not recognize what information is of sufficient quality and, above all, relevant. Inappropriate information found on the internet can increase the concerns rather than soothe them, contributing to health anxiety. Most research to date suggests that these disadvantages might be most salient for adolescents with the highest health anxiety, who generally pay more attention to catastrophic, even if unlikely, explanations.

However, these studies do not generally focus on tracking the relationship between health anxiety and an individual's health-related internet use over time, and, if they do, then only with regard to short-term distress after reading the health information. They do not, however, examine the long-term association of these two variables.

In our longitudinal study, we focused on whether fluctuations in health anxiety from baseline would lead to a subsequent change in health-related internet use six months later, and vice versa.[11] Three times, six months apart, we asked adolescents about their health anxiety and how often they had used the internet for health-related purposes (e.g., reading, commenting on, and sharing health-related articles and posts). We looked at the relationship between the variables separately for adolescents with generally high, moderate, and low health anxiety, because this may impact what health information they seek and how they evaluate it.

[11] Švestková, A., Šmahel, D., & Dědková, L. (2024). In preparation, unpublished study available as preprint: https://dx.doi.org/10.2139/ssrn.4859492.

Our results show that health anxiety and health-related internet use **may be causally related**. The increase in health anxiety was followed by an increase in the intensity with which adolescents searched for health information on the internet six months later. Similarly, the change in health information seeking increased later health anxiety. However, this relationship did not appear for all adolescents. It was strongest among those who had moderate levels of health anxiety at the beginning of our follow-up. On the contrary, we did not find it at all in adolescents who had high levels of health anxiety, despite the fact that they seek health information intensively and may be more stressed by it than others.

At the level of **correlation**, we found that adolescents with the highest health anxiety also use the internet the most for health-related purposes. This is consistent with existing research that shows that people with higher health anxiety are generally more interested in health information than others and they are more likely to search for it on the internet.

To sum up, we can simplistically say that, when it comes to health anxiety, what adolescents do on the internet and how it affects them is mainly determined by their individual characteristics. The internet and social media can reinforce health anxiety for some groups. But, at the same time, we cannot say that adolescents who are exposed to health content most frequently are at the highest risk of increased health anxiety.

2.6 Sexual Content on Social Media and in Communication

Another frequently discussed online activity for adolescents is exposure to sexual content (i.e., content that includes nudity and explicit depictions of genitals or sex). In terms of their psychological well-being, encountering such content can be both positive and negative.[12] Although smartphones are currently the most commonly used technology by adolescents, existing research has not focused much on how often they encounter sexual content with them.

In this study[13], we investigated whether and how often adolescents encounter sexually explicit materials on the most commonly used smart-phone apps, specifically on social networking apps (i.e., Instagram, TikTok) and messaging apps (i.e., Facebook Messenger, WhatsApp).

In these apps, adolescents can encounter sexual content in different ways. On social networking apps, it is mainly through the content they follow. On messenger apps, the source of sexual content may be other people, such as the peers with whom adolescents interact.

For two weeks, we collected objective data from adolescents' smartphones about their use of social networking and messaging apps. In combination with surveys every evening about sexual content, we tested two basic hypotheses. The first hypothesis questioned whether the adolescents who generally spent more time on social networking and messenger apps during the measurement period are more likely to encounter sexual content than the adolescents who use these apps less.

In terms of **correlation**, we found that more time spent in these apps was generally unrelated to the reporting of exposure to sexual content—in other words, time spent on social networking and messaging apps was unrelated to the levels of exposure to sexually explicit materials. However, when we focused on gender differences, we found that boys were more likely to be exposed to sexual content when using messaging apps.

[12] Štulhofer, A., Tafro, A., & Kohut, T. (2019). The dynamics of adolescents' pornography use and psychological well-being: a six-wave latent growth and latent class modeling approach. *European Child & Adolescent Psychiatry, 28*(12), 1567–1579. https://doi.org/10.1007/s00787-019-01318-4

[13] Šaradín Lebedíková, M., Tancoš, M., Cho, Y., Šmahel, D., & Chow, S. (2024). The role of social networking and messaging apps in adolescent exposure to sexually explicit materials: A 14-day window into adolescent smartphone usage. In preparation, unpublished study available as preprint: https://osf.io/preprints/psyarxiv/eu2gf.

The second hypothesis addressed whether adolescents who spend more time on these apps than is usual for them over a 14-day period (i.e., there is a fluctuation from their common behavior) would be more likely to encounter sexual content, and if these results differ by the age and gender of the adolescents.

When we focused on whether an increase or decrease in app usage compared to average behavior was associated with higher exposure to sexual content, we did not find any association at **the causal level**.

This study can be summarized by saying that while, on a general level, the use of social networking and messaging apps is not related to exposure to sexual content, boys are more likely to encounter such content. This is an important finding, because the research suggests that parents tend to focus sexual education on girls while neglecting boys. Boys are more likely to be exposed to sexual content, while they may lack proper awareness of the character and risks of sexual content.

2.7 Summary of Causal Impacts on Psychological Well-being

An important result of our studies is that an increase in time on social networking apps (e.g., Instagram, Facebook, TikTok) compared to what is usual for particular adolescent was associated with the worsening of positive affect and an increase in negative affect in adolescents. This suggests a negative impact for social media use on adolescents' current affect. However, this impact was only very weak and further research is needed in this regard. On the other hand, in contrast to social networking apps, we found no causal effect on adolescents' affect for the use of entertainment apps (i.e., YouTube, Netflix, Twitch and gaming apps, such as Clash Royale). Thus, the results varied according to the adolescent's smartphone activity.

We did not find any causal effects when we focused on playing violent video games and its effect on adolescents' empathy or aggression. Similarly, results for the viewers of video game streams showed that neither the presence of the streamer nor their aggressive comments led to an increase in aggression in the viewers.

Concerning the impact of seeking health information on the internet, we found that the internet and social media can reinforce health anxiety for some groups of adolescents. At the same time, this risk was not highest for adolescents who are most frequently exposed to health content. **Therefore, health-related internet use had different effects for different groups of adolescents, with some experiencing worsened health anxiety and others not.**

Regarding exposure to sexually explicit materials online, we found that a **higher level of usage of social networking and messaging apps had no effect on the level of exposure to sexually explicit material.**

3 Impacts on Social Well-being

3.1 Online Communication and Social Competence

An important aspect of adolescents' social well-being is their social competence—the ability to effectively communicate and establish new relationships. This competence relies on several specific social skills, such as initiating new relationships, sharing experiences and feelings (i.e., self-disclosure), or expressing disagreement assertively.

In public debates, concerns often arise that young people may be losing their social skills due to technology. However, frequently missing from these debates is that online communication can actually serve as a beneficial environment for developing these skills. Online communication allows adolescents to think through and edit their responses, provides a certain degree of anonymity, and offers access to a wide range of communication partners. These features can make online communication less demanding and more conducive to practicing social skills, while providing opportunities for building relationships.

In our longitudinal study, we investigated how online communication impacts social competence.[14] Specifically, we focused on adolescents' social *self-efficacy*, that is, their confidence in their social skills. We asked adolescents about their use of

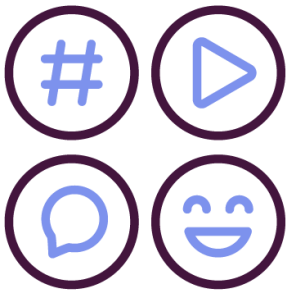
[14] Mýlek, V., Dědková, L., Dienlin, T., & Schouten, A. P. (2024). In preparation, an unpublished study available as preprint: https://doi.org/10.31234/osf.io/xgqh4.

online communication and their social self-efficacy three times, at six-month intervals.

Our results indicate that, at a **causal level**, online communication and social self-efficacy do not influence each other. Using online communication (whether with offline friends or online acquaintances) more than usual did not lead to changes in adolescents' social self-efficacy six months later. Similarly, changes in social self-efficacy did not have an effect on the frequency of online communication.

However, looking at mere **correlation**, we found a positive association between online communication and social self-efficacy. Adolescents who communicated more frequently with their offline friends also reported higher confidence in their social skills. Notably, online communication with online acquaintances (i.e., people known exclusively from the internet) was not associated with social self-efficacy.

Thus, our study suggests that adolescents who are more socially competent tend to communicate online more, similar to what we would expect offline. However, increased engagement in online communication does not impact adolescents' social competence—it neither improves nor diminishes it. In other words, our study does not support the notion that adolescents are losing social skills due to online communication.



3.2 Social Support on Social Media and in Communication

Support from peers, parents, and close friends is important for children and adolescents because it increases their resilience to feelings of loneliness, depression, and stress. However, research on the support provided on social media has produced conflicting results. While some adolescents find support, others do not. Some even lose it.[15] The inconclusive results may be due to the lack of clarity about what adolescents are actually doing on social media, because the behavior associated with viewing content may be different from chatting with friends.

In our published research[16] (see Appendix 2), we investigated whether the use of social networking sites (e.g., Instagram, Facebook) and communication apps (e.g., WhatsApp, Facebook Messenger) on smartphones leads to increased perceived social support among adolescents the following day. We also looked at the opposite relationship: whether the feeling of social support leads to an increase or decrease in app use the next day. We also paid attention to adolescents with social anxiety, who may find online interaction more enjoyable than face-to-face interaction.

We found that after adolescents spent more time on social networking and communication apps than is usual for them, they felt no more or less support the next day. We found mixed results for **the causal association** between perceived support one day and the use of social networking and communication apps the next day. While, for the majority of adolescents, we did not find an association between support and app use, for a very small proportion of adolescents (less than 10%), an association existed in various forms.

For example, for some people who feel more social support than usual, they use communication apps less the next day, and vice versa; for different people, who feel more social support than usual, they use communication apps even more the next day. This was similar to social media use. As for social anxiety, we found no significant effect—for adolescents suffering from social anxiety, the results do

[15] Lapierre, M. A., & Zhao, P. (2021). Smartphones and social support: Longitudinal associations between smartphone use and types of support. *Social Science Computer Review, 40*(3), 831–843. https://doi.org/10.1177/0894439320988762

[16] Blahošová, J., Tancoš, M., Cho, Y. W., Šmahel, D., Elavsky, S., Chow, S. & Lebedíková, M. (2024). Examining the reciprocal relationship between social media use and perceived social support among adolescents: A smartphone ecological momentary assessment study. *Media Psychology*. Advance online publication. https://doi.org/10.1080/15213269.2024.2310834

not differ. Thus, social anxiety does not seem to be the characteristic that explains the different effects of app use on social support.

Thus, there is no significant positive or negative relationship between the level of social support and the use of social networking and messaging apps among adolescents, and it is certainly not the case that social media and other technologies have a harmful effect in this regard.

3.3 Consensual Sexting and Social Support

One of the relatively common risky online behaviors among adolescents is sexting. This involves sending and receiving messages of a sexual nature, which may include intimate information, nude pictures, or photos or videos of other people. Sexting itself may not be dangerous. Research shows that sexting can be positive for adolescents' well-being because it develops interpersonal relationships, deepens feelings of intimacy, and helps adolescents explore their own sexuality.[17] With sexting, however, there is a risk that it will turn into so-called non-consensual sexting. This means that the person who receives the sexting messages may, for example, forward them to other people without the sender's consent, or it may take the form of coercion to send sexual messages under pressure. Such forms of sexting can have negative effects on psychological and social well-being.

Research also points to the gendered outcomes of sexting on social well-being.[18] While girls face a lot of criticism when they engage in sexting (and especially when their intimate messages are shared, for example, among peers at school), boys are praised for this behavior among their peers, and it is a way for them to secure high status in the peer group.

Because existing research has not consistently differentiated between consensual sexting and other non-consensual forms (such as the circulation of intimate information), the aim of our study was to investigate whether purely consensual sexting is potentially dangerous for social well-being.

In our three-wave longitudinal study[19] we focused on whether engagement in consensual sexting was related to changes in peer support six months later and, conversely, whether changes in peer support were related to engagement in consensual sexting. We then investigated whether the results differed for boys and girls.

We found that engaging in consensual sexting with subsequent peer support **was not related on the causal leve**l, and, conversely, changes in peer support were not related to sexting six months later. These results did not change after we focused on boys and girls separately.

Our results, therefore, suggest that consensual sexting is not dangerous for adolescents in terms of their peer relationships. Nor is it beneficial in terms of peer relationships; however, it is worth noting that consensual sexting usually takes place in a romantic relationship, and our study did not focus on assessing this aspect of social well-being. Thus, our research contributes to studies that suggest that consensual forms of sexting are not dangerous for adolescents' well-being

[17] Englander, E. (2019). What do we know about sexting, and when did we know it? *Journal of Adolescent Health, 65*(5), 577–578. https://doi.org/10.1016/j.jadohealth.2019.08.004

[18] Ringrose, J., Regehr, K., & Whitehead, S. (2021). 'Wanna trade?': Cisheteronormative homosocial masculinity and the normalization of abuse in youth digital sexual image exchange. *Journal of Gender Studies, 31*(2), 243–261. https://doi.org/10.1080/09589236.2021.1947206

[19] Lebedíková, M., Araujo, R., Mýlek, V., Šmahel, D., & Dědková, L. (2024). The reciprocal relationship between consensual sexting and peer support among adolescents: A three-wave longitudinal study. *Computers in Human Behavior*, *152*, 108048. https://doi.org/10.1016/j.chb.2023.108048

4 Impacts on Physical Well-being

4.1 Beauty Ideals and Body Image on Social Media

There is often a debate about how social media (e.g., Instagram, TikTok) predominantly portray bodies that conform to prevailing beauty ideals that are hard to achieve for most people and that can lead to body dissatisfaction.[20] This is especially true in adolescence, when the body and body image develop rapidly. However, less research has been done on how active engagement with idealized content and appearance-related interactions, such as likes and comments that praise beauty ideals on social media, contribute to body dissatisfaction.

Two studies were conducted to explore this topic. The first focused on the short-term impact of reading positive comments that compliment the appearance of ideal bodies on adolescent body dissatisfaction.[21] Two groups of adolescents were included in the research. One was exposed to photos of ideal bodies with positive appearance comments (e.g., "I want to be thin like that too!"). The other saw photos of ideal bodies with appearance-neutral

[20] Saiphoo, A. N., & Vahedi, Z. (2019). A meta-analytic review of the relationship between social media use and body image disturbance. *Computers in Human Behavior*, *101*, 259–275. https://doi.org/10.1016/j.chb.2019.07.028

[21] Kvardova, N., Machácková, H., & Güleç, H. (2023). 'I wish my body looked like theirs!': How positive appearance comments on social media impact adolescents' body dissatisfaction. *Body Image*, *47*, 101630. https://doi.org/10.1016/j.bodyim.2023.101630

comments (e.g., “Who took that picture?”). We then asked about dissatisfaction with one's body. We expected that the group that viewed the positive comments would experience higher dissatisfaction. As this was an experiment, our results inform the causal effect of comments on body dissatisfaction.

The boys who viewed the positive appearance and neutral comments had similar levels of body dissatisfaction, so the positive appearance comments did not cause more body dissatisfaction for them. Positive appearance comments, however, played this role for girls. Girls who saw positive appearance comments were subsequently less satisfied with the appearance of their own bodies. In a further analysis of the data, we found that positive appearance comments increased body dissatisfaction when adolescents found the ideals portrayed to be highly attractive. In this case, the effect was evident for both girls and boys.

The second study explored the long-term effects of appearance activity on social media on body dissatisfaction in adolescents. In addition to exposure to appearance-related compliments, this so-called appearance activity involved active posting, liking, and commenting on idealized images. We asked adolescents about their appearance activity on social media, their body dissatisfaction, how often they compared themselves to idealized bodies, and how much they wish to attain an ideal body. After initially asking these questions, we repeated them six months later and again six months after that, resulting in a three-wave study over a one-year period.

At the level of correlation, we found that adolescents who engaged more frequently in appearance activity on social media reported greater adoption of and comparison with social media ideals, although they did not report higher body dissatisfaction. However, appearance activity on social media was not causally linked to elevated body dissatisfaction in adolescents. Adolescents who engaged more frequently in appearance activity did not feel more body-dissatisfied six months later. Similarly, appearance activity did not lead to a higher endorsement of social media ideals or more frequent comparisons to them over time.

Overall, these results indicate that, while comments praising beauty ideals on social media can contribute to increased body dissatisfaction in adolescent girls, engaging with appearance-related idealized content does not necessarily lead to heightened body dissatisfaction over a longer period of time. These findings challenge the conclusions of past correlational research and the widespread notion of exclusively harmful social media effects on body image.

4.2 Anonymity on Social Media and Body Shaming

Anonymity is often discussed as a contributing factor to online aggression. One type of aggression is body shaming (i.e., unsolicited negative comments and the mocking of someone for their physical appearance). This is very common on social media today, and bystander reactions are crucial in such situations. They can be supportive of the victim (e.g., rejecting aggressive behavior), but they can also blame the victim for the event, which then has a negative effect on the victim’s well-being.

In our experimental study[22] we investigated the circumstances under which adolescents who witness body shaming on social media show a higher tendency to blame the victim. Specifically, we focused on the role of the anonymity of the users who made aggressive comments in social media posts (e.g., "Has herself to blame, she should not look like that"). Thus, we tested whether anonymity on social media may contribute to an aggressive reaction in some situations and, thus, in our case, to the victim blaming of body shaming. We were also interested in whether it contributes to blame when bystanders identify with aggressive commenters.

[22] Kvardova, N., Machackova, H., & Jaron Bedrosova, M. (2023). Role of anonymity in body shaming on social media: Insights from social identity model of deindividuation effects. In preparation, unpublished study available as preprint. https://doi.org/10.31234/osf.io/9875r

As part of our research, we showed adolescents a body shaming post on social media. One group saw a post where the commenters were anonymous, with just a nickname and no profile picture. The other group saw comments with profile pictures and names that showed personal information about the commenters (e.g., name, interests). We then examined the tendency to blame the victim and to identify with the aggressive commenters.

Consistent with expectations, at **the level of correlation**, we found that adolescents who identified more with aggressive commenters blamed the victim more for body shaming. This highlights the need for further research to explore the reasons for this identification in order to prevent victim-blaming on social media.

However, neither the identification nor the subsequent blame was, at **the causal level**, caused by the anonymity of the aggressive commenters in our research. Adolescents who saw posts with anonymous commenters did not blame the victim more than those who saw posts with profile pictures and nicknames.

Thus, our research suggests that anonymity on social media may not, in all circumstances, encourage aggressive bystander responses.

4.3 Mobile Health Application (mHealth App) Use and Body-related Attitudes

mHealth apps are software applications designed for mobile devices to support health-related functions, such as tracking personal health data, monitoring fitness, managing chronic conditions, and providing health information and guidance. Adolescents frequently use mHealth apps to target modifiable lifestyle behaviors related to food, weight, and exercise. Tracking sports activities, calorie intake and burn, and weight can impact the body and its appearance, thereby influencing how adolescents perceive their bodies. However, the understanding of how mHealth app use and body attitudes interact during adolescence remains limited. Examining these effects is particularly important because adolescence is a critical stage for developing body image and physical identity.

Our longitudinal study[23] focused on adolescents' mHealth app use and their body dissatisfaction and physical self-worth over time. We examined whether fluctuations in the mHealth app usage resulted in subsequent changes in body dissatisfaction and physical self-worth six months later and vice versa.

Our results showed that mHealth app activity was **causally linked** to physical self-worth in adolescent girls, but not adolescent boys. Adolescent girls who used mHealth apps more frequently felt higher physical self-worth six months later. On the other hand, using mHealth apps did not influence subsequent body dissatisfaction across genders. When we looked at the reverse relationship, the results showed that changes in body-related attitudes (i.e., body dissatisfaction and physical self-worth) did not predict the frequency of using apps six months later.

At the level of correlation, adolescents with higher physical self-worth were more likely to use mHealth apps.

We can conclude that using mHealth apps does not negatively affect adolescents' body satisfaction or physical self-worth. On the contrary, they may have a beneficial impact, particularly in improving the physical self-worth of adolescent girls.

4.4 The Impact of Digital Technology Use on Sleep

Adolescents spend more and more time using smartphones, which raises concerns about the adverse effects on sleep. Previous research has shown that adolescents frequently use smartphones in bed and do so more often than with other portable devices, such as laptops or tablets.[24] Although some

[23] Gulec, H., Muzik, M., Smahel, D. & Dedkova, L. (2025). Longitudinal associations between adolescents' mHealth app use, body dissatisfaction, and physical self-worth: Random intercept cross-lagged panel study. *JMIR Mental Health*. http://dx.doi.org/10.2196/60844

[24] Smith, C., de Wilde, T., Taylor, R. W., & Galland, B. C. (2020). Prebedtime screen use in adolescents: A survey of habits,

available research has found that the use of various media, such as television, game consoles, and computers, is associated with an increased prevalence of sleep problems among adolescents, there is no scientific consensus for the feared negative impact of smartphone use on adolescents' sleep.[25]

Most of the available research on this topic is correlational and focuses on the differences in sleep duration and quality between people who typically spend more time using different types of media and those who use them less. In addition, most studies measure media use with questionnaires that do not represent an accurate estimate of time spent using media. The mentioned weaknesses of previous research also apply to studies that focus on smartphones.[26]

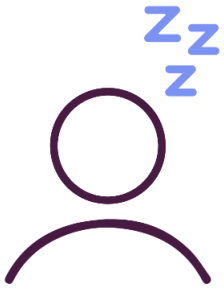
In our EMA research,[27] we examined (see EMA explanation in Appendix 1) how time spent using a smartphone during the two hours before bedtime is related to the time to fall asleep, sleep duration, sleep quality, and the daytime sleepiness of the adolescents. In doing so, we distinguished between the effects related to the typical patterns of smartphone use before bedtime and the effects related to the daily variation from these patterns (e.g., an increase in the amount of time spent using a smartphone before sleep compared to the typical level of use). We collected data on smartphone use before bedtime with a smartphone app that tracked when the smartphone screen was on.

At **the causal level**, we found that, on days when adolescents used their smartphones more than usual before bedtime, they went to bed slightly earlier and slept slightly longer. This is a rather surprising finding, suggesting that, in some cases, smartphones can act as a sleep aid. However, these discovered causal effects were rather small.

Regarding the use of other media (e.g., PC, laptop, television), we found that, on days when adolescents used these media more than usual before bedtime, they took less time to fall asleep but fell asleep later compared to their typical sleep patterns. However, even these found causal effects were rather small.

Our study **found no correlation** between the typical patterns of bedtime smartphone use and the quality and duration of sleep. However, the use of other technologies (e.g., PC, laptop, television) before bedtime was associated with the worsening of the examined aspects of sleep. Specifically, adolescents who generally used other media more before bed reported a later bedtime and shorter sleep duration compared with those who used them less intensively.

These results can therefore be interpreted to mean that the adverse effect on sleep is related to the evening use of other media and not to smartphone use.



barriers, and perceived acceptability of potential interventions. *Journal of Adolescent Health, 66*(6), 725–732. https://doi.org/10.1016/j.jadohealth.2019.12.007

[25] Lund, L., Sølvhøj, I. N., Danielsen, D., & Andersen, S. (2021). Electronic media use and sleep in children and adolescents in western countries: A systematic review. *BMC Public Health, 21*(1), 1598. https://doi.org/10.1186/s12889-021-11640-9

[26] Lund, L., Sølvhøj, I. N., Danielsen, D., & Andersen, S. (2021). Electronic media use and sleep in children and adolescents in western countries: A systematic review. *BMC Public Health, 21*(1), 1598. https://doi.org/10.1186/s12889-021-11640-9

[27] Tkaczyk, M., Lacko, D., Elavsky, S., Tancoš, M., & Šmahel, D. (2023). Are smartphones detrimental to adolescent sleep? An electronic diary study of evening smartphone use and sleep. *Computers in Human Behavior*, *149*, 107946. https://doi.org/10.1016/j.chb.2023.107946

4.5 Summary of Causal Impacts on Physical Well-being

Positive comments that praise ideal bodies on social media increased body dissatisfaction, but only among adolescent girls and adolescents who found the displayed bodies highly attractive. Although engaging with beauty ideals may have some short-term negative effects on the body image of vulnerable adolescents, it did not result in long-term body dissatisfaction six months later. Further, we found that anonymity did not lead to higher levels of identification with aggressive commenters or the victim blaming of body shaming on social media. We revealed that adolescent girls who used mHealth apps more often felt higher physical self-worth six months later. Regarding sleep quality, we found that smartphone use did not adversely impact adolescents' sleep; however, the evening use of other media (e.g., PC, laptop, television) was associated with poorer sleep outcomes.

Thus, we found only partial evidence for an adverse effect of technology use on physical well-being. However, these effects do not appear to be universal because they vary by gender or across different technologies and platforms (e.g., smartphones may have a different effect on sleep than large computer screens). Conversely, we did not find evidence for some of the expected effects on physical well-being.

5 Conclusions and Implications

Several key conclusions can be drawn from our research on the impact of technology use on Czech adolescents' well-being. First of all, it can be stated that "**People experience impacts on well-being in many ways.** " It always depends on the specific type of psychological, social, or physical well-being variable that we associate with the use of technology. **The impact of technology use varies across different levels of well-being**, such as positive or negative affect (i.e., immediate feelings), stress, aggression, the level of social support, and health anxiety. Thus, we can expect that the impacts of technology use are likely to be different and varied also in domains not included in our report.

Another important finding is that **the causal impacts of technology use are not the same for all adolescents**. For example, the negative effect of reading health information online on anxiety was found only among adolescents with moderate levels of health anxiety. Similarly, the causal effect on body dissatisfaction was observed only among girls and adolescents who perceive ideal bodies as highly attractive. Our analysis also revealed that smartphone use increased stress levels in approximately 20% of adolescents. This corresponds with existing research showing the various impacts of technology on adolescents.[28]

Our studies also emphasize that it is not possible to speak about the impact of smartphones, social media, and other technologies on adolescents in general because it depends primarily on the specific online activity. For example, we found that the increased use of social media negatively impacts affect, while entertainment apps (i.e., videos, games) have no negative impact. It appears that **the use of technology can have a positive, negative, or even no effect on well-being according to the way it is used and the individual characteristics of the adolescents.** Future research should focus on what adolescents do online and which types of content or activities have negative or positive effects.

In the theoretical model we suggest that we need to distinguish between the short- and long-term effects of technology use.[29] For example, the causal effect of social media use found on short-term affect is not necessarily related to long-term life satisfaction. This distinction is necessary to guide future research.

The question of what impact the use of digital technologies has on adolescents has no simple and straightforward answer, despite the simplistic interpretations and moral panics that often appear in the media. The impacts vary according to how these technologies and platforms are used, according to different indicators of well-being, and according to the individual characteristics of each adolescent.

Our findings shed more light on the debate about the current bans on social media for children under 16 years old and smartphones in schools. **In our studies, we did not find any robust support for a negative impact for ICT in the many areas we examined**. Thus, before baning or restricting ICT use, we should ask where the evidence is for these policies[30]. We should also recognise the possible unwanted effects. For instance, it was revealed that digital technology bans may reduce adolescents' digital literacy.[31] We recommend focusing more on educating adolescents about digital skills and digital security rather than imposing bans on digital technologies.

[28] Valkenburg, P. M., Beyens, I., de Vaate, N. B., Janssen, L., van der Wal, A. (2024). Person-Specific Media Effects. In T. Araujo & P. Neijens (Eds.), Communication Research into the Digital Society. Fundamental Insights from the Amsterdam School of Communication Research (pp. 233-245). Amsterdam University Press.

[29] Smahel, D., Gulec, H., Lokajova, A., Dedkova, L., & Machackova, H. (2023). The integrative model of ICT effects on Adolescents' well-being (iMEW): The synthesis of theories from developmental psychology, media and communications, and health. *European Journal of Developmental Psychology*, *20*(6), 944-961. https://doi.org/10.1080/17405629.2022.2135501

[30] Rahali, M., Kidron, B., & Livingstone, S. (2024). Smartphone policies in schools: What does the evidence say? LSE. https://eprints.lse.ac.uk/125554/1/Smartphone_policies_in_schools_Rahali_et_al_2024_002_.pdf

[31] Smahel, D., Mascheroni G., Livingstone, S., Helsper, E., van Deursen, A.J.A.M., Tercova, N., Stoilova, M., Georgiou, M.A., Machackova, H., & Alho, K. (2023). Theoretical integration of ySKILLS: Towards a new model of digital literacy. KU Leuven: ySKILLS. https://zenodo.org/records/11242207

6 Ten Recommendations for the Public, Journalists, and Educators

1. **Distinguish correlation and causality:** When interpreting the results of studies, it is essential to distinguish between correlation and causality. As we have explained, correlation refers to an association between two phenomena without implying a causal relationship. Studies that are questionnaire-based and collect data at only one point in time (and are not experimental) cannot provide causal interpretations for the impact of digital technologies.

2. **Be aware of the limitations of causal studies:** Even studies that allow for causal interpretations for the effects of social media and other new technologies and platforms have their limits. For example, longitudinal studies may not capture all possible influences, and experimental conditions often differ from the everyday context of media use.

3. **Systematically summarize scientific evidence:** Valid causal interpretations should be based on a systematic summary of all of the available scientific evidence on the topic, and consider the quality of these studies. Individual studies should only be seen as partial evidence. It is important to be aware of their limitations, like the composition of the research sample or the method used. Meta-analyses, systematic reviews, and summarizing reports usually provide a more complete and reliable picture of the current evidence.

4. **Put emphasis on the individual characteristics of adolescents:** Our research confirms that, in the matters of the impact of new technologies on the well-being of children and adolescents, individual psychological characteristics and other personal and environmental characteristics (such as family, peer relationships, and other factors) play a crucial role. Therefore, it is not possible to speak about the universally applicable impacts of technology on adolescents on a general level, because adolescents differ in their baseline settings.

5. **Be mindful of the quality of research and scientific publications:** It is important to distinguish between high-quality and low-quality scientific journals. Not every scientific journal is trustworthy. A quality journal requires that the study undergoes a thorough peer review process to ensure that the study was properly conducted and that the results were interpreted correctly. Such a peer review process and emphasis on the quality of results distinguish quality scientific journals from the so-called predatory publications that have suspiciously short peer review processes and churn out one article after another. Tips to identify a predatory journal can be found here.[32] Other scientific or popular scientific texts and contents (e.g., books, interviews with experts) should also be viewed critically.

6. **Be cautious when interpreting the results:** If someone presents general conclusions about the impact of smartphones or social media based on questionnaire surveys at one point in time and generalizes the conclusions to the entire population of children and adolescents, caution is needed. Such generalizations, while attractive to the media, often ignore the complexity and diversity of the real causal impacts. That can lead to incorrect or misleading conclusions.

7. **Mind the effect size:** A "significant" result does not always equate to practical importance. In large studies with thousands of participants, even tiny effects or differences between groups can be statistically significant. It is crucial to assess the effect size—how strong the effect is and how substantial the difference appears. When evaluating claims about media use, consider the size of the effect and, where possible,

[32] Scientometrics MUNI (2024). Publications | Best Practices in Research: Series of methodical documents of the Masaryk University. Masaryk University – MUNI Centre for Scientometric Support. https://scientometrics.muni.cz/publikace

compare it to other relevant effects to better understand its real-world impact.

8. **Consider alternative explanations:** Consider alternative explanations when addressing societal issues that are often attributed to smartphones, social media, and digital technologies, such as declining mental health. Other factors, such as academic pressure, climate anxiety, economic challenges, and political instability (such as the danger of war), may also play significant roles. Focusing solely on digital technologies risks overlooking deeper root causes and misdirecting efforts to address the problem effectively.

9. **Think of the unintended consequences of policies:** Using social media and digital technologies may expose adolescents to certain risks, and restricting their access to these technologies might seem like a sensible way to shield them. However, such restrictions can have unintended adverse effects. For instance, adolescents may miss opportunities to develop the digital skills needed to navigate the online landscape safely and effectively. Those who circumvent restrictions could also face greater risks because they might find it harder to report negative experiences to their parents and seek support. Digital media also enable adolescents to maintain contact with friends and family. Restricting its usage may limit the fulfillment of their social needs.

10. **Consider the prevalence and context of online risks**: It is essential to critically assess the prevalence of the risks that adolescents face online, because these are often overstated. While individual experiences help illustrate specific concerns and need to be taken seriously, they may reflect rare and extreme cases rather than common experiences. Overreliance on such examples risks misrepresenting the broader reality and diverting attention from the most relevant and widespread issues.

Appendix 1: Research Methods Presented in this Report

Appendix 1 provides more detail for the methods used in the 15 studies described above. See Appendix 2 for a list of all of the studies and their associated methods.

Longitudinal Studies (3-wave and 4-wave)

Our studies are based on two non-overlapping longitudinal surveys. Data for both surveys were collected using online questionnaires (CAWI method), which were completed separately by adolescents and one of their parents or caregivers. In both surveys, the same groups of adolescents and parents/caregivers were repeat-edly surveyed at six-month intervals.

The first survey involved four waves of data collection. The first wave, conducted in May-June 2021, included 3,087 adolescents aged 11-16 (M = 13.47, SD = 1.74), of whom 49.9% were girls. The subsequent waves included 1,995 adolescents (November-December 2021); 1,602 adolescents (May-June 2022); and 1,060 adolescents (November-December 2022).

The second survey involved three waves of data collection. The first wave, conducted in June 2021, included 2,500 adolescents aged 11-16 (M = 13.43, SD = 1.70), of whom 50% were girls. The following waves had participation from 1,654 adolescents (November-December 2021) and 1,102 adolescents (May-June 2022).

Both surveys were conducted similarly. Respon-dents were selected and data were collected by research agency STEM/MARK in cooperation with Data Collect. Participants were recruited from existing online panels and newly recruited households. Quota sampling ensured the representativeness of the sample, meaning that the representation of households in terms of the education of the household head, geographic region (14 regions), and size of the municipality corresponded to Czech households with children, based on the available data from the Czech Statistical Office at the time.

EMA (Ecological Momentary Assessment) Studies

EMA studies (sometimes referred to as experience sampling or ambulatory assessment) use an intensive longitudinal data collection technique, which means that participants are followed for a period of time, typically days or weeks. Participants complete short questionnaires one or more times a day. This type of study allows for the assessment of the short-term effects of media and technology use.

Our study involved 203 Czech adolescents, aged 13 to 17, 41% of whom were girls. The selection and recruitment of respondents was carried out by the MEDIAN agency (selection of 70% of respondents) in cooperation with the IRTIS research team (30%). It was a so-called oppor-tunity sample (i.e., non-representative). This method of participant selection is common for this type of study. The study was approved by the Ethics Committee of Masaryk University (EKV-2018-068). Before participating in the research, adolescents and their parents received information regarding the research, and they were assured of complete anonymity and the careful handling of all of the data collected. They were also given the opportunity to withdraw from participation at any time. Participation was conditional on the adolescent and their parent or legal guardian signing an informed consent form. After each data collection, participants had the opportunity to win cash vouchers worth 2,000 CZK and 500 CZK in a lottery, and, at the end of the study, they could win cash vouchers to buy a smartphone or a game console.

Data collection and monitoring was carried out by the IRTIS research team. The study involved 14 days of intensive collection, which was repeated four times over a one-year period (first collection: May-June 2021; second collection: September-October 2021; third collection: January-February 2022; fourth collection: April-May 2022). The intensive collections were preceded by an online entry questionnaire. Subsequently, participants were instructed to install the IRTIS smartphone app on their own smartphones. This app collected so-called objective data on smart-phone use and sent short questionnaires to the participants several times a

day. The day after the end of the intensive data collection, the app sent a short questionnaire about the preceding fortnight. After the entire study was completed, participants completed an exit questionnaire.

Experimental Studies

Through experimental research, we investigated the short-term effect of digital technologies on adolescents' well-being. We randomly divided adolescents into groups that were subsequently exposed to different online content (e.g., one group to aggressive comments, the other group to non-aggressive comments while streaming a game). Dividing adolescents into such groups allowed us to gain insights into whether specific online content impacts well-being in the short term (i.e., causality).

Data for experimental research of the effects of (1) aggressive comments in online game streaming on subsequent aggressive tendencies, (2) comments that praise ideal bodies on social media on body dissatisfaction, and (3) anonymity in body shaming incidents on victim blaming, were collected through the Median agency. The first two studies' data collection took place in August 2021 and the third-study data was collected in October 2022. The agency reached out to the parents of adolescents on its panel through an email invitation. Adolescents then completed an online questionnaire on a laptop, smartphone, or tablet. The online questionnaires included questions for basic information (e.g., age, gender) and other characteristics (e.g., online activity, aggression, body perception). It also included viewing experimental stimuli (i.e., newly created online content) and additional outreach (e.g., streaming an online game, a social media post depicting ideal bodies).

The first study involved 604 Czech adolescents (54% girls), the second had 613 Czech adolescents (52% girls), and the third study had 500 Czech adolescents (54% girls) between the ages of 13 and 18. The total samples from which the participants were randomly divided into individual experiments, were selected according to quotas so that they were representative of Czech households with children in terms of socio-economic status. Girls, boys, and individual age groups were equally represented in the samples.

Appendix 2: Studies in this Report

Section of the Study	Focus of the Study	Methods / Number of Respondents / Waves	Authors / Year of Study / Link to Study
Psychological Well-being			
2.1	The Impact of Smartphone Use on Psychological Well-being (affect and stress)	EMA study (N = 201), 4 collections EMA	Šaradín Lebedíková, M., Lacko, D., Tkaczyk, M., Blahošová, J., Elavsky, S., Smahel, D. (2025). How Social Networking and Entertainment Apps Impact Adolescents' Affect? An Experience Sampling Study. In preparation, an unpublished study. Šaradín Lebedíková, M., Beyens, I., Lacko, D., & Smahel, D. (2025). Are Smartphones Stress-inducing or Stress-buffering for Adolescents? An Experience Sampling Study. Accepted for presentation at the 75th International Communication Association Conference (ICA). 12. 6. - 16. 6., Denver, Colorado, USA. Full study available as preprint: https://osf.io/preprints/psyarxiv/c9hxy
2.2	Violent Games and the Connection to Aggression and Empathy	Longitudinal study (N = 3,010), 4 waves	Lacko, D., Machackova, H., Šmahel, D. (2024). Published study: https://doi.org/10.1016/j.chb.2024.108341
2.3	Social Gaming: Impact on Loneliness and Depressive Mood	Longitudinal study (N = 3,010), 4 waves	Lacko, D., Kyslík, F., Smahel, D., & Machackova, H. In preparation, an unpublished study.
2.4	Streaming: What Does Watching Other Players Do to Children?	Experiment study (N = 604)	Lacko, D., Machackova, H., Dufková, E. (2024). Published study: https://doi.org/10.1177/14614448231182620
2.5	Health Content on the Internet and Health-related Concerns	Longitudinal study (N = 1,102), 3 waves	Švestková, A., Smahel, D., Dědková, L. (2024). In preparation, unpublished study available as preprint: https://dx.doi.org/10.2139/ssrn.4859492
2.6	Sexual Content on Social Media and in Communication	EMA studie (N = 201), 1 collection EMA	Šaradín Lebedíková, M., Tancoš, M., Cho, Y., Smahel, D., Chow, S., (2024). In preparation, unpublished study available as preprint: https://osf.io/preprints/psyarxiv/eu2gf
Social Well-being			
3.1	Online Communication and Social Competence	Longitudinal study (N = 2 500), 3 waves	Mýlek, V., Dědková, L., Dienlin, T., Schouten, A. P. (2024). In preparation, an unpublished study available as preprint: https://doi.org/10.31234/osf.io/xgqh4
3.2	Social Support on Social Media and in Communication	EMA studie (N = 194), 1 colection EMA	Blahošová, J., Tancoš, M., Cho, Y. W., Šmahel, D., Elavsky, S., Chow, S. & Lebedíková, M. (2024). Published study: https://doi.org/10.1080/15213269.2024.2310834
3.3	Consensual Sexting and Social Support	Longitudinal study (N = 1,102), 3 waves	Lebedíková, M., Araujo, R., Mýlek, V., Šmahel, D., & Dědková, L. (2024). Published study: https://doi.org/10.1016/j.chb.2023.108048
Physical Well-being			
4.1	Beauty Ideals on Social Media and Body Image	Experiment (N = 613)	Kvardová, N., Macháčková, H., & Güleç, H. (2023). Published study: https://doi.org/10.1016/j.bodyim.2023.101630

	Navigating Beauty Standards on Social Media: Impact of Appearance Activity on Adolescents' Body Dissatisfaction.	Longitudinal study (N = 1,102), 3 waves	Kvardova, N., Machackova, H., Maes, C., & Vandenbosch, L. (2025). In preparation, an unpublished study available as preprint: https://doi.org/10.31234/osf.io/u6pmk
4.2	Anonymity on Social Media and Body Shaming	Experiment (N = 500)	Kvardová, N., Macháčková, N., & Jaroň Bedrošová, M. (2023). In preparation, unpublished study available as preprint: https://doi.org/10.31234/osf.io/9875r
4.3	Mobile Health Application (mHealth App) Use and Body-related Attitudes	Longitudinal study (N = 2,232), 3 waves	Gulec, H., Muzik, M., Smahel, D., Dedkova, L. (2025). Published study: http://dx.doi.org/10.2196/60844
4.4	The Impact of Digital Technology Use on Sleep	EMA studie (N = 201), 1 collection EMA	Tkaczyk, M., Lacko, D., Elavsky, S., Tancoš, M., & Smahel, D. (2023). Published study: https://doi.org/10.1016/j.chb.2023.107946

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