

TOO MUCH SCREEN TIME? – PERCEPTION AND ACTUAL SMARTPHONE USAGE, GENDER DIFFERENCES AND ACADEMIC SUCCESS

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Abstract

The number of hours spent using mobile phones has been increasing over the years and is especially visible in younger generations. Interestingly, the body of research on this emerging topic is mainly based on self-assessment measures of screen time. There are few studies on mobile phones in Croatia. Therefore the aim of this study was to examine how many hours Croatian high school students spend on mobile phones and see if there is a discrepancy in self-estimates of high-school students' screen time compared to the objective measure obtained through an application for screen time tracking. Moreover, gender differences in screen time were analysed, as well as differences between different levels of students' academic achievement. This study included 156 high-school pupils aged 14 to 18. They were asked to fill out a questionnaire about their smartphone usage habits and attitudes, while their smartphone usage was tracked for one week using the Screen Time application. The analysis was done based on data collected from 130 participants. Most of the students reported that they spend 2 to 4 hours a day using their smartphones, while their actual screen time is, on average, 5 hours and 29 minutes per day. 64.6% of the students underestimated the time spent on their smartphones. Moreover, most of the students believe that it is recommended to spend 1-2 hours a day using a smartphone, while addiction is formed when a phone is used for 2-4 hours a day. There were no significant differences in screen time between students with different school achievements, as well as between male and female students. However, when gender differences were examined for different categories of mobile phone applications, the results showed

that female students spent more time on social media applications while male students spent more time using multimedia applications.

Keywords: *self-assessment, actual screen time, gender differences, social media*

INTRODUCTION

Today, in an average Western European household, one can find a television, a desktop computer, a laptop, game consoles, several smartphones, and a tablet. Children themselves often have access to all these devices from an early age (Sigman, 2012). Time spent watching television, playing a video game, or using an electronic device with a screen (such as a smartphone or tablet) is, according to the Merriam –Webster Dictionary, termed screen time. Defining the term through the years of research has caused „conceptual chaos” (Kaye et al., 2020) because definitions of screen time vary, causing confusion and nonuniformity in the field. Different conceptualisations also reflect on the measurement of screen time itself. As a result, it is unsurprising that self-report measures, widely used to track screen time, vary considerably. The differences in the conceptualisation of the term could be attributable to the fact that the field of study is new, and the academic community has yet to define a common terminology (Kaye et al., 2020). At the same time, a need exists for a uniform measure of screen time, one that is as objective and as precise as possible. According to recent data from the USA, an average adult spends more time on a mobile phone (3 hours and 43 minutes daily) than watching television (3 hours and 35 minutes daily) (Wurmser, 2019). Additionally, in 2021 there were 6.4 billion mobile phone users worldwide (O’Dea, 2022), roughly 80% of the population. Since mobile phones are taking over the market for screen devices (StatCounter, 2022), this study takes a closer look at mobile phone screen time.

According to Johnson (2021), the average daily time spent using the Internet on a mobile phone was 36 minutes ten years ago, and in 2019 it increased to 132 minutes a day. Data shows that younger generations spend even more time on mobile phones. In a study conducted in 2015, university students spent 5 hours a day on average using their mobile phones, out of which they spent 4 hours online (Atas & Celik, 2019).

Along with the increase in time spent on mobile phones, there is also a growing concern about using them. According to the Pew Research Center (2018) study, more than 50% of parents and children think they spend too much time on their mobile phones. The addictive behaviour of adolescents was of particular concern; 72% of teens checked messages as soon as they woke up, and 56% showed signs of anxiety and sadness when their mobile phone was not with them. A national study conducted in the USA found that adolescents stay awake for several hours longer than the scheduled time for sleep because they are using their mobile phones. Although they are aware that such usage reduces their attention span, the behaviour persists (Screen Education, 2018).

Gender differences in the time spent using a mobile phone, content of usage and addiction in adolescence were frequently researched. One of the findings is that adolescent girls are more likely to use mobile phones than boys because a mobile phone is primarily used for communication and emotional support (Geser, 2006). Additionally, recent research shows that, with the emergence of smartphones, the mobile phone usage patterns of males and females are different. While females use smartphones for accessing social networking sites and instant messaging applications (Anshari et al., 2016), males use them for gaming, music, and news updates (Pawlowska & Potembska, 2012, Andone et al., 2016; Chen et al., 2017; Taywade & Khubalkar, 2019). The gender differences in smartphone usage could also be explained by the finding that males spend more of their screen time on their computers and gaming consoles than on their mobile phones (Chen et al., 2017; Lee & Kim, 2018).

Time spent on a mobile phone is also related to student's academic success and education satisfaction. A study conducted on Chinese students found that more screen time is connected to lower grades (Krithika and Vasantha, 2013). Subsequent studies show that school success was also negatively correlated with mobile phone addiction (Ng et al., 2017; Baert et al., 2018; Lepp et al., 2015; Boumosleh & Jaalouk, 2018; as cited in Shoukat, 2019). Furthermore, Kuzneff and Titsworth (2013) have shown that the usage of mobile phones during classes strongly influences the comprehension of lessons. Students who do not use their mobile phones during class have marked down 62% more information in their notes, recalled more details from lectures and scored better on multiple-choice tests. However, some research shows that the effect of mobile phone usage on academic success was more severe among male students than among females (Nayak, 2018).

One of the first studies on screen time usage among young people in Croatia was done by Relja and Božić (2012), who found that already ten years ago, a mobile phone was the primary source of communication for young people, which was at the same time the main use for mobile phones for them. In another study by Ilišin et al. (2013), young people aged 14-29 reported spending 3.38 hours on the Internet and 2.48 hours watching television. Five years later, the average time spent on the Internet was 3.49 hours (Gvozdanović et al., 2019). A couple of studies on screen time done with younger children are indicative of early habits of device usage in younger generations in Croatia. A major national study done in 2017 shows that the average time a pre-schooler spends in front of a screen is 2.4 hours daily on weekdays and 3 hours daily on the weekend (Buljan Flander, 2017). Similar findings were reported by Roje Đapić et al. (2020). This is supported by a qualitative study done with 8-year-olds and their parents, wherein in nine out of ten families, smartphones were available for children to use (Topić and Kovačević, 2018).

Šišara et al. (2020) examined how young adults (18-25-year-olds) spend their time online and found that 51% of Croatian youth spend from 3 to 4 hours a day using their mobile phones, while only 26% report that they spend more than 5 hours a day using their mobile phone.

Some insights on gender differences in screen time in Croatia come from a longitudinal study on social media use, showing that female students aged 14-15 spend significantly more time using social media than their male counterparts (Kuterovac Jagodić, 2020). Most students reported using social media for less than 4 hours a day. In another longitudinal study, screen time was conceptualised as one of the indicators of sedentary behaviour in adolescents, and it included activities like playing video games, watching TV, and browsing the Internet. The average screen time per day reported in that study was 4.36 hours (Štefan et al., 2018). There were also certain studies done in the Croatian context that investigated specific mobile phone functionalities used by young people; Knežević & Delić (2017) studied the usage of mobile shopping applications, and Kim et al. (2020) provided a better understanding of how young people use mobile devices and applications to manage their health issues.

All of these studies done in the Croatian context, as well as most of those done worldwide, used some form of a subjective self-report measure to indicate screen time (e.g., questionnaire, survey or interview). Self-assessment measures are not always accurate, and new technology allows us to cross the gap between self-assessment and real-time. Andrews et al. (2015) found that while the number of phone usage during the day was far greater than what the participants had estimated for themselves, there was no significant difference between the estimated time spent using a mobile phone and the actual time, suggesting that respondents' self-assessments have to be interpreted with caution. Furthermore, Boase and Ling (2013) found that self-assessments of time spent on a mobile phone were moderately correlated with actual time spent on it, and Lee et al. (2017) found that respondents underestimated time spent on a mobile phone by 40%.

It also needs to be noted that even research that has used an objective measure of screen time, such as an application for screen time tracking, was primarily conducted with users of the iPhone Operating System (iOS) (Elhai et al., 2018, Rozgonjuk et al., 2018). Other objective measures that were used were phone calls and sent SMS (Foerster et al., 2015), the number of times a person has checked their phone (Rozgonjuk et al., 2018), and the number of interactions with a smartphone that lasted less than fifteen seconds (Wilcockson et al., 2018). However, research that has attempted to validate self-assessments of screen time, comparing them with objective measures, more often than not, found weak or even non-existing relationships between the two (Ellis, 2019).

Considering these findings on the inadequacy of self-reports in assessing screen time spent using mobile phones, one goal of this study was to see how well the self-reported screen time corresponds to the actual screen time measured with a more objective and widely available tool. To the authors' knowledge, there are still no studies that have used an objective measure of screen time in the Croatian context. Moreover, since younger generations nowadays are the ones that have access to mobile phones from an early age and use it heavily in their adolescent years, it is crucial to collect reliable data on how much they really use their mobile phones

and how precise they are in their estimations. Not only can this serve as an indicator of how accurate previous findings on adolescents' mobile phone use were, but it can also provide us with some first insights into actual screen time in this age group. Therefore, another goal of this study was to contribute to a better understanding of gender differences in screen time, as well as differences depending on the school success of high schoolers in Croatia. Additionally, we wanted to explore our students' attitudes on the recommended daily usage of mobile phones, as well as what the threshold is for declaring mobile phone addiction.

Although there are recent studies which used an objective measure to draw certain conclusions about teenagers' screen time (e.g. Dahlgren et al., 2021), self-assessments are still the most commonly used measure when analysing young people's screen time (Barthorpe et al., 2020, Twenge & Farley, 2020, Xiao et al., 2020, Khan et al., 2021, Magid et al., 2021, Tang et al., 2021, Soares et al., 2021). Hence, by using an objective measure, we not only aim to gain a better understanding of teenagers' mobile phone usage in general, but we also want to gain a deeper understanding of how exactly they use their phones, i.e. how much time they spend using specific mobile phone applications. The main difference between our work and previous work in this field is that most of the research relied on self-reported screen time, and even in cases where an objective measure was used, analyses were based solely on the overall recorded screen time.

According to our goals, three research questions were formed as follows:

1. How much time do high-school students spend using their smartphones daily, and additionally, is there a discrepancy between the self-reported and the actual time spent on a mobile phone?
2. Are there gender differences in the time spent using a mobile phone?
3. Are there differences in time spent on a mobile phone depending on a student's school success?

We assumed that students would spend an average of 3 to 4 hours a day using their smartphones and that they would underestimate the actual time spent on their smartphones. Furthermore, girls would spend more time on their smartphones, and school success would negatively correlate with screen time.

METHOD

Participants

Convenience sampling was used to gather high-school students aged 15-18 as participants in this study. The selection procedure consisted of randomly selecting 6 students (3 female, 3 male) from 26 classes of all four grades of Gornjogradska gimnazija in Zagreb, Croatia. The reason the sampling was done this way was that not enough resources were available to include all students attending this gymnasium/grammar school in a procedure that we intended to make as rigorous and as controlled as possible. To avoid the self-selection of participants and make sure that there is an equal number of male and female students, it was decided to conduct the sampling in this manner. The initial sample consisted of 156 participants, but the analysis proceeded to the sample of 130 students, for whom we had complete data. Sample characteristics are shown in Table 1.

Table 1, Sample characteristics (N = 130)

Grade	Number of classes	Number of students	Percentage (%)
1	7	30	23.1
2	7	37	28.5
3	6	31	23.8
4	6	32	24.6
Gender	Frequency	Percentage (%)	
Female	68	52.4	
Male	62	47.6	
School success	Frequency	Percentage (%)	
Sufficient	1	8	
Good	15	11.5	
Very good	65	50	
Excellent	49	37.7	

Instruments and the procedure

The research was conducted in November and December of 2019 and consisted of two parts. In the first part, students filled out a questionnaire and were asked to download the mobile application Screen Time (Version 1.3.3; Iridium Dust Limited, 2019), which records the time spent on a smartphone. The questionnaire consisted of the following: first, there were three items about the participant's gender, the grade they attended, and their school success in the previous grade. Then, there were three questions on the usage of mobile phones: participants were asked how much time they spent on their mobile phones daily; how much time they

thought was recommended to spend on one's phone in a day, and after how many hours a day one develops a mobile phone addiction. These three questions were answered on an ordinal scale, where answers were "less than one hour", "one hour to two hours", "two to four hours", and "more than four hours", while for the last answer, participants could also specify how many hours exactly. The questionnaire was administered in a paper format in the classroom.

After completing a questionnaire, students were asked to download the mobile application Screen Time, which records the time spent on a smartphone. Screen Time monitors users' activity and provides data on the daily use of the mobile phone as well as the applications installed on it. In the case of iOS users, a built-in tool for tracking phone usage was used. After one week of monitoring their screen time with these tools, students were asked to report recorded time that they had spent using their smartphones in the one-week period in the format of hours and minutes. Additionally, participants were asked to report the exact time that they have been using specific applications (Instagram, WhatsApp, Viber, Facebook, Facebook Messenger, Snapchat, YouTube, Google Chrome/Safari, Deezer/Spotify/Soundcloud, Netflix, Pinterest, Camera, E-mail, mobile games). To ensure the correctness and prevent the possibility of false data entry, the research assistant checked whether the reported data of each student matched the data on their phone for overall weekly usage and the five applications that the research assistant would select randomly.

RESULTS

The self-reported measure of screen time and a review of students' attitudes

A complete overview of students' self-reported screen time, as well as their attitudes towards mobile phone usage, are represented in Table 2, while Figure 1 shows the visualisation of students' answers.

When asked about how much time they think they spend using their smartphone daily, the largest number of students (46.2%) chose the answer "from 2 to 4 hours a day", while only 10% of the students estimated that they use their smartphones less than 2 hours a day. Not one student estimated that they spend less than an hour a day using their smartphone, but as many as 26.2% of the students estimated that they use their smartphones for more than 6 hours a day.

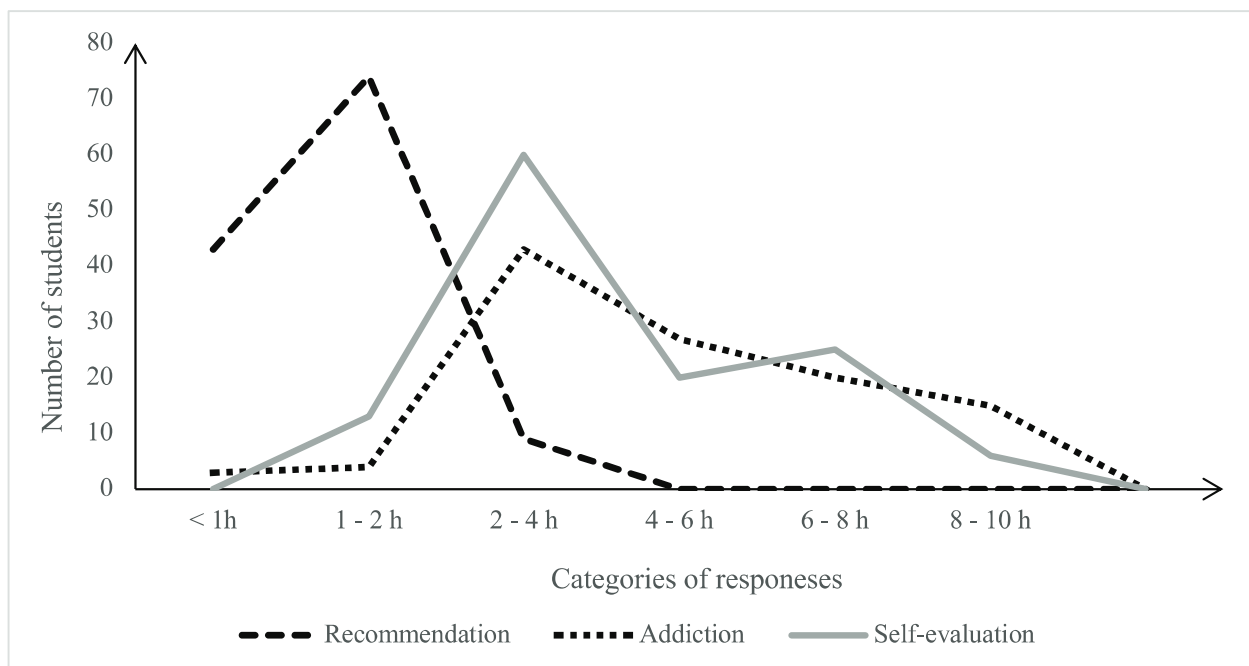
As for the students' attitudes on the daily recommended time for using a mobile phone, the largest percentage of students (57.7%) believe that one should use a mobile phone for 1 to 2 hours a day, while only a couple of students (7.7%) think it should be used for 2 to 4 hours a day. Not a single student believes a mobile phone should be used for more than 4 hours a day. Regarding the students' view on the daily hours spent using a mobile phone, after which one

becomes addictive, one-third of the students (33.1%) feel that even 2 to 4 hours a day may imply smartphone addiction.

Table 2, Frequencies and percentages of students' answers to questions regarding habits and attitudes towards mobile phone use (N=130)

Item	Answer	Frequency	Percentage (%)
How much time do you spend on a mobile phone on average per day?	1 to 2 hours	13	10
	2 to 4 hours	60	46.2
	4 to 6 hours	20	15.4
	6 to 8 hours	27	20.8
	8 to 10 hours	7	5.4
How much time a day is recommended to spend on a cell phone?	Less than 1 hour	43	33.1
	1 to 2 hours	75	57.7
	2 to 4 hours	10	7.7
After how much time you spend on your cell phone a day, do you feel addicted?	Less than 1 hour	3	2.3
	1 to 2 hours	4	3.1
	2 to 4 hours	43	33.1
	4 to 6 hours	28	21.5
	6 to 8 hours	20	15.4
	8 to 10 hours	16	12.3

Figure 1, Comparison of estimated daily recommended time using a mobile phone, estimated daily time using a mobile after which addiction is formed, and estimation of one's own mobile phone use. N = 130



In further analysis, Spearman's coefficient was calculated to examine the correlation between students' self-evaluations of screen time and attitudes toward mobile phone usage. Statistically significant correlations were found between students' self-evaluation of time spent using a mobile phone daily and the evaluation of recommended daily use of a mobile phone ($r(125) = .267, p < .01$), as well as between the recommended time and the estimated time it takes on a daily basis to develop an addiction ($r(112) = .219, p < .05$).

Analysis of student mobile phone usage based on data from the Screen Time application

First, the reported weekly mobile phone usage time was recoded into average daily values (hours per day). The descriptives are in Table 3. To make the interpretation clearer, the most used mobile applications are grouped into two categories - social media applications (Instagram, WhatsApp, Snapchat, Viber, Facebook, Facebook Messenger and SMS) and multimedia applications (YouTube, Netflix, Deezer). Based on the Screen Time application data, students use their mobile phones for 5 hours and 29 minutes daily on average, of which 2 hours and 28 minutes are spent on social media applications and 1 hour and 26 minutes using multimedia applications.

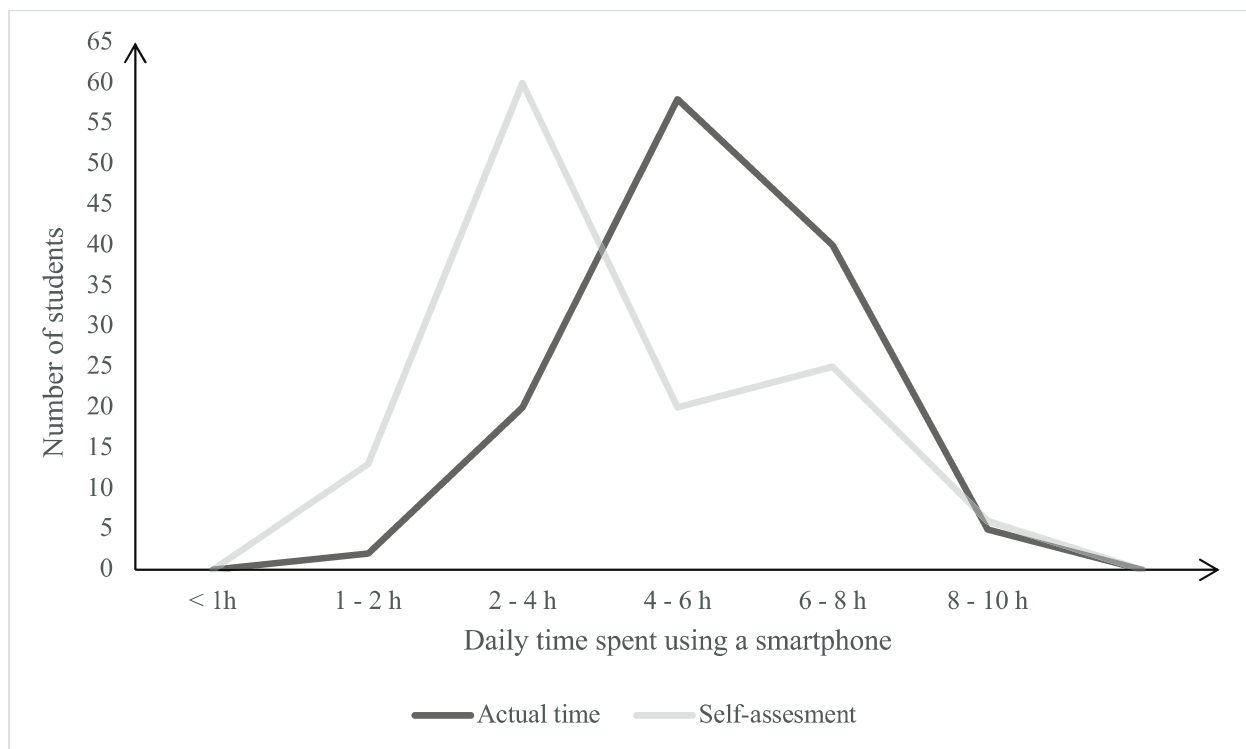
Table 3, Descriptive statistics for smartphone usage obtained by Screen Time application (N = 130)

	M	M _h	SD	Min	Max.
Daily usage	5.48	5:29	1.642	1.25	9.69
Social media apps	2.47	2:28	1.405	0.26	8.31
Multimedia apps	1.44	1:26	1.093	8.31	4.3

Legend: M – mean; M_h – average daily smartphone usage expressed in hours and minutes; SD – standard deviation; Min. – minimal observed value; Max. – maximal observed value

Figure 2 shows the comparison of self-assessment and the actual time spent using a mobile phone. To examine whether there is a difference between self-evaluation and the actual time spent using a mobile phone, a nonparametric Wilcoxon sign-rank test was done. Considering that the students' self-evaluated screen time is expressed in categories, i.e., it is an ordinal variable, the data transformation was done on the data from the Screen Time application to make it categorical as well. Wilcoxon's sign-rank test showed that there is a statistically significant difference between the self-evaluated screen time and the actual screen time ($Z = -9.384; p < .001$). The largest percentage of students estimated that their daily usage time was 2 to 4 hours, while in reality, the actual number of hours that the majority of students spend using a mobile phone is between 4 to 6 hours a day (more specifically, 5 hours and 29 minutes, as already established). The results of this nonparametric analysis show that students underestimate the time they spend using a mobile phone. To further examine the disparity between self-reports and an objective measure, we calculated Spearman's correlation coefficient between the two ($r(127) = .318, p < .001$).

Figure 2. Comparison of self-assessment and the actual time spent using a mobile phone.
N = 130



To obtain a more detailed view of the discrepancy between students' self-evaluations and the direct measure of screen time, for each student, we calculated the difference between the self-evaluated screen time and the actual screen time obtained through the Screen Time application, earlier recoded into a categorical variable. This way, we could see that 64.6% of students underestimated the number of hours spent on their mobile phones, 19.2% of them gave an accurate estimation, and 15.4% of students overestimated their screen time

Gender differences in mobile phone usage

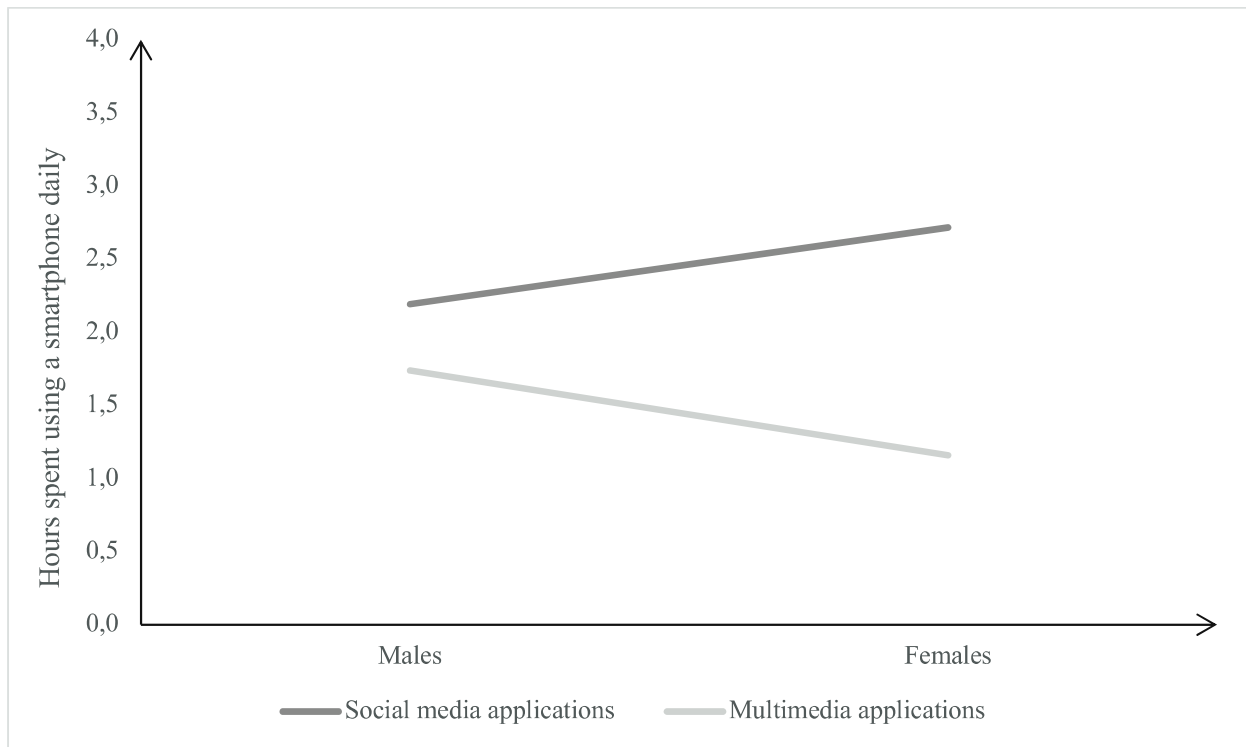
In an attempt to examine gender differences in mobile phone usage, we conducted a t-test using Screen Time application data. The test showed no significant difference between female and male students in the overall time spent on mobile phones ($t = 0.785$; $df = 128$, $p = .434$).

However, when we test gender differences using time spent on different mobile phone applications, the results indicate a different conclusion (Figure 3). We used the categorisation previously mentioned, categorising the applications into two categories - social media and multimedia applications. The ANOVA procedure indicated that there is a significant difference between females and males in time spent using certain applications ($F = 6.492$; $df = 2, 127$; $p = .01$), with the effect size of $\eta^2 = .09$, which is indicative of moderate to high effect size.

Male students spend 2 hours and 11 minutes daily on average using social media applications, while female students spend 2 hours and 43 minutes on average using the same applications.

Hence, female students spend, on average, 32 minutes more using social media applications than male students. On the other hand, male students spend 1 hour and 44 minutes a day on average using multimedia applications. In comparison, female students use multimedia applications for 1 hour and 10 minutes daily, meaning that female students spend, on average, 34 minutes less than male students using multimedia applications.

Figure 3, Gender differences in the usage of different types of mobile phone applications.
 $N = 130$



Comparison of mobile phone usage with respect to school success

Another goal of this research was to examine if there were differences in using a mobile phone depending on students' academic achievement. ANOVA showed that these differences do not exist ($F = 1.186$; $df = 3, 126$; $p > .05$). Moreover, we examined if there are differences in using specific categories of applications based on students' academic achievement, but ANOVA again indicates that the differences do not exist ($F = 0.434$; $df = 2, 125$; $p > .05$). To conclude, students who are more successful in school, as well as those who are somewhat less successful, spend on average an equal number of hours using their mobile phones. However, one should be aware that the lack of statistical differences between categories of student achievement could be a result of a small number of students in each of the categories.

DISCUSSION

The discrepancy between the reported and the actual time spent on a mobile phone

If we were to believe the self-reports on mobile phone usage, we would claim that high-school students sampled in this study spend 2 to 4 hours a day using their mobile phones. These results are in line with studies on screen time done in Croatia so far. However, when we take into account data from an objective measure of daily screen time, it is clear that the average time these high-school students spend on their mobile phones is 5 hours and 29 minutes per day. Given that the average time spent on a mobile phone increases every year (Johnson, 2021), this result is not so surprising. Moreover, according to recent research done on a representative U.S. sample, teenagers spend, on average, 7 hours and 22 minutes daily using their smartphones (Rideout & Robb, 2019). Our high schoolers spend most of their screen time on applications used for communication and multimedia applications. These results are in line with research conducted in the Croatian context, in which the most significant number of high-school students used their smartphones to stay connected to their friends and family but also as a way of entertaining themselves through listening to music (Relja & Božić, 2012). We could therefore postulate that teenagers use their mobile phones both as a necessity, but also as a way of fulfilling their needs for social interaction and interpersonal connection, and as a source of entertainment. It is also often discussed that smartphones have become status symbols, a part of one's social identity (Relja & Božić, 2012), and having in mind the emerging trend of forming and maintaining an identity on social media platforms, it should not come as a surprise that teenagers spend almost a fourth of their day using their mobile phone.

As for the students' attitudes towards smartphone usage, most of them feel like they spend more time using their smartphones than they think is recommended, which is 1 to 2 hours a day. A significant correlation between the estimated recommended time and the estimated time one spends using a smartphone could imply that students are, in some way, justifying their behaviour since the more time they think they spend using their mobile phones, the more they estimate is recommended to spend using one's phone. This could be interpreted as a mechanism not to categorise their own mobile phone usage habits as problematic but more in line with the norm, as they define it. However, these conclusions should be drawn with caution since the correlation is not that big. Furthermore, another small yet significant correlation has been found between students' estimates of the recommended time for using a mobile phone and the time after which a mobile phone addiction is developed: This is also in line with the earlier interpretation since it is expected that if one estimates that it is recommended to spend fewer hours a day using a phone, the lower the perceived threshold for forming a mobile phone addiction is expected of this person to have. However, as shown in Figure 1, it is clear that the dispersion of estimates of the recommended time is limited; not one student thinks it is recommended to spend more than 4 hours a day using a smartphone, which could affect the size of the correlation coefficient. Our results showed no significant cor-

relation between the estimated addiction threshold and the estimated daily time spent using a smartphone. Also, no significant correlations were found between mentioned attitudes on smartphone use and the actual time spent using a mobile phone.

When comparing self-reported mobile phone usage with actual time spent using a mobile phone measured via the Screen Time application, our results show that most of our participants tend to underestimate it, i.e., they think they spend less time on their smartphones than they really do. Only a small proportion of participants reported spending more time using their smartphones than recorded with the Screen Time application. It is, however, important to note that only 19.2% of students accurately estimated their daily screen time. One might interpret the correlation ($r(127) = .318, p < .001$) between self-report and objective measure as indicative of a moderate relationship, which then might seem contradictory to declaring self-reports as inadequate. However, the context of this correlation coefficient must be considered – in this case, we would expect it to be the highest possible since self-reports and data from the Screen Time application are both measures of the same construct, and that is daily mobile phone usage. A moderate correlation coefficient, therefore, does not suffice and is, in fact, especially problematic considering that self-reports are still the most common measure of screen time used in research, their construct validity being taken for granted completely uncritically. If, as our results suggest, only roughly 20% of data on mobile phone usage based on self-reports is accurate, then that brings some of the conclusions into question, which could be especially problematic when, for example, the relationship between screen time and mental illness is researched. In a national study of using modern technologies in early childhood, authors state that “children with highest levels of anxiety-depression are those who spend more screen time”, while the paper does not explain how exactly the screen time was measured, except for stating that the data was collected from parents using self-report measures (Selak Bagarić et al., 2021). In addition, the discrepancy between the self-report and the actual measure shows us that students are usually not aware of how much time they spend using their mobile phones. Because of this, they cannot be expected to be critical of their mobile phone usage, making self-regulation more difficult.

Screen time and gender differences

The results show that both female and male students use mobile phones for an equal number of hours daily, but how they use them is different. While female students spent an average of 32 minutes per day more than male students using social networks and correspondence applications, male students spent roughly the same number of minutes per day more than female students using multimedia applications, such as watching YouTube videos. These gender differences are in line with previous research on screen time (Pawlowska & Potembska, 2012, Andone et al., 2016, Rideout & Robb, 2019) and serve as additional proof that female and male adolescents use their smartphones in specific ways, which is something that should be researched more deeply, and considered in future interventions on mobile phone use.

Screen time and academic success

In contrast to previous research (Krithika and Vasantha, 2013; Ng et al., 2017; Baert et al., 2018; Lepp et al., 2015; Boumosleh and Jaalouk, 2018; as reported in Shoukat, 2019), our results do not show differences between students based on their academic success in the amount of time spent using their mobile phones. One possible explanation is that today's high schoolers grew up with digital technology, which has become an important part of their everyday lives, even school life. They use their phones not only for communication and entertainment purposes but also to search for information and do their homework, presentations and other school-related tasks. Therefore, future research on the relationship between academic success and screen time should clearly differentiate the portion of screen time spent on school-related activities from other uses of smartphones to get a better insight into how different smartphone usage patterns affect school success. However, our results should be interpreted cautiously because of the type of measure used for academic success, which was expressed in 4 categories (sufficient, good, very good and excellent). Although this is the conventional way of expressing academic success in Croatia, it would be better if we used an interval scale, i.e., the average grade, which would then be expressed with two decimals. This way, we failed to capture the differences in school success in this rather homogenous group of students since, for example, 50% of participants reported "very good" as their passing grade for the previous grade (see Table 1).

Limitations

One of the limitations of this research is a somewhat smaller sample size ($N = 130$), based on which conclusions should be drawn cautiously. This is especially important to note when considering the gender and academic achievement differences we have obtained since the compared groups were even smaller. Moreover, in future research, vocational school students should also be incorporated, not just grammar school students. That way, we could gather a sample that is more heterogeneous regarding academic achievement and more representative of the whole population. Overall, the generalizability of our findings is limited due to our sample consisting of students from one grammar school in the capital city. Better generalizability could be achieved in future studies with bigger samples consisting of more Croatian high schools from different regions. Moreover, conclusions were limited due to ordinal measuring scales used for some questions (e.g., perceived screen time). More precise results would have been obtained if an interval scale had been used instead. There are several reasons we chose the ordinal scale for perceived screen time. Firstly, we suspected that students would not answer sincerely about the time they spend on their phones, so to prevent that, we offered them categories for orientation. Also, open-ended survey questions are more likely to be left unanswered, so using multiple-choice questions could also help prevent missing data. Since categorical measurement of perceived screen time was also used in existing literature (e.g. Boase and Ling, 2013), the chosen scale seemed appropriate for answering our research questions while obtaining as much data as possible.

To gain a deeper understanding of students' habits and attitudes toward mobile phone usage, the qualitative methodology would be far more appropriate.

Practical implications

The disparity between self-reported screen time and an objective measure of screen time obtained in this study could serve to encourage future research in the field to apply novel practices to minimise the error of conclusions. We hope to raise awareness of how questionnaires are not suitable methodological tools for measuring screen time, especially when better technological solutions are easily available. The lack of such awareness could lead to erroneous conclusions, which are especially problematic when correlating screen time to constructs such as depression or anxiety, drawing conclusions on the connections between screen time and mental health, all of which should be drawn with great caution. The measures used in this context should be as reliable as possible.

Moreover, results obtained from our high schoolers indicate that the self-awareness of one's screen time is lacking, which then could prevent self-regulatory behaviours if one's screen time really is problematic and an intervention is needed. Knowing this, more suitable education programmes about the possible drawbacks of mobile phone usage could be developed, and clear data on the actual usage of mobile phones could guide better educational policies. Additionally, different interventions done in a school setting could target female and male students differently, knowing that their mobile phone usage patterns are not the same. While female students could benefit more from educational materials on safely using social media, for male students, it would be more beneficial to provide information on the use of multimedia on mobile phones.

CONCLUSION

When asked about their daily habits of using a mobile phone, most of the students estimate that they spend 2 to 4 hours a day using their mobile phone, while the data from an objective measure of screen time shows that our high-schoolers spend on average 5 hours and 29 minutes per day using their mobile phone. The majority of students underestimate the time spent on their smartphones. Female students use their phones more than male students for communication purposes, while male students use them more for entertainment purposes, like watching videos. These differences reveal how qualitatively different the experience of mobile phone usage is between female and male high-school students in our study. Our results show no significant differences in time spent using a mobile phone between students of different academic achievements but conclusions on this topic are limited because of the suboptimal measure of academic success used in our study.

Overall, our findings could serve as a preliminary overview of certain patterns that characterise the usage of mobile phones among high-school students. Although the generalizability of our findings to the population of all Croatian students is limited due to the small sample size and specific sample characteristics (only a portion of one grammar school's students; from the capital), our study could serve to orient future research on screen time and to encourage the use of novel technological tools in education research.

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KOLIKO SU SREDNJOŠKOLCI STVARNO NA MOBITELU? - SPOLNE RAZLIKE U UPORABI MOBITELA I PERCEPCIJA VREMENA PROVEDENOG NA MOBITELU KOD SREDNJOŠKOLACA

Sažetak

Broj sati provedenih na mobitelu posljednjih se godina sve više povećava što je posebno vidljivo kod mladih generacija. Većina istraživanja o ovoj temi uglavnom se temelji na mjeri samoprocjene vremena pred ekranom. U Hrvatskoj je relativno malo studija o mobitelima i njegovom utjecaju. Stoga je cilj ovog istraživanja bio ispitati koliko sati hrvatski srednjoškolci provode na mobitelu te uočiti postoji li odstupanja u samoprocjeni vremena na mobitelu u odnosu na objektivnu mjeru dobivenu pomoću mobilne aplikacije za praćenje vremena. Nadalje, analizirane su spolne razlike u vremenu provedenom pred ekranom kao i razlike između različitih razina akademskog postignuća učenika. U istraživanju je sudjelovalo 156 srednjoškolaca u dobi od 14 do 18 godina. Od ispitanika je zatraženo da ispune upitnik o navikama i stavovima uporabe pametnih telefona, dok je njihova upotreba pametnog telefona praćena tijekom tjedan dana pomoću aplikacije Screen Time. Konačna je analiza napravljena na temelju podataka prikupljenih od 130 sudionika. Većina učenika navodi da se koristi pametnim telefonom od dva do četiri sata dnevno, dok im je stvarno provedeno vrijeme ispred ekrana u prosjeku 5 sati i 29 minuta dnevno. Njih 64,6 % učenika podcjenjuje svoje vrijeme provedeno na pametnim telefonima. Učenici većinom smatraju da je preporučljivo jedan do dva sata dnevno koristiti se pametnim telefonom te misle da se ovisnost stvara ako se telefon koristi dva do četiri sata dnevno. Nije bilo značajnih razlika u provedenom vremenu na mobitelu između učenika različitog školskog uspjeha kao ni između učenika i učenica. Međutim, kada su ispitane spolne razlike za različite kategorije aplikacija za mobitele, rezultati su pokazali da učenice provode više vremena na aplikacijama društvenih mreža, dok učenici provode više vremena koristeći se multimedijским aplikacijama.

Ključne riječi: *samoprocjena, stvarno provedeno vrijeme na mobitelu, spolne razlike, društvene mreže*