Laura Marciano Anne-Linda Camerini 10

THE SMARTPHONE: ALLY OR ENEMY?

Tips for a healthy and balanced digital life









© copyright 2022 by Carocci editore, Rome

Original edition: *Lo smartphone: alleato o nemico? Consigli per una vita digitale sana e bilanciata* (Carocci, 2022)

Graphic project by Ulderico Iorillo and Valentina Pochesci



05 Preface

07 PART ONE THE SMARTPHONE: ALLY OR ENEMY?

- 08 Introduction
- 10 Behavioural addictions
- **13** From gambling to online gaming
- 14 Digital addictions
- 17 Problematic use of smartphones and social media
- 19 Psychological factors related to digital addictions
- 20 A bit of methodology
- **25** Tracked data and problematic use of smartphones and social media
- **Z7** The cognitive consequences of digital addictions
- 30 The socio-emotional consequences of digital addictions
- **3** The adolescent brain
- 37 The importance of the online social world for teenagers
- 40 Theories on digital addictions
- What should we do log off?
- 46 Balanced and healthy Internet use
- 47 Conclusions

49 PART TWO SMARTPHONE ADDICTION

63 Glossary

PREFACE

How familiar are we with the repercussions of scientific research and medical practice for our daily lives? What are the "passions" and motivations that drive researchers and healthcare professionals? What do we know about their professions?

Society strives to make science and its implications known to ordinary people in many different ways. Just think, for example, of the variety of leaflets promoting the importance of a healthy lifestyle and well-being in general. Of course, school does its part as well, introducing the principles of scientific literacy and raising awareness of a series of issues that help foster scientific thinking among young people.

These considerations are in fact the starting point for the *Let's Science!* project, carried out by the IBSA Foundation for Scientific Research in collaboration with the Department of Education, Culture, and Sport of the Canton of Ticino (DECS). The partnership has made it possible to identify interesting topics that have been addressed by the project, getting scientists working in the canton involved. Two different worlds that are often far apart – scientific research and school – have thus been brought together, promoting dialogue between professionals and students through themed workshops, in order to develop awareness of both the topic itself and how to communicate it.

But what was the range of topics the project would address and what considerations led to certain strategic decisions? Science and research are advancing rapidly, especially in biomedicine and related disciplines, and the continuous expansion of fields of investigation requires a constant effort to stay up to date, in order to both maintain a historical perspective and accommodate the numerous innovations. Access to scientifically accurate information, conveyed in accessible language, opens up the opportunity for children to get to know and become passionate about topics that are generally considered "difficult".

And that's the idea behind the *Let's Science!* series, which aims to broaden the range of scientific topics that can be explored at school. The topics, which are interdisciplinary and directly related to individual health and well-being, are presented in an innovative way: the scientific text is in fact accompanied by a story that draws on the experience of cantonal middle school classes, who,

under the guidance of their teachers, developed original scripts, which were then translated into comics by professionals in the industry.

The only thing left for us to do is invite young readers to explore the fascinating fields of research presented by *Let's Science!*, which in turn open up opportunities for further questions and insights. Who knows, one of these readers might in turn one day become the one taking important steps forward in understanding the complexity of life and the delicate balance that allows us to be healthy and happy. Enjoy reading!

SILVIA MISITI

Director of the IBSA Foundation for Scientific Research

NICOLÒ OSTERWALDER

Educational consultant for science at the Department of Education (DECS)





I think about spending a bit of time on my smartphone during the day. And when I say, "a bit", I mean "a lot". I'm not sure how much time I spend on my phone on average, but I know I could go to bed much earlier and finish my homework faster if I just stopped using it. I do lots of things with my smartphone, such as messaging other people, using Snap, and playing games... so it still has a positive effect on my well-being, because otherwise, I wouldn't have the friends and relationships I have today. But I also feel the negative effects because of the time it takes away from my homework or going to sleep, for example.

These words of a teenager, interviewed in 2020, are a good description of the pervasive use of new technologies, such as smartphones. Today, teenagers' everyday lives are characterised by the use of the Internet, smartphones, and social media. According to the data from the **JAMES study**, a representative survey carried out every two years in Switzerland on the use of media and leisure time by young people aged between 12 and 19, 97% of young people aged between 12 and 19, 97% of young people that reaches 100% in late adolescence. In addition, 79% of 13-year-olds say they use social media nearly every day, a percentage that rises to 97% among 18-year-olds.

And it is precisely during the transition from primary school to middle school at around age 11 that most young people are given a smartphone, as the Mediaticino study reports [figure 1].

The most widely used social media platforms are WhatsApp, Instagram, Snapchat, TikTok, YouTube, Facebook, and Twitter. An important figure is the amount of time spent on these platforms: the largest increase in time spent using digital media in the last ten years was recorded in 2020, perhaps as a result of the COVID-19 pandemic. Swiss adolescents spent more than three hours a day online during school days and more than five hours a day on the weekend. Meanwhile, they spent almost three hours a day on their smartphones during school days and four hours a day on the weekend.

Given that the use of the Internet, smartphones, and social media has increased and is increasingly becoming part of everyday life, a common concern is wheth-



🚺 Figure 1 Ownership of devices among adolescents



er the use of digital media could be harmful to young people's well-being, especially considering that some data showed a **decrease in well-being** (for example, happiness) and an **increase in depressive symptoms** after the introduction of the smartphone. In addition, it seems difficult to define when smartphone use is "healthy" and when it becomes "problematic", leading to digital addiction.

Answering these questions is not easy, especially considering that nowadays everything is done online, from the simplest daily task to homework and professional work. So how is it possible to be "addicted" to something that is part of everyday life? How should we define "problematic use" of the Internet, smartphones, and social media? Why is it important to study digital addictions in young people?

Before answering these questions, we need to take a step back and understand what it means to **be addicted** to something that is not a substance (such as

alcohol or drugs), but a behaviour. To do this, we need to introduce the concept of **behavioural addictions**. In addition, we also need to understand **why young people – and adolescents in particular – are most at risk**.



Behavioural addictions have been the subject of debate for decades. Research and clinical experience suggest that behaviours carried out in an **intense** (in terms of duration), **repetitive** (in terms of frequency), and **problematic** (in terms of social relationships, at school, and work) way can cause significant problems, regardless of the nature of the specific activity. People can not only smoke cigarettes, drink alcohol, and use drugs but also **gamble**, **play video games**, use the Internet, engage in sexual activities, shop, exercise, eat, or tan excessively [figure 2].

However, not everyone who is heavily engaged in these activities can be considered to have a **clinical addiction**. To diagnose addiction, psychological



Table 1 List of 11 Symptoms of Substance-Related Addictions

LOSS OF CONTROL

- **1.** Consuming the substance in larger quantities or for a longer time than originally intended.
- 2. Desire and failed attempts to stop or reduce use of the substance.
- **3**. Spending a lot of time acquiring, using, or recovering from the effects of the substance.
- 4. Having an intense desire (craving) to use the substance.

IMPAIRMENT

- 5. Failure to fulfil major obligations at work, school, or home.
- 6. Continued use of the substance, even if it causes (or worsens) social or interpersonal problems.
- **7.** Reducing or giving up a significant social, work, or recreational activity due to using substances.

RISKY BEHAVIOUR

- **8.** Using the substance in physically dangerous situations (e.g. while driving or in dangerous social circumstances).
- **9.** Continuing to use the substance despite knowing that a medical or psychological problem is getting worse.

PHARMACOLOGICAL SYMPTOMS

- **10.** Tolerance: the individual needs to gradually increase the dose of the substance to produce the desired intoxication or effect, or the effect of an administered dose decreases over time.
- **11.** Withdrawal: unpleasant physical effects that occur when the individual stops taking the substance or when it is blocked by a specific antagonist.

and psychiatric specialists refer to a manual that defines psychological conditions, called the **DSM-5** (**Diagnostic and Statistical Manual of Mental Disorders**). This manual has been updated over the years, and the latest version (the fifth edition) was published by the APA (American Psychiatric Association) in 2013. The DSM-5 contains the category "Substance-Related and Addictive Disorders" to describe addictive behaviours. These disorders are measured on a continuum from mild to severe and they are characterised by 11 symptoms [table 1]]. Gambling disorder, the first behavioural addiction to be described, also appears in the same category. Gambling has similar effects on the brain to substances such as alcohol and drugs. These similarities have led us to think that **substance** and **behavioural addictions** are part of a single larger category: **pathological addiction** [figure 3 ^(C)].

In this regard, the **World Health Organization** (WHO) describes pathological addiction as a "psychological, sometimes even physical condition caused by the interaction between an organism and a substance, characterised by behavioural responses and other reactions that include



a compulsive need to consume the substance continuously or periodically, in order to experience its psychological effects and sometimes to avoid the discomfort of withdrawal".

Note that the description, a "psychological, sometimes even physical condition" in the definition, refers to the fact that the psychological condition of addiction can sometimes – but not always – also be caused by a substance. In addition, the definition emphasises how the condition of pathological addiction is caused by the interaction between the individual and the substance or behaviour. We can think of this interaction as a special encounter between the person and the object of addiction: in this encounter, each person has different tastes and preferences. When a person encounters



a substance (e.g., cigarettes or alcohol) or engages in a behaviour (e.g., gambling) that is particularly in line with their tastes and preferences, then this encounter becomes special and particularly rewarding. The person will then try to experience this special encounter again (for example, by consuming the substance or playing the game again) and will struggle to tolerate its absence.



🏷 FROM GAMBLING TO ONLINE GAMING

For the diagnosis of Gambling Disorder, the DSM-5 lists nine criteria that reflect those for substance addiction. The inclusion of Gambling Disorder as a behavioural addiction has paved the way for the classification of other excessive behaviours. However, to introduce a new diagnosis, reliable and consistent scientific evidence from scientific studies and clinical experience is needed.

The scientific literature available up to 2012 suggested that there was one behaviour that deserved more attention, which was therefore included in Section 3 of the DSM-5 (dedicated to "Conditions for further study", i.e. provisional diagnoses that require further investigation): Internet Gaming Disorder (IGD).

The excessive use of video games (*with* and *without* the use of the Internet) is a common phenomenon. However, spending a lot of time playing is a necessary but not a sufficient criterion for a psychiatric condition. Problematic players play not just for fun, but also to forget about their real-life problems and manage negative emotions. Another distinctive feature is loss of control, which prevents players from regulating the frequency and duration of their gaming activities. In severe cases, problems caused by online gaming may include:

- O dropping out of school;
- O losing the job;
- o breaking up with a partner.

The prevalence rates of IGD hover around 3% globally, with the risk being more than twice as high in males. In addition, IGD correlates with high levels

of psychological distress (such as anxiety, depression, hyperactivity, and loneliness), as well as sleep problems (reduced hours of sleep, difficulty falling asleep or sleeping through the night, and daytime sleepiness). Usually, adolescents develop this condition more often than adults, especially when they feel a lack of meaning in life, when they are poorly integrated in the school environment, when they receive little support from their parents, or when their parents already have addiction problems. These conditions, therefore, represent risk factors, which refer to all the factors linked to a person's biology and genetics or to their family environment and social situation that increase the probability of developing a certain disease in the future.



DIGITAL ADDICTIONS

Nowadays, however, there is a discussion not just about IGD, but also of other forms of digital addiction, which can include, for example, the use of the Internet in general, smartphones, and social media.

The first studies on online behavioural addictions, i.e., **digital addictions**, date back to 1999. That year, a researcher named Kimberly Young noted that people can develop problems concerning **different activities online** – including activities such as shopping, gambling, trading, emailing,



cyber-sex, and games – and that they often become addicted to a particular application, which then triggers pathological behaviour. Given that various activities can lead to digital addictions, many researchers have criticised the construct of Internet addiction as a problem and have suggested that **Internet addiction** is a symptom that can be traced back to another underlying psychological problem, which then also finds expression online. This does not detract from the fact that this kind of problem exists and causes significant suffering.

According to these researchers, the Internet is merely how a problem is expressed (addiction *on* the Internet), but is not the object of addiction (addic-

tion *to* the Internet). Due to this lack of consensus in the scientific community and the lack of agreement on how to measure the problem and distinguish it from other existing problems, **Internet addiction has not been included in the DSM-5**. Moreover, today it is more correct to talk about excessive, compulsive, or problematic use of the Internet, rather than addiction. However, the criteria for evaluating it are primarily based on the criteria for evaluating pathological gambling and Internet gaming addiction, as described by the DSM-5. These criteria have been adapted to the context of Internet use, as well as to the use of smartphones and social media.

In general, today we can say that there are two distinct types of Internet addiction [figure 4 ()]:

- Specific pathological use. People are addicted to specific online functions (such as online shopping, using specific trading platforms, checking emails, pornography, etc.). Specific pathological Internet use (SPIU) should be understood as the result of a pre-existing psychological problem, which then became associated with an online activity. It is reasonable to assume that these addictions or problems are content-specific and would exist even in the absence of the Internet;
- **generalised pathological use.** This is not specific to a particular application but is an inclusive concept that encompasses several behaviours that overall resemble an addiction. It is reasonable to think that this problem would probably not even exist in the absence of the Internet. Generalized pathological Internet use (GPIU) involves excessive and multidimensional use of the web. This problematic use is associated with wasting time without a clear objective in mind and is related to the social aspect of the Internet, including the excessive use of social media platforms. According to this view, the need for social contact is satisfied and reinforced using social media, and this increases the desire to pursue a virtual social life. The individual also spends time online to escape their personal responsibilities, and this leads to significant problems with daily functioning, such as the tendency to procrastinate other activities. Time is a valuable resource,

available in limited quantities. In optimal conditions, the individual uses this resource in a conscious manner; but when its use becomes controlled by external factors, it can become problematic. Some studies, for example, report that good time management is inversely associated with levels of problematic use of digital media and positively associated with good school performance.

It has been proposed that people suffering from psychological problems such as depression, social anxiety, and loneliness prefer online social interactions to face-to-face ones. In these cases, online interaction is perceived as less anxiety-inducing, as you do not have to "put yourself out there", so you avoid the embarrassment of an "in-person" situation.

In addition, in online interactions, you have more time to think about your responses because the interaction is often asynchronous, meaning it takes place at different times. This preference can thus lead to excessive use of social media and instant messaging applications that, in turn, could increase existing psychological problems.

The mechanism would therefore be a positive loop in which the problematic use is reinforced over time ("positive feedback") [figure 5 ①].





> PROBLEMATIC USE OF SMARTPHONES AND SOCIAL MEDIA



Problematic use of smartphones and social media has similar characteristics to problematic use of the Internet and other behavioural addictions. Although there are several definitions with similar criteria, below is a **comprehensive list of all existing criteria** [figure 6]:

- abuse: using your smartphone so much that people around you point it out;
- cognitive salience: always having your smartphone and social media in mind even when you are not using them and constantly checking your conversations, so you don't miss anything;
- loss of control: repeated unsuccessful attempts to reduce your smartphone usage;
- (o) tolerance and withdrawal: tolerance refers to using your smartphone or social media more and more to get the same enjoyment as before; withdrawal, on the other hand, means feeling irritable, impatient, depressed, or anxious when you can't use your smartphone and social

media and being unable to stand not having your smartphone or not being able to use social media;

- emotion regulation: using smartphones and social media to escape negative emotions and find comfort;
- impairment: this refers to how using smartphones and social media interferes with daily activities such as pursuing your hobbies or meeting with friends, concentrating in class or at home, when you have to do your homework, to the point of not doing it or postponing it. In addition, impairment can also affect the social sphere; it thus includes problems in relationships with parents, peers, or teachers.

In addition, some hypotheses suggest the existence of a seventh criterion, called **craving**, which indicates the presence of a very strong desire to use smartphones and social media.

These criteria are an exhaustive list of symptoms of problematic use of smartphones and social media, although there is still no common and universal consensus. So, **the list is not yet definitive** and some criteria (such as the seventh) are considered valid by some experts but not by others.



🚺 Figure 6 Defining criteria of problematic smartphone use

How do you deal with this issue? Reflecting on the problematic use of this tool is the first step to becoming aware of a possible problem. Talking about it can help you find solutions that are often just around the corner. Tackling the issue and finding a shared solution with those close to you could enable you to regain control over your digital habits.



Digital addictions are often **comorbid with other psychological problems**. People who have symptoms of problematic Internet, smartphone, or social media use often also have symptoms of attention and hyperactivity disorders, depression, hostility or aggression, obsessive-compulsive symptoms, and anxiety. In general, the relationship between digital addictions and other psychological disorders can be explained by **three hypotheses** [figure 7]:

- the psychological disorder leads to or increases the symptoms of digital addiction;
- 2. digital addiction leads to or worsens the symptoms of the psychological disorder;
- 3. both disorders have shared underlying mechanisms.

Figure 7 Different hypotheses on the relationship between digital addictions and other psychological disorders



In addition to these three hypotheses, it is also possible that the level of comorbidity has been overestimated due to the type of assessment tools used or methodological deficiencies in the scientific studies investigating the two constructs.



© STUDY DESIGN

To test the first two hypotheses, it is important to conduct **longitudinal studies**, which can help to better understand which disorder was present first. Longitudinal studies differ from those that involve a single data collection point, called **correlational**



studies, precisely because the participants are followed over time using repeated measurements at a distance of days, months, or years [figure 8 ()]. We can imagine a correlational study as being like a photograph taken of a sample (that is, of all the participants) at one specific moment, so the results derived from it can only be valid at that moment. In a longitudinal study, on the other hand,

🕼 Figure 8 Difference between correlational and longitudinal studies



the researcher takes multiple photographs of the same participants over time, so the results obtained can tell us something about the longer-term dynamics.

In general, the evidence from longitudinal studies suggests that some psychological disorders may occur before the development of problematic Internet, smartphone, and social media use, while others may be secondary to the problematic use of new technologies.

The choice of the type of study to be carried out clearly also depends on the type of research question posed, according to a principle that you have probably already practised at school.

© THE SAMPLE

In each study, it is important for the **sample** – that is, all the participants – to be **representative**, that is, it should represent all possible differences in individuals. Usually, when a sample is representative, the **distribution** of the subjects for a given variable (for example, time spent using their smartphone) takes the **shape of a bell** (known as a **normal distribution**, **Gaussian distribution**, or the **bell curve**). Figure 9 (1), for example, shows that **many subjects have intermediate**



levels of smartphone use and are positioned in the centre, while few subjects fall into the tails of the distribution.

Therefore, if we think of smartphone use as a variable of interest, it is very likely that most of the subjects will have intermediate levels of use (for example, about 2-3 hours), so more subjects will be in the centre. On the other hand, it is much less likely to observe participants who use their smartphone for only few minutes a day (the left or lower tail) or for many hours (6-7 hours, the right or upper tail). The larger a sample is (that is, the more people it includes), the more representative it is.

© MEASURING DIGITAL ADDICTION

Measuring problematic use of the Internet, smartphones, and social media is not easy. Currently, several **questionnaires** are available that include criteria that are not always comparable. In addition, there is little information available on these scales' psychometric properties; most are used only in one country. **Psychometric properties** mean at least two properties of the questionnaires, in particular: reliability and validity [figure 10].

Reliability refers to the extent to which the questions in the questionnaire measure the construct under investigation (or a dimension of the construct)



Figure 10 Reliability and validity

in a way that is consistent between the questions. You can think of reliability as telling you how similar the questions are to each other. For example, "Do you use your smartphone more than intended?" and "Do other people tell you that you use your smartphone too much?" are two questions that measure smartphone abuse and are thus similar. In addition, the concept of reliability also has to do with whether the questionnaire always measures the same construct over time. In other words, the results should be identical or similar whenever you repeat the questionnaire.

The second criterion is **validity**, which indicates the extent to which a questionnaire measures what it is intended to measure. It refers, for example, to the extent to which a questionnaire on problematic smartphone use measures precisely that construct and not another one, such as social anxiety. A test could have a very high level of reliability but measure a different construct!

To put the idea of reliability into a school context, it is as if all the questions in a test were formulated in a seemingly different way and the purpose of all of them was to assess your in-depth understanding of only one fact. If the test was well designed, a person who was able to answer any one of the questions correctly should be able to answer the others correctly as well.

To give an idea of validity, on the other hand, we can take the same example in which we give all the students the same test in the form of a practical or written exercise in English. Students who are foreigners or who have reading difficulties might perform poorly even if they understood the topic presented in the test well at a practical level. In this case, the written test would measure a different factor (linguistic knowledge), rather than the factor relating to understanding (practice) of the topic.

Kimberly Young developed the first questionnaire for measuring problematic Internet use based on the DSM's criteria for gambling. Her questionnaire is called the **Internet Addiction Test** (also known as the IAT) and consists of 20 questions. However, this tool produced limited and conflicting results.

Scales have also been created to investigate the problematic use of social media – such as the **Bergen Social Media Addiction Scale** [table 2]], originally

Table 2 Bergen Social Media Addiction Scale

OVER THE LAST YEAR	VERY RARELY (1)	RARELY (2)	SOMETIMES (3)	OFTEN (4)	VERY OFTEN (5)
Have you spent a lot of time thinking about social media or planning how to use it?					
Have you felt an urge to use social media more and more?					
Have you used social media in order to forget about your personal problems?					
Have you tried to cut down on your use of social media without success?					
Have you become restless or troubled if you are prohibited from using social media?					
Have you used social media so much that it has had a negative impact on your studies?					

used for problematic use of Facebook, but then extended to other social media platforms – and for problematic smartphone use, such as the **Smartphone Addiction Scale**.

In summary, there are several instruments designed to assess digital addictions, but none are universally accepted as the **gold standard**.

If you want, you can try them out in class to find out what score you get and whether or not it is similar to that of the people closest to you (such as your classmates or parents). You can also try to come up with your own instrument with your classmates. However, remember that to be validated as a standardised tool, it would have to undergo reliability and validity testing.

© THE LIMITS OF SELF-REPORT QUESTIONNAIRES AND THE USE OF TRACKED DATA

It is widely recognised that self-report questionnaires are subject to **biases**, i.e. systematic errors. These biases include errors in **recalling** certain information, such as the duration and frequency of daily behaviours (including the use of new technologies). Another bias is **social desirability**, which refers to respondents' tendency to report inaccurately on sensitive topics to present themselves in the best possible light (for example, to report spending less time using social media so as not to feel judged).

Technological advances are making it possible to avoid these biases thanks to the use of trace data, defined as the footprint of the activities carried out through an online, and thus digital, computer system. Trace data can be collected via specific applications installed on the participant's smartphone, enabling researchers to get around the limits of self-report questionnaires. However, the use of these applications is still in its infancy and researchers face several challenges. For example, collecting tracked data requires informed consent and some people may not agree to their digital data being tracked.

TRACKED DATA AND PROBLEMATIC USE OF SMARTPHONES AND SOCIAL MEDIA

What are the indicators of problematic smartphone use? Since excessive smartphone use is an indicator of problematic use, researchers began to study the frequency and duration of smartphone use using tracked data to understand the relationship with self-reported data. The results showed that, for example, the degree by which respondents **overestimated** or **underestimated how much time they spent using their smartphone** (calculated from the discrepancy between the traced duration of smartphone use and the self-reported use) predicted problematic use. This means that people who have difficulty estimating – whether over or underestimating – how much time they spend on their smartphone are usually more likely to have symptoms of problematic use. **Trace frequency** is also a good predictor of problematic smartphone use. In this case, people with a higher frequency of use (e.g., people who "often check their notifications") will be more likely to have symptoms of problematic smartphone use, as this often interferes with daily activities (e.g., checking notifications while doing homework) and thus causes more impairment.

However, other studies have shown that the **amount of time spent** using smartphones, rather than the frequency of use, is also linked to problematic use. In this case, spending a lot of time online could come at the expense of other activities (for example, sleeping, exercising, or spending time with friends) that positively influence well-being and are, therefore, inversely associated with problematic smartphone use. One study compared the tracked data of people with and without symptoms of problematic smartphone use. In this case, the researchers found that people who had symptoms of problematic use spent twice as much time on their smartphones and interacted with applications (especially those intended for social interactions and social media) twice as often as those who did not have any symptoms. Therefore, it seems that **the number of interactions with the smartphone**, and especially **the use of applications such as social media** or apps for social interaction, such as **instant messaging**, are indicators of problematic use.

The role of the frequency of smartphone use as an indicator of problematic usage is not surprising, considering that people often interact with their smartphones many times just to **check their notifications**. Notification checking habits are specific to smartphone use rather than use of other devices such as laptops and tablets. In fact, smartphones are always accessible (they are in our pockets) and always provide access to different applications and activities. According to a study using video-recorded data, in which participants were asked to wear a small camera on their chest to record interactions with their smartphones, they checked their phones automatically and unconsciously "just like putting their hand over their mouth when they cough". Participants picked up, unlocked, used, and put back their smartphones once every 5 minutes (on average) without a specific purpose. And not only that: once their smartphone was unlocked, young people often fall into a loop, i.e. a vicious circle. For example, they open a notification that then leads to using other apps, thus spending more time on their smartphone than initially intended and getting lost in activities with no specific purpose. This brings us back to a consideration mentioned earlier, namely the importance of time management. Time dedicated to our digital life, which is often deliberately encouraged, competes with time dedicated to real life, which can contribute to distancing us from the "flesh and blood" relationships that we need to grow up as happy, healthy people.

5 THE COGNITIVE CONSEQUENCES OF DIGITAL ADDICTIONS

Frequent smartphone use can hinder daily routine and have negative consequences for young people. For example, it can have negative cognitive consequences. **Cognition** includes the functioning of our brain and, particularly, our **ability to learn, memorise, make decisions, and apply our knowledge**. These skills are crucial, especially at school. Even at the advent of television in the 1960s, researchers were already concerned that excessive use of the media could have a negative impact on schooling. Today, it is thought that digital media, and in particular smartphones, can have negative effects because they:

- (o) take time away from studying;
- (o) are a source of distraction;
- reduce the ability to engage in activities that do not offer immediate gratification;
- have an impact on memory.

There are various theories and hypotheses that explain these mechanisms.

For example, according to the Displacement Hypothesis, our time is limited, and when we spend too much time on our smartphones or on the Internet, there is little time left to do our homework, study, or sleep. Above all, sleep is important for the development of the brain, as it



consolidates our knowledge (in terms of what we have learned in the day), facilitating the transfer from short-term to long-term memory. So, if we use our smartphone too much before going to bed, it means less time spent sleeping!

In addition, many activities are done online nowadays, both recreational and academic. An example of a recreational activity could be watching streaming content or playing games online, while examples of academic activities include searching for information online or distance learning, which was adopted during the pandemic but continues to be used. In these cases, the displacement hypothesis is certainly valid, since the educational content competes with recreational content or entertainment platforms such as YouTube, Netflix, or social media, and time dedicated to one activity or the other is mutually exclusive. As human beings, we are attracted to entertaining, interesting, or sometimes relaxing content, which inevitably becomes a source of distraction at the expense of school content. This mechanism is similar to another one you may be familiar with: the foods that we find most appealing are those that excite our taste buds the most, such as those that are particularly sweet or salty. Often, however, the same foods do not have a particularly high nutritional value, but rather expose us to health risks, and compete with foods that are nutritionally beneficial. Similarly, we also need to be careful, because the need for content that does not nourish our brains is often induced deliberately and helps limit our self-control, which should remain firmly in our own hands.

Another theory asserts that people are able to do multiple activities at the same time, i.e. **multitasking**. The **Limited Capacity Model**, however, argues that true multitasking does not exist because our brain can only process one stimulus at a time. If a person is engaging in multiple activities (or receiving

multiple stimuli), their brain must continually switch from one stimulus to another, even if only for a few seconds. For example, imagine you are reading a text and receiving a notification on your smartphone screen; the moment the notification arrives, your brain spends time and energy registering it and deciding whether to open it or not, so you stop concentrating fully on the text you were reading.

Some **experimental studies** have shown that the mere presence of a smartphone on your desk or in your backpack (even if you don't receive a notification) leads to greater distraction when performing a task requiring concentration (such as a test). In these cases, the distraction is thought to result from cognitive salience (i.e., thinking that you could receive a notification at any time), which does not allow you to fully concentrate. In fact, as we have seen, **cognitive salience** is one of the dimensions that characterise smartphone addiction.

In addition to being a source of distraction, the use of digital media can affect our ability to commit to long-term goals, especially at school. For most young people, studying is a big commitment: they do not enjoy it and get bored easily. This is in part because students often don't see the immediate benefit of studying and get distracted by more fun things such as watching videos on their phones or playing video games. We only appreciate what we have learned in the medium and long term when we do well on a test, get into university, or get a job after finishing school. Knowing how to commit to something that doesn't offer immediate gratification is a fundamental skill, but it is hypothesised that it has been impaired by the presence of digital media and access to content that offers instant gratification at any time. To make an analogy with food again, it is obvious that a bag of crunchy crisps or a tub of smooth ice cream is very inviting and provides instant gratification, but is very harmful to our health in the long term; preparing a rich salad, on the contrary, can be a long process that requires a certain amount of effort – effort that many of us are no longer willing to make - but has very positive effects on our health.

Always at our fingertips, the smartphone has also become an excellent substitute for our memory. Thanks to Google, Maps, and many other applications, we have continuous access to information to tackle the various tasks of daily life. You don't need to remember the deadline for your thesis, there's the calendar app; you don't need to know the way to get to wherever you're meeting your friend, there's the Maps app; you don't need to remember what the formula for relativity is, there's Google. With our smartphones in our pocket, we tend to outsource our memory, i.e. to entrust the memory processes to external storage. We are more likely to remember **where to find the information than the information itself**.

This phenomenon is called the **Google effect** and describes another aspect of digital addiction. Technologies should help us to face an increasingly complex life as active participants, not make us incapable of tackling tasks that were once so simple that anyone could manage



them. If they push us in the former direction, they are beneficial; if they make us regress, they are clearly harmful.

THE SOCIO-EMOTIONAL CONSEQUENCES OF DIGITAL ADDICTIONS

Excessive use of smartphones, social media, and the Internet in general can also have socio-emotional consequences. For example, a factor that is often involved in the problematic use of smartphones and social media is the **Fear of Missing Out**, or FoMO.

According to the scientist Andrew K. Przybylski, FoMO is defined as a pervasive anxiety that other people might be having rewarding experiences that we feel left out of. As a result, a person is pushed to constantly check online content and in-

coming notifications to stay constantly updated on what is going on and what their friends are doing. However, as we have already noted, such checking behaviour is distracting when studying, interferes with what we are doing, and limits our cognitive processing capabilities. Another problem arising from the problematic use of smartphones and social media is the **feeling of loneliness**.



However, the research findings on this are inconsistent. According to the **Social Compensation** hypothesis, people who don't have much offline social contact tend to compensate by seeking out more online. However, this behaviour gives rise to a vicious circle, as the person learns to only interact online and not offline in the real world.

Particularly anxious people might also find online interaction easier and more appealing. However, this means that their level of social anxiety is only managed temporarily, because without in-person interaction, the problem is not addressed, but just temporarily solved by creating a **comfort zone**.

Online interaction can be a source of anxiety and depression as in the case of **social comparison**: comparing yourself with people who have a better lifestyle or physical appearance than you makes you feel inadequate and lowers your self-esteem. At the same time, **trying to present a perfect image of yourself** on social media entails constantly thinking about your body and developing "obsessions" that can then lead to more serious problems, especially in adolescence, when your body changes.

5 THE ADOLESCENT BRAIN

But why are digital addictions an important phenomenon especially for young adolescents? We'll try to answer this question over the next few pages.

Adolescence, defined as the transition from childhood to adulthood, is a period of development in which **the regions of the brain undergo significant changes**, influenced by biological and environmental factors. In general, it has been reported that cognitive abilities that promote cognitive self-control (such as regulating impulsive behaviours) and self-regulation of emotions (e.g., managing negative emotions such as anger and sadness) develop gradually during adolescence.

These abilities develop due to the maturation of certain parts of the brain in the **prefrontal cortex** [figure 11 [1]]. In particular, the brain increases its connections to speed up both the processing and the exchange of information to carry out increasingly complex mental processes (for example, to cope with in-

🕼 Figure 11 The prefrontal cortex



creasingly difficult demands at school). We must not forget that the prefrontal cortex contains **two control**, **or executive function**, **systems**: the **cognitive** one – which we can describe as **"cold"**, because it refers to mental processes such as working memory, planning, and self-control – and the **affective** one – which we can call **"hot"**, since it refers to the control of emotional responses.

These two systems are associated with different sub-regions of the prefrontal cortex: the cold system refers to the dorsolateral prefrontal cortex (DLPFC) and the hot one to the orbitofrontal cortex (OFC)/ventromedial prefrontal cortex (vmPFC). It should be noted that the development of this part of the brain is what has enabled us to evolve compared to our ancestors. In fact, the prefrontal cortex is the "newest" part of the brain, the result of our evolution, and thanks to it, we have been able to develop language and a series of complex mental abilities that are characteristic of human beings.

But all this comes at a price! This is because **the brain takes a long time to develop** and reach its full functioning during adulthood. Of the two systems, the cold one matures before the hot one. In other words, the maturation of the cognitive control system guides the maturation process of the emotional control system – i.e. the regulation of emotions – during adolescence (and this maturation process can take **until the age of 25**!).

Why are young people more at risk of developing digital addictions? The first point to highlight is that **adolescents are more vulnerable** to all those behaviours that can potentially lead to being "out of control". And it is easy to see how the use of digital media can easily facilitate these behaviours. This is one of the reasons why minors are subject to

special protection even in uncomfortable cases (such as excessive use of smartphones and social media), where "protect" means "protect from themselves". Your rights as a person must be developed in a healthy environment that allows you to achieve complete psychophysical well-being. In some cases, institutions must equip themselves with tools and measures to guarantee this right, even if it feels like placing limitations on you. When you become an adult, you will realise that certain limits were necessary to allow you to grow up properly.

The second point to bear in mind when answering why young people are more at risk of developing digital addictions involves brain maturation, but this time another brain region, namely the **reward system** [figure 12].

Unlike the prefrontal cortex, this system is located in the "oldest" part of the brain and is common to all animal species. The reward system is driven by the activity of a neurotransmitter also known as **the pleasure molecule**: **dopa-mine**. In general, dopamine serves many functions in the brain, such as motor functions, but the pathway known as the **meso-cortico-limbic system** is the one that controls pleasure. It runs from limbic brain structures (located deeper in the brain), such as the striatum and the amygdala, to cortical structures (located in the cortex), such as the prefrontal cortex.

Thanks to the action of dopamine, the reward system allows you to:

O motivate a behaviour that leads to a reward (these behaviours in themselves are dictated by our basic needs we are programmed to meet, such as nourishment and care, as well as by needs we learn thanks to the culture and society we live in, such as self-realisation);

🚺 Figure 12 The reward system



- O learn which actions lead to pleasure (i.e., reward) and in what circumstances, i.e. places and times (this process is also called associative learning because the brain associates the positive emotion of reward with a certain circumstance and expects the same pleasant feeling in the same circumstance in the future); to be clear, this is how the reinforcement techniques used to train dogs work;
- O experience positive emotions (such as those you feel after eating something sweet, receiving a compliment, or winning a sum of money): everything that involves pleasure as a fundamental component.

The reward system is very active in adolescence (much more so than in childhood or adulthood). This probably has an important evolutionary significance, as it enabled human beings in the remote past to exploit the teenage years for very effective training: in fact, the pleasure system also changes in response to pubertal hormones, with androgens and estrogens having different effects on brain structures, including the subcortical regions of the brain related to processing emotions, sensitivity to social and emotional stimuli, motivation, and reward. The early maturation of the pleasure system is also related to **the increase in dopaminergic activity** during adolescence. The dopaminergic system activates **reward responses** during various, generally pleasant, activities. In fact, when we have experiences that give us pleasure, dopamine is released. This causes a feeling of reward, which then psychologically reinforces the initial pleasant behaviour and gradually increases the amount of the behaviour or substance required to produce the feeling of reward. This feedback system causes us to seek out increasingly rewarding stimuli to obtain the same pleasurable effect.

Imagine investing money in the bank: the reward system works as if you had to keep investing more money to keep getting the same return on the investment. Whereas if we stop increasing the money we put into our investment, the return will decrease rather than remain constant. Therefore, many researchers think that altered or overactive dopamine pathways may be the ultimate cause of addictive behaviours.

The risk is that to achieve the same return on investment and the same pleasurable feeling, you will need increasingly intense stimuli, which will lead you to have a particular attachment to that activity (i.e., to be "addicted" to it). You will thus devote much more time to it than you initially invested.

Responses to rewards are a key aspect of the adolescent brain, since, compared to children and adults, their neural responses to environmental stimuli are more pronounced and sustained (i.e., more is dopamine released), especially when the stimuli involve social interaction.

The **parallel but unbalanced development** of these brain areas, i.e., of **cognitive control, or executive function, structures, and the pleasure system**, explain why adolescence is a period especially marked by imbalance, better described as the **dual systems model** (also known as the maturational imbalance model) [figure 13].

According to this developmental model, the **pleasure system** matures in early adolescence while the **cognitive control or executive function system** reaches maturity in early adulthood. The **time gap between the matura-tion of the two systems creates a period of greater vulnerability during**

🕼 Figure 13 The dual systems model



Source: Somerville LH, Casey BJ. *Developmental neurobiology of cognitive control and motivational systems*. Curr Opin Neurobiol. 2010 Apr;20(2):236-41.

adolescence when there is a greater propensity to seek out pleasant stimuli, including reward- and novelty-seeking behaviours, even when those entail taking risks.

The control system is not able to properly manage the reward system: you can think of the adolescent brain as being, in this sense, like a machine with a turbo engine but brakes that don't work very well.

This means that adolescents are not yet fully able to respond adequately with their behaviour to situations dictated by emotions – both positive and negative – because this is a capacity that develops in the following years.

All forms of addiction act on these two systems. In fact, you can think of the lowest common denominator between substance addictions and behavioural addictions (including digital ones), that is, those that do not include the use of a substance but involve a behaviour, as being precisely the impairment of control skills, in parallel with the experience of strong feelings of reward.

This can happen at any age and is the mechanism that gives rise to addiction. However, it is now easier to understand why adolescents are more at risk: because these two brain systems are exactly the ones that still must be calibrated. Moreover, in adolescence, the difficulty of managing one's own behaviour is even more pronounced when it comes to the social sphere.

THE IMPORTANCE OF THE ONLINE SOCIAL WORLD FOR TEENAGERS

Humans are social creatures. This means that the impacts of lack of healthy socialisation on health (mental and physical) are very serious. Social interaction is what defines us and determines our well-being. This means we are always "hungry" for social interactions; it is a hunger that is determined by our nature and biology.

This **social hunger** is particularly high during the teenage years. Why is that? Because the brain needs a lot of social stimuli to develop and mature. For example, adolescents need to form **their own identity**, and this can only happen in relation to others, since **others reflect our image**, both for good and sometimes for bad, giving us a better understanding of who we are and what we want. A social experience that includes getting to know different people, contexts, and cultures is also even more enriching, as having a variety of experiences allows us to better understand who we are and makes us more ready to tackle future experiences, even unfamiliar ones.

Smartphones, and even more so social media, are highly attractive to the adolescent brain precisely because they enable social interaction anywhere and at any time. In addition, compared to childhood, adolescence is characterised by **more complex and hierarchical peer relationships**, with larger social networks, usually **organised into groups** that promote their values, including clothing, idioms, and behavioural styles. To be part of these groups, adolescents feel compelled to act in line with these values because it is essential to feel part of a group and accepted by their peers. It is not easy to be yourself and distinguish yourself from others in a context where there is a strong drive to fit in, especially when the group becomes very "closed" to those who aren't part of it or who think differently. However, talking about and addressing the complexity of social dynamics, especially by remaining open to diversity without judging, allows for more rewarding social experiences and promotes a climate of greater openness and social inclusion, thus facilitating identity development and tolerance towards diversity.

In addition to this, this is also the period when we begin to form **romantic re-lationships** and **deep and lasting friendships**, all elements that make a good

social sphere indispensable for growing up well-adjusted (many difficulties that arise at this age, if not resolved, are reflected in adult life, and contribute to the development of various social problems).

It is, therefore, not surprising that adolescents are also **hypersensitive to peer** acceptance and rejection. For example, adolescents report higher levels of embarrassment than children and adults if they know that they are (simply) being observed by their peers [figure 14].

Groups can also influence young people's self-esteem through social comparison. The influence of their peers is not only relevant for their sense of self, but also for engaging in risky behaviours. During adolescence, most young people begin to consume alcohol, tobacco, or illicit drugs, have their first sexual experiences, and tend to break the rules more often, even to the point of engaging in violent behaviour (including online). The likelihood of being involved in such behaviours is greater under the influence of peers, as





Source: Somerville LH. *The Teenage Brain: Sensitivity to Social Evaluation*. Current directions in psychological science. 2013, 22(2), 121-7.

their presence triggers a motivational state that increases the tendency to seek short-term rewards from risky choices and behaviours. All these factors together mean that adolescents are likely to be exposed to potentially controllable risks which, however, become uncontrollable thanks to the reinforcing effect of the peer group.

According to some scholars, the more adolescents use social media, the more they engage in risky behaviours such as substance use and unprotected sex, since they all offer the same kind of immediate gratification, or reward.

"It's like always having a chocolate in your pocket"



For the adolescent brain, which is "hungry" for rewards and gratification, especially of a social nature, smartphones and social media are like "always having chocolates in your pocket". A hungry person who has loads of chocolates in their pocket will hardly be able to resist. This is

even more true considering that the adolescent brain is still developing, especially when it comes to the cognitive control system (which doesn't mature until adulthood) and the emotional control system.

Just like chocolate is rewarding for the brain, a like, a message, or a new follower is equally rewarding. Since smartphones are always available and accessible, we can thus see the experience as being like **always having a rewarding chocolate in your pocket, but it's also always a different chocolate**, since the social stimuli are all different. This diversity means our brains do not get used, or habituated, to the stimuli, but instead are always interested in something new, even if the stimuli all come from the same place. Today it's milk chocolate, tomorrow it's white, the next day it's dark, but it's always a pleasant flavour. If I like fruit, it will always be fruit-flavoured, but a different fruit every day, so I never get bored.

That's what social media is like: it offers content we like, but something different every day, so it keeps us "glued" to our screens because we always feel rewarded by something new. If not controlled, this mechanism becomes a vicious cycle that can lead to problematic use over time. We often talk about

the algorithms behind social media, which are described as designed to attract our attention as much as possible, although we are often unaware of them. That's why there is always a lot of discussion about how to regulate the social world, and since we see children as vulnerable, they must be subject to special care and protection.



There are several theories that explain how digital addictions start and progress. We present two of them below. The first is called the **Interaction of Person-Affect-Cognition-Execution** model, or **I-PACE model**, published by Matthias Brand and colleagues in 2016 and updated in 2019 [figure 15].



Source: Brand M et al. The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviours: Update, generalization to addictive behaviours beyond internet-use disorders, and specification of the process character of addictive behaviours. Neurosci Biobehav Rev. 2019 Sep;104:1-10.

This model argues that several factors determine an individual's situation and behaviour that can then lead to a digital addiction. These factors are:

- O cognitions;
- genetics;
- (o) temperamental and personality characteristics;
- o childhood experiences;
- o pre-existing psychological problems;
- O coping style;
- o motivations for using smartphones and social media.

At first, the use of smartphones and social media can be mainly driven by personality traits such as **impulsiveness**. The urge to check your smartphone for brief but repetitive moments is perceived as something rewarding. These brief moments of gratification act as **positive reinforcement** for the person.



At a later stage, this impulsivity is compounded by problems with self-control and disinhibition and conditioning processes. All this ultimately results in problematic compulsive use.

Compulsive behaviours – which can vary – are engaged in to distract yourself from your

problems and difficulties, regulate your mood, and avoid negative emotions such as anxiety and sadness.

Compulsive behaviours associated with the use of smartphones and social media are related to:

- O the need to be in constant contact with and available to others; for example, feeling compelled to respond as quickly as possible, to maintain constant communication;
- O the need for novel stimuli, such as having to stay up to date on recent events and news, looking for new and different stimuli on social media;

- O the need to check, that is, having to check your own social media and what others are doing, being anxious if you are not updated on what is happening in the outside world or to your friends;
- social anxiety; needing reassurance from others or feeling the need to be in constant contact with someone.

These compulsive and problematic behaviours are fostered by the portability of smartphones and the constant availability of personalised content. The persistent and compulsive use of smartphones can also be perceived as unpleasant when it compromises the success of other activities, such as doing your homework or interacting with other people, going so far as to ignore them when they are talking or when they are with us in person. This behaviour is known as **phubbing**, which comes from "phone" + "snubbing", i.e. ignoring someone with your smartphone.

Even parents themselves could ignore their children if they use their smartphones in a compulsive and problematic way. In this case, younger children of school or pre-school age may engage in risky behaviours (e.g. at the park) just to attract the attention of the parent on their phone.

The transition from impulsiveness to compulsiveness is a central aspect of many addictions, behavioural and otherwise. In fact, as in substance use disorders, impulsive traits are critical in initiating the behaviour, whereas compulsive behaviours begin later.

The second study that is useful to remember in this context was conducted by Patti M. Valkenburg and Jochen Peter, who developed the **Differential Susceptibility to Media Effects Model (DSMM)** [figure 16 ^(C)] in 2011. In particular, the model sets out four propositions. The first proposition states that the effects of the media are conditional, depending on three types of differential susceptibility variables: dispositional, developmental, and social.

Dispositional susceptibility is defined as all the dimensions of the individual that predispose them to use and respond to digital media in a certain way, such as gender, biology, temperament, personality, cognitions, values, attitudes, motivations, and moods. Some of these dimensions (e.g., personality) are more stable across time and situations than others (e.g., mood).



Figure 16 Differential susceptibility to media effects model

Source: Valkenburg PM, Peter J. The Differential Susceptibility to Media Effects Model. J. Commun. 2013;63(2):221-43.

Developmental susceptibility is defined as the selective use of and response to digital content depending on the stage of cognitive, emotional, and social development. These stages of development include childhood, adolescence, adulthood, and old age.

Social susceptibility includes all the factors in the social context that can influence an individual's use of and response to digital content. These social contexts can act on various levels. For example, in the interpersonal context, parents and peers can limit or encourage exposure to certain programmes, social media platforms, or games. Families with a higher income can give the young person more alternatives in terms of free time (e.g. sports, music, and other recreational activities), thus limiting the amount of time spent in front of a screen. In addition, parents with a higher level of education are also more attentive in regulating their children's exposure to digital media, perhaps because they are more informed about the subject or because they have carried out related studies. Similarly, schools and organisations may restrict or encourage access to apps and websites. Finally, norms and values in each society can promote or discourage the use of certain media.

The second proposition asserts that the effects of the media are indirect, since they are mediated by different response states that can be cognitive

(for example, the level of attention), emotional (positive or negative emotions), or excitative (such as being agitated).

The third proposition states that differential susceptibility variables act as predictors and moderators of the effects of media use on media response states. In other words, dispositional, developmental, and social differences can predict the type of media use, but they also moderate response states. What this means is that these differences (such as being male or female, adolescent or adult, alone or with lots of friends) determine a response state that is already different in itself.

One example is that girls usually use social media more (type of use) and experience higher levels of social anxiety (response state) than boys, especially in early adolescence (11-13 years). Boys, on the other hand, tend to experience negative effects later, around age 14-15. On the one hand, these gender differences risk reinforcing certain stereotypes (as in the case of girls and social media use); on the other hand, however, they reflect windows of sensitivity to the effects of digital media that go hand in hand with the maturation processes that occur during puberty (processes that occur earlier in girls than in boys).

Finally, the **fourth proposition** emphasises that **the effects of media are twoway**: media also influence susceptibility variables and response states, and vice versa. So, **everything influences everything else**.



After considering what digital addictions are, why young people are most at risk, and what mechanisms are involved, at this point it is legitimate to ask the following question: what should we do in cases of problematic use?

The first answer might be: **log off**. This phenomenon, known as a **digital detox**, involves abstaining from using electronic devices entirely or only abstaining from using them for specific purposes



(such as specific apps). A digital detox can therefore include **breaks from using a single device or from using all digital devices**. It is a **temporary abstinence** from electronic devices to detox oneself, similar to fasting. And it is important that this is **voluntary** and not forced by external circumstances (for example, a parent banning a child from using their phone) because forced interventions (i.e., interventions against the will of the individual) have proved ineffective in reducing problematic use. It would be much better to discuss the problem as a family and then agree on what decisions should be made, always considering that the child, as a more vulnerable person, should be subject to special protection and the parent should not enact arbitrary bans, but suggest them as a matter of responsibility. This is because blocking access to certain smartphone functions does not help anyone understand and solve the underlying reasons for problematic use. In fact, it is more useful to implement specific detox behaviours, depending on the needs of the individual, rather than a total limitation of use.

So, the question is: does digital detox work? The answer is it depends. Some studies have shown that there may be both positive and negative effects. The positive effects include reduced time online, less anxiety and stress, greater well-being, and improved ability to self-regulate. The negative effects, on the other hand, include boredom, feeling socially isolated, loneliness, and fear of missing out (FoMO). We could say that the effects are mixed. What we've seen, in fact, is that it is usually users who use digital media in a problematic way who experience more positive effects than those who do not engage in problematic behaviours. However, in some cases, participants who underwent a longer period of detoxification from social media then reported increased use of social media when they were able to access it again, most likely due to the need to make up for lost time. It is therefore essential to discuss these effects both with peers and with adult caregivers to explore methods that are well understood and accepted, the benefits of which can then be recognised. Creating opportunities for quality leisure time is an essential aspect, because the aim is to rediscover alternative ways of socialising and dedicate time to alternative activities that promote well-being.

🏷 BALANCED AND HEALTHY INTERNET USE

So, what other solutions are there? Some scholars have noted that the relationship between the amount of time spent using digital media and mental wellbeing is not linear but follows an **inverted U-shaped curve** [figure 17 ⁽¹⁾]. In other words, moderate engagement (for example, 1 hour per day) in digital activities would not in itself be detrimental to well-being but would actually benefit it, probably because it allows social, and entertainment needs to be met.

Beyond a certain time, however, it would be harmful as it distracts and takes time away from other activities such as sleep or homework. The effects also depend on when the digital activities are engaged in - during the week or at the weekend. In fact, greater use on a weekday would lead to greater negative effects than the same amount of use at the weekend.

Thus, you could say there is an **appropriate level** (neither too low nor too high) of consumption of digital content that is good for young people. Since **time is a**



Source: Przybylski AK, Weinstein N. A Large-Scale Test of the Goldilocks Hypothesis: Quantifying the Relations Between Digital-Screen Use and the Mental Well-Being of Adolescents. Psychological Science, January 13 2017, 28(2), 2014-15.

limited resource and there are lots of tasks competing for it, **you should always try to be the one who decides how much time to devote to each task** and make sure that digital apps do not steal this precious resource away from you.



So how does problematic use differ from healthy Internet use? When we talk about healthy use, what we mean is connecting to the Internet for a **specific purpose**, for a **reasonable period**, **without this leading to cognitive or behavioural impairment**. People who healthily use the Internet can separate online communication from real-life communication. They use the Internet as a **useful tool for a specific purpose**, rather than as a source in the search for their own identity.

There is no specific time limit or behavioural framework, so it is difficult to define a behaviour as problematic when it is dictated by needs that are not problematic in themselves, such as seeking social connections and information.

There is therefore no threshold level but rather a *continuum* of functioning, with healthy use on one side and problematic use/addiction on the other [figure 18 ()]. It is up to the individual whether their Internet use is adaptive or maladaptive, depending on their needs and stage of development. To sum up, we can say that the difference between an excessive but healthy enthusiasm and an addiction is that healthy enthusiasm *adds* to your life, while addiction *takes away* from it.

This is particularly true in younger generations, especially during adolescence, when the risk of developing psychological problems is greater and the processes of cognitive control are still immature.







TEXTS

By the students of class 3D of the Giubiasco Middle School:

Yasmine Aloui Seraya Bandir Ilian Baranzini Daniel Beghelli Marouan Bouakkaz Amos Brugnoni Sofía Victoria Christen Anna Courbon Francesco Di Mattia Sandrina Di Pancrazio

Enea Fontebasso Enny Fostinelli Ilaria Giottonini Stjepan Kesedzic Emiliano Marrazzo Samuel Melke Leon Mihailenko Enea Mombelli Suami Papais Serena Roberta Pisanelli

Under the coordination of the teachers:

Davide Ricciardi (Italian teacher) Dorin Pirogan (science teacher)

Giubiasco Middle School 13 Via Fabrizia - 6512 Giubiasco Ticino - Switzerland www.smgiubiasco.ti.ch decs-sm.giubiasco@edu.ti.ch Head teacher: Michel Fregni Deputy Head: Andrea Malinverno

ILLUSTRATIONS

By Alessandro Telve for the Scuola Romana dei Fumetti.



























Behavioural addiction	An addiction not related to substance use and defined as long-term loss of control over, for example, the use of video games or gambling. In a behavioural addiction, the person is unable to reduce such behaviour, despite the negative effects observed in their daily functioning.
Bias	In methodology, a "systematic error" that leads to an incorrect estimate of the effects observed by the researcher.
Cognitive salience	The integration process by which objects and stimuli from the external environment or internal states come to the attention of an individual in a meaningful way, becoming relevant and able to influence their thoughts and behaviours.
Comorbidity	The co-existence of two psychological or physical problems, the concomitant presence of two or more disorders in the same person.
Compulsion	A behaviour carried out in an automatic and uncontrollable way that offers relief from anxiety and worries.
Coping	The way people deal with and respond to stress and life prob- lems. A positive (or adaptive) coping style is implemented when the individual seeks a solution or help from other peo- ple when faced with a problem. A negative (or maladaptive) coping style is implemented when a person denies, avoids, or escapes from the problem, for example by taking refuge in the digital world.

Correlational study	A study that applies a research methodology to investigate the extent to which two variables or events are related to each oth- er. Generally, a correlational study involves a single data col- lection point and enables simple statistical analyses that can only explain associative links between the variables observed, not deduce cause and effect relationships.
Digital detox	A period in which a person voluntarily decides to abstain from using social media, digital devices, and digital environments, entirely or only in relation to specific contexts, platforms, or technological devices. The aim is to take a break to review their relationship with technology and make it healthier.
Dispositional susceptibility	All the dimensions of a person (genetics, temperament, person- ality, etc.) that predispose them to use and respond to using dig- ital media a certain way.
Dopamine	An organic molecule that is part of the catecholamine family. It is one of the most important neurotransmitters in our nerv- ous system and plays a key role linked to the pleasure system and reward mechanism, since it is released when the brain ex- pects a reward (even the anticipation of a pleasurable sensa- tion can be sufficient to increase its levels). As it is involved in controlling many other processes, it plays a key role in several diseases and syndromes such as Parkinson's, attention deficit hyperactivity disorder (ADHD), schizophrenia, and psycho- sis, as well as in compulsive behaviours and addictions to food, gaming, drugs, or medications.
Dorsolateral prefrontal cortex	A brain region involved in cognitive faculties essential for hu- man beings, such as memory, attentional processes, and plan- ning.
DSM-5	Abbreviation derived from the title of the <i>Diagnostic and</i> <i>Statistical Manual of Mental Disorders</i> published by the American Psychiatric Association. It is one of the most wide- ly used nosographic classification systems for mental and psychopathological disorders in psychiatry, psychology, and medicine.

FoMO	Acronym for "Fear of Missing Out", it indicates the fear of being left out. It refers to a form of social anxiety characterised by the pervasive desire to stay in touch with what other peo- ple are up to through technological devices and by constantly thinking that other people are doing something more interest- ing or rewarding, i.e. that you are missing out on something.
Gambling Disorder	Also known as "compulsive gambling" or "gambling addic- tion", it is characterised by the inability to resist the persis- tent, recurring, and maladaptive temptation to bet large sums of money. In the DSM-5, it is included in the section on pathological addictions.
Genetics	A branch of biology that studies genes, heredity, and genetic variability in living organisms.
Gold standard	In psychology, it is the most reliable, accurate, and valid test to confirm the presence of a problem.
Identity	In psychology and social sciences, the concept that an individ- ual has of themselves, both on an individual level and within society; a set of unique characteristics that make the individual unique and one of a kind. It is not immutable, but changes over time based on person-environment interactions.
Impulsivity	A maladaptive predisposition to quick and impulsive reac- tions. It also includes a reduced ability to inhibit your own behaviour and a difficulty in delaying the reward or gratifica- tion that comes with it.
Incidence rate	In medical statistics, the number of new cases of a disease, or any morbid event, that occurs in a given population over a given period of time.
Internet Gaming Disorder (IGD)	Recently included in the third section of the DSM-5, it in- cludes all addictive behaviours ranging from online gambling to video games. There are several similarities with substance addictions, including alteration of the dopaminergic system linked to reinforcement and various behavioural changes such as impulse control, inhibition, and cognitive control.

I-PACE	A model that considers the Interaction of Person-Affect- Cognition-Execution, used in the study of different addic- tive behaviours. It was published by Matthias Brand and col- leagues in 2016 and updated in 2019.
Loneliness	A condition in which the person becomes isolated – by choice, due to personal circumstances and life events, or because they are isolated/ostracised by others – giving rise to a privileged relationship with themselves. The feeling of loneliness often triggers a tendency to hypervigilance to social threats: feeling socially isolated activates special attention to self-preservation that translates into a greater propensity for surveillance of the social world.
Longitudinal study	A study in which repeated observations of the same partici- pants are made over a long period of time. Days, months, or years may elapse between measurements.
Multitasking	A set of attitudes and behaviours that enable a person to be engaged in two or more different activities or tasks at the same time. The term comes from the field of IT, where it indicates the ability of an operating system to run multiple programmes simultaneously.
Neuro- transmitters	Endogenous chemical messengers used by neurons (the cells of the nervous system) to communicate with each other or to stimulate muscle or gland cells. The function of neurotrans- mitters is to transmit information and signals via neurons to keep the body working properly and regulate behaviour. The best known are glutamate, GABA, dopamine, serotonin, ace- tylcholine, histamine, norepinephrine (or noradrenaline), and epinephrine (or adrenaline).
Orbitofrontal/ ventromedial prefrontal cortex	A region of the prefrontal cortex located in the frontal lobe, in the lower part of the cerebral hemispheres, involved in pro- cessing risk and fear. It plays a key role in decision making and inhibiting emotional responses.

Peer group	A group of people who share similar characteristics such as age, working environment, education, or settings in which other leisure activities are carried out. It is the form of so- cial grouping that emerges spontaneously in adolescence: it is perceived as an open environment in which it is easier to find ways to express your personality, even in opposition to the adult world.
Personality	see Temperament
Phubbing	A recent neologism born from the fusion of the words "phone" and "snubbing", it refers to the act of ignoring or ne- glecting the person you are physically speaking to in order to frequently check your mobile phone or another technological device in a more or less compulsive way.
Prevalence rate	In medical statistics, the number of cases of a disease, or any morbid event, that occurs in a given population over a given period of time.
Reinforce- ment	In psychology, any event resulting from the behaviour of an individual (or animal) that can increase the likelihood that such behaviour will be repeated in the future. It is customary to distinguish between positive reinforcements (when stimu- li, such as rewards, are added to reinforce the desired behav- iour) and negative reinforcements (when aversive stimuli are removed to reinforce the desired behaviour).
Reliability	The extent to which the questions in a questionnaire measure the construct under investigation (or a dimension of it) in a way that is consistent between the questions.
Represent- ativeness of the sample	In psychology and research methodology, this indicates the procedure whereby a selected segment of a group that is rep- resentative of the population as a whole in terms of key var- iables of interest to the researcher is taken into account in a study.

Response state	A transient state in the moment; it is also called a "state variable" because its level can change quickly from one moment to another or over the course of a day. One example is emotions, which usually last a few dozen minutes.
Sample	In psychology and research methodology, this is the segment of the population on which the observations and analyses of a study are carried out.
Social anxiety	Needing reassurance from others or feeling the need to be in constant contact with someone.
Social comparison	The tendency to evaluate your own behaviours in relation to the most common behaviours in the group you belong to. The theory of social comparison was developed by Leon Festinger in the 1940s.
Social desirability	In methodology, the tendency of respondents to give respons- es that are considered more socially acceptable, with the aim of presenting themselves in the best possible light in the eyes of others and of researchers.
Temperament	Traits or behavioural characteristics that are biological in nature and appear very early in life. As children progress through var- ious cognitive and emotional stages that allow them to interact with, experience, and respond to the world in increasingly com- plex ways, temperamental traits develop into personality traits.
WHO	Acronym for the "World Health Organization", the authority responsible for the directing and coordination of the health sec- tor within the United Nations system. Founded in 1948 and based in Geneva, the objective of the WHO is the "the attain- ment by all peoples of the highest possible level of health", which is defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".
Withdrawal	In psychology or medicine, a state of distress or suffering due to the absence of the physiological, pharmacological, or toxic effect of a substance (or of a behaviour, in the case of behav- ioural addictions) to which the body was accustomed.



Internet, smartphones, and social media: just a few decades ago, the technological tools that are now available would have seemed like science fiction. And they can certainly do amazing things: overcome distances, make most of the human knowledge available at the click of a button, and satisfy many of our desires instantly. Yet, precisely because of their "powers", sometimes these tools can trap us and deprive us of our most precious resource: our time. In this booklet, the authors explore the relationship between young people and their digital lives: when does the use of smartphones and social media become a problem? When can it be considered an addiction? And above all: what should we do?

 Laura Marciano, Harvard T.H. School of Public Health and the Institute of Public Health, Faculty of Biomedical Sciences, University of Lugano (USI).
Anne-Linda Camerini, the Institute of Public Health, Faculty of Biomedical Sciences, University of Lugano (USI).
Heads of the Mediaticino project.

Inside the comic: Smartphone addiction Texts by the students of class 3D of the Giubiasco Middle School, Ticino, Switzerland. Illustrations by Alessandro Telve for the Scuola Romana dei Fumetti.



Repubblica e Cantone Ticino Dipartimento dell'educazione, della cultura e dello sport