

# DIGITAL TECHNOLOGIES AND MENTAL HEALTH

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**Abstract.** *Rights to dignity and freedom of thought (mental autonomy) are fundamental human rights. They imply the fundamental right to mental health. The possibility that rights to dignity, mental autonomy and, as a consequence, mental health may be severely jeopardized by certain digital technologies and Artificial Intelligence (AI) is recognized on a worldwide scale, yet, current legal frameworks are still struggling to carve out regulatory measures that fully take into accounting the impact of digital technologies and AI on mental health. This narrative review starts with a brief historic overview highlighting why internet and AI have taken the potential for individual and collective mental manipulation of former media of mass communication to the next level. In the current society context, dark patterns in commercial digital tools are cogently designed to manipulate consumer choices. Internet and social media platforms exploit AI to generate addictive trigger cues, fake contents, and deceptive interactions. Digital technology has hijacked our mental autonomy and represents an unprecedented threat to mental health and well-being, in particular of children and young individuals connected for long hours day and night as now officially recognized by international health organizations worldwide. The problem has already found expression in novel forms of compulsive behaviour and addiction (digital addiction) with related symptoms of anxiety, depression, sleep disorders, anhedonia, suicidal ideation. This article identifies psychological mechanisms likely to account for mental health deterioration in the digital age in terms of conditioned obedience to digital authority, de-individuation, pathological brain adaptation to chronic stress, reward deficiency syndrome (RDS), and learned helplessness. These mechanisms are non-conscious, deeply rooted in human neurobiology, and rely on the mechanism of psychobiological conditioning.*

**Keywords:** Digital Technology; Mental Health; Dark Patterns; Social Media; Deceptive Interaction; Digital Addiction; Reward Deficiency Syndrome; Learned Helplessness.

## INTRODUCTION

Digital technology and Artificial Intelligence (AI) pose threats to the human right to freedom of thought (McCarthy-Jones, 2019), identified in terms of threats to the right not to reveal one's thoughts, not to be penalized for one's thoughts, and not to have one's thoughts manipulated. To lose freedom of thought is to lose dignity and psychological integrity at the individual level, and social fairness and trust at the level of society. Rights to freedom of thought and dignity (Al-Rodhan, 2021) are protected by international human rights law, with the clear understanding that what the latter aims to secure is mental autonomy (Al-Rodhan, 2021; McCarthy-Jones, 2019).

In the digital society at the current technological scale, an individual's mental autonomy in terms of agency over their thoughts, actions, and decisions is compromised by factors relating to access to information, domain knowledge and expertise, and the individual understanding of and access to the different types of digital technology and AI currently deployed. As a consequence, digital policymakers have to entirely reconsider individual citizen awareness and ability to act. In 2021, the World Health Organization Mental Health Atlas formally recognized new forms of addiction to digital technology (connected devices) as a worldwide problem, where excessive online activity and internet use lead to inability to manage time, energy, and attention during daytime and produce disturbed sleep patterns or insomnia during nighttime (World Health Organization, 2021).

This problem was subsequently reported to have increased in magnitude worldwide during the COVID-19 pandemic (World Health Organization, 2022). Both the Digital Safety Act (Regulation - 2022/2065 - EN - DSA - EUR-Lex, n.d.) and the AI Act (EUROPEAN COMMISSION, 2021) of the European Commission are aimed towards a unified regulatory framework that is to protect individuals, in particular

youth and other vulnerable populations, from mental manipulation threats and mental health risks posed by digital technology and AI. However, clear definitions of mental manipulation, or mental health risks that would have to be mitigated by effective regulation, are not stipulated.

This quicksand of conceptual vagueness in the different legal texts pertaining to digital technology and mental health is due to 1) uncertainty about a general definition of what is to be understood by mental health on the one hand, and 2) a complete lack of understanding of the psychological mechanisms at play. This narrative review follows the Stanford University guidelines (Woodward, n.d.) and is aimed at providing a conceptual background for further investigation.

Insights into phenomena and symptoms translating the impact of digital technology on mental health, the psychological mechanisms at play, and a set of appropriate testing tools for further quantification in clinical and experimental research are reviewed. In the history of mass media communication, digitalization and AI have brought about technology for mental manipulation (Clark & Purdon, 1995; Holmes, 2017; Lifton, 1961; Al-Rodhan, 2021) well beyond what was previously possible. In the 20th century, communication in human society changed quantitatively and qualitatively by the invention of radio (Schwartz, 2015; Birdsall, 2012; United States Holocaust Memorial Museum, n.d.) and its use for advertising and political propaganda beyond mere public information.

Our belief systems are intrinsically biased by our personal history and experience, and we tend to believe in the validity of a certain type of information rather than another on the basis of such bias (Maffei et al., 2015). The strongest reinforcement of false beliefs is, purely and simply, the mere repetition of false facts and figures at the largest possible scale (Greifeneder et al., 2020). Repeating a false claim over and over again makes it believable through psychological mechanisms at play in incantation in tribal rituals (Boyer & Liénard, 2020).

Television (Killen, 2011; Packard, 2007; Packard, 1964) and, ultimately, the internet and the mobile phone, with the explosion of social networks (Pantic, 2014) and chatbots driven by various forms of AI, have progressively given birth to an entirely new breed of technology, ideally suited for behavioural monitoring and manipulation at the largest possible scale (Pérez-Sales, 2022). Intrinsically healthy real-world stimuli and sensations through physical contact with others and with material reality, which have a measurably positive effect on our psychological well-being (Heatley Tejada et al., 2020; Schneider et al., 2023), have been replaced by a whole universe of remote virtual social reality (Weizenbaum & Wendt, 2015) and deceptive online interactions.

## DARK PATTERNS IN MOBILE PHONE APPLICATIONS

Dark patterns were first identified in connection with persuasive technology tools aimed at influencing user behaviour in mobile phone applications. A first attempt at categorization was proposed already in 2010 (Dark Patterns - Types of Dark Pattern, 2019) to shed light on evil practices used in the design of mobile phone applications, where DP have been predominant for some time.

The presence of dark patterns in the UX design of digital platforms, websites, and mobile applications has been identified in 95% of all platforms and applications linked to commercial ventures (Di Geronimo et al., 2020). A dark pattern is defined as “a user interface that has been carefully crafted to trick users into doing things that they usually might not do” (Dark Patterns - Types of Dark Pattern, 2019). Dark patterns rely on a solid understanding of unconscious mechanisms of psychological conditions, and never have the user’s interest in mind.

For example, companies showing a long list of privacy policies in mobile applications although consumers involuntarily accept to share more data than they intended to. Aggressive commercial dark patterns involve practices that force the consumer to proceed to certain steps, make decisions, or perform certain tasks without freedom of choice, while mild dark patterns leave option to opt-out of the process. Surprisingly, it has been found that aggressive dark patterns are much better accepted by users than mild ones (Luguri & Strahilevitz, 2020; Mathur et al., 2021), presumably because aggressive ones more strongly display what may be called digital authority.

Digital authority, combined with the novelty effect of a given technology application or AI product, paradoxically helps masking the intrinsically evil intent behind them (Fogg, 2003; Nodder, 2013), which is akin to a psychological phenomenon known as the Milgram Effect (Russell, 2011). Dark patterns enable AI to deceptively lead consumers and users to “do what they are told to” willingly and uncritically. Mild dark patterns are present in almost all commercially linked internet and mobile applications. Individuals of all ages worldwide have already become used to being manipulated by them, a phenomenon referred to as dark pattern blindness or blindness to malicious internet design (Di Geronimo et al., 2020), akin to the well-known phenomenon of change blindness in psychology (Simons & Rensink, 2005).

Normative perspectives for analyzing dark pattern effects in terms of their potentially detrimental effects on consumers and society have been proposed by the OECD (Dark Commercial Patterns, 2024; OECD, 2021), without any deeper scrutiny of their consequences for the psychological well-being of individuals and society. Clear working hypotheses are urgently needed here for carving out appropriate regulatory measures. Also, there is no universally agreed definition of the dark pattern concept apart from the understanding that they lead users into making decisions they would not have made if fully informed and capable of selecting alternatives or given the choice of opting out (Dresp, 2022).

In short, by their manipulative nature, dark patterns online limit individual freedom of choice and the conscious awareness that is necessary “to say no” to a process, a procedure or a product. The General Data Protection Regulation (GDPR) of the EU (European Union, 2016) which encompasses the demand for clear information, transparency, control of all data, is violated by dark patterns in digital technology and AI. The motivations and intentions detectable behind a digital design pattern or AI determine whether it contains dark patterns or not. Mobile phone applications use dark patterns to achieve business goals in a virtual space where people spend most of their time. With the wider use of online games and AI-driven interactive platforms and social media (Fogg, 2003; Nodder, 2013), we have entered a new universe of human-computer interaction, by nature manipulative, because the aim of online platforms and social media is to keep people engaged.

Dark patterns therein serve the purpose of manipulating users to act in a certain way (Dark Commercial Patterns, 2024; OECD, 2021; Dresp, 2022), which is often contrary to their interests, in time alters their psychological ability to perceive and decide cogently and, ultimately, may engender behavioural changes that negatively affect individuals (Dresp, 2022) and society as a whole. The design of online gaming and interactive platforms unilaterally benefits the interest of their creators. Deceptive interaction as a general dark pattern, omnipresent in social media platform design and impossible to single out at the technical level, has potentiated mental manipulation at the largest possible scale.

The Digital Services Act (DSA) of the European Commission (Novovic, 2024) recognizes the dangers of dark patterns in digital technology and Artificial Intelligence (AI) to the safety and well-being of human individuals and society. The necessity for their uniform legal ban across Europe is recognized further in the Artificial Intelligence Act (European Union, 2021). Therein subliminal behavioural priming by dark patterns in Artificial Intelligence (AI) is identified as “high risk” technology to be banned legally in the future as soon as scientific insight on the mechanisms at play is available.

## DECEPTIVE DESIGN IN AI-DRIVEN SOCIAL MEDIA

The convergence of human intelligence and AI has given way to a deceptive space of relational interactions between humans and AI. The humanwashing of AI-enabled machines (Scorici, Schultz, & Seele, 2022) as a specific form of anthropomorphism represents a deceptive way of using AI-enabled systems and machines, misleading organizational stakeholders and the broader public about the true capabilities such machines possess. This has enabled the deterioration of social structures and communication processes with regard to consequences, accountability, and liability (Freiman, 2022).

Widespread cybercrime and cyber-insecurity have been listed among the top ten global risks to society in the next two years and beyond at the World Economic Forum in 2024 (Global Risks Report 2023 | World Economic Forum, n.d.). AI threatens democratic aspects of trust formation, and biases and destroys critical social aspects relating to distrust and its consequences on individuals and society (Freiman, 2022; Global Risks Report 2023 | World Economic Forum, n.d.; Hunter et al., 2023; Ferrara, Cresci, & Luceri, 2020;

Swire-Thompson & Lazer, 2019). Beyond the spread of false information, the rise of AI-manipulated multimedia, with a massive presence of AI-powered automated accounts and various forms of harmful content, the perils we encounter when exposed to such an online ecosystem have been allowed to proliferate beyond controllable levels (Swire-Thompson & Lazer, 2019).

This has produced a novel, particularly evil, breed of dark pattern: deceptive interaction (Uyheng & Carley, 2020; Obermaier & Schmuck, 2022). We may define deceptive interactions enabled by AI-powered platforms in terms of online contacts and interactive feedbacks that the user cannot control, either because the contact per se is fake and therefore deceptive (Uyheng & Carley, 2020), and/or the interaction deceives because it is coercive, deceitful, diminishing, hostile, discriminating and manipulative (Obermaier & Schmuck, 2022). Deceptive interaction (see Figure 1) makes humans believe they are interacting with another human when they are not, or allow other human platform members to create user profiles anonymously, permitting them to lie to and/or abuse others without penalty. Repeated exposure to algorithm-driven deceptive interactions engenders mental and behavioural modifications, especially in the young (Pew Research Center, 2024). This may have irreversible consequences on an individual's perception, understanding, reasoning, thoughts, emotions, trust, and overall psychological well-being at the individual level and at the level of their social interactions with others in the real world.



**Figure 1** Deceptive interaction in AI-powered social media as the most destructive form of dark pattern, directly manipulating human mental autonomy. As a consequence, the psychological well-being of individuals and society is jeopardized.

Moreover, public health is threatened by deceptive AI, given the large amount of inaccurate information that circulates online within and beyond the formal health care system (Suarez-Lledo & Alvarez-Galvez, 2020). AI and the internet have changed people's engagement with health information—be it through search, user-generated content, or mobile apps and social media platforms—in a way that could negatively affect health outcomes with regard to life quality and risk of mortality. This, ultimately, threatens public trust in health care institutions (Suarez-Lledo & Alvarez-Galvez, 2020; Bizzotto, Schulz, & De Bruijn, 2023).

AI-driven platforms that enable fake news campaigns and online hate speech have fuelled the social phenomenon of polarization, characterized by the fragmentation of society into antagonistic fractions with strictly opposed values that impede cooperative processes in the pursuit of common good (Van Bavel et al., 2021). The threats represented by polarization have already materialized, and democracy is globally under siege (De Mello, Cheung, & Inzlicht, 2024; Vasist, Chatterjee, & Krishnan, 2023). Polarization has impeded pandemic response (De Nicola, Mambou, & Kauermann, 2023) and consensus on critical global

issues such as climate change (Falkenberg et al., 2022), and has weakened the resilience of our society to adversity.

From a positive perspective, social media have enabled activist groups and minorities to become more visible and get their messages over to the wider public, highlight inequalities, denounce injustice, and advance discourse on social justice at a larger scale. The negative side, however, is that social media are being used by extremists, political parties, and politically motivated players to demonize specific groups and to discriminate already marginalized populations to achieve specific, non-noble ends that destroy cohesion in society (Smiley & Fakunle, 2016; Ahmed et al., 2024).

Deceptive interaction via AI-driven digital platforms increases violence in society by promoting hate speech, loss of empathy for others, criminality, domestic violence, and terrorism, with a measurable impact on national statistics of domestic terrorist attacks (Rulis, 2024; Piazza, 2022).



Figure 2 Digital authority as a source of phenomena of unwarranted obedience (Milgram Effect), de-individuation, online conformity, fear of missing out, and polarization

AI-driven manipulative disinformation via social media also effectively conveys false endowments to technological or financial resources, national and foreign governments and political parties (Reisach, 2020). The large-scale nature of online deception is one of the conditions of its success in a new social universe where digital authority engenders a clearly identifiable set of negative consequences on human individual and collective mindsets and behaviour (see Figure 2).

## IMPACT OF DIGITAL TECHNOLOGY ON MENTAL HEALTH

The impact of digital technology on mental health and well-being encompasses a wide range of adverse effects, symptoms, and conditions, from social withdrawal in problematic online use to full-blown digital addiction (Pereira et al., 2020; Fineberg et al., 2024; Meng et al., 2022; Dresp-Langley & Hutt, 2022), chronic stress (Haidt, 2024; Maftai & Pătrăușanu, 2023), anxiety (Kerr et al., 2024; Du et al., 2024), depression (Keles, McCrae, & Grealish, 2019; Hu et al., 2024), anhedonia (Guillot et al., 2016; Cangelosi et al., 2024; Dresp-Langley, 2023), and suicidal ideation (Cheng et al., 2018; Chamarro et al., 2024; Morese et al., 2022). Adolescents and young adults in particular are targeted by manipulative online content (Dadi, Dachew, & Tessema, 2024), and online stereotypes and image models imposed by digital technology cause severe psychological harm, especially in youth (Sumner et al., 2021).

Fear of missing out (FoMO) (Groenestein et al., 2024) and an overall lack of awareness (Young et al., 2024) are factors that contribute to the victimization of youth by digital technology and social media. Thus, digital technology has produced a novel form of adversity we may call digital adversity (see Figure 3).



Figure 3 Digital adversity as a source of altered mental health in terms of reward deficiency syndrome linked to internet addiction, sleep disorders, chronic stress, and depression leading in extreme cases to anhedonia and suicidal ideation.

Exposure to a certain type of image material in social media can have detrimental effects on the self-esteem and body image of adolescents, in particular girls (Jacob, Evans, & Scourfield, 2017). According to a study by the World Health Organization (The World Health Organization, 2024), girls' psychological and mental health are particularly affected by the consequences of online deception, with adolescent girls twice as likely to report feeling lonely compared with boys, and to suffer from eating disorders more frequently.

Overexposure to algorithm-driven online contents also affects the ability to learn. While digital technology has the potential to improve access to educational content and enhance the learning experience, children's social lives increasingly focus on social media, which affects their concentration and learning ability in school. Studies on young people across countries (Jiotsa et al., 2021; Shannon et al., 2022) highlight the association between the use of social media and body image concerns, eating disorders, and generally poor mental health. Addictive design features (Montag et al., 2019) and excess of screen time and blue light exposure for long hours day and night pose a threat to general health, especially that of children (Dresp-Langley, 2020).

Excessive digital content exposure distracts children and young people in general from academic as well as relaxing extracurricular activities. In 2024, the WHO proposed an extended universal definition of mental health (World Health Organization, 2019) in terms of:

*"... a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It has intrinsic and instrumental value and is integral to our well-being. Mental health conditions include mental disorders and psychosocial disabilities as well as other mental states associated with significant distress, impairment in functioning or risk of self-harm."*

The document further states that, in 2019, 970 million people globally were reported living with a mental disorder, anxiety and depression being the most common. Mental health conditions affect all aspects of life and account for six years lived with disability. People with severe mental health conditions die ten to twenty years earlier than the general population. Having a mental health condition increases the risk of suicide and experiencing violations of human rights. In addition, the economic consequences of mental health conditions are incommensurable, with productivity losses that outstrip the cost of healthcare.

In 2024, the World Health Organization (The World Health Organization, 2024) has formally recognized that addiction to digital technology has become a worldwide threat to the mental health and well-being of individuals and groups, particularly youth. Excessive online activity and internet use lead to an inability to manage time, energy, and attention during daytime, and to disturbed sleep patterns and insomnia during nighttime. The psychological mechanisms underlying the many ways in which human mental autonomy has been hijacked and mental health put into jeopardy or compromised by digital and AI-driven technology are not known, but it is possible, under the light of what has been reviewed here above, to suggest likely candidate mechanisms.

## PSYCHOLOGICAL PHENOMENA AND MECHANISMS

Mental manipulation by digital technology relies on universal mechanisms that are mostly non-conscious and grounded in life-long psychological conditioning to submit to authority, including digital authority.

### Obedience to Digital Authority and Fear of Missing Out

Individuals or groups believed to have authority can effectively assert such over individuals or crowds. Milgram's famous experiments on blind obedience to fake authority clearly demonstrated that belief is what matters, not whether the authority is authentic in terms of competence, eligibility, or legal standing (Russell, 2010). Individuals, groups, and media perceived by others to have authority acquire the power to influence these others positively or negatively. When the perceived authority is in close proximity, their ability to exert influence is maximized (Gibson, 2018; Cialdini & Goldstein, 2004). As millions of individuals worldwide spend long hours day and night tethered to their digital devices, digital authority is always nearby, effectively replacing the real-world authority of parents, peers, or teachers.

The positive side of obedience to authority is that it maintains safety and order. However, when a perceived authority is fake and not critically questioned, it gains the power to exploit and abuse. Korte (2020) referred to E. M. Forster's prophetic short story *The Machine Stops* (1909) as a dystopian narrative in which a controlling machine dictates life and communication, evoking parallels with the digital media environment of today. In this story, all communication is virtual; face-to-face meetings no longer occur, and when the machine fails, society collapses—an allegory for unchecked digital dependency (Forster, 1909).

Submission to perceived authority has been learned from early childhood, embedding an almost unconscious desire to conform to digital technology. This desire is exemplified in the Fear of Missing Out (FoMO), defined as “the tendency to experience anxiety over missing out on the rewarding experiences of others” (Rozgonjuk et al., 2020). Empirical studies have demonstrated FoMO's central role in mental health issues related to digital technology use (Rozgonjuk et al., 2020; Beyens, Frison, & Eggermont, 2016).

### De-individuation and Online Conformity

Obedience to authority may produce de-individuation, a psychological process whereby individuals abandon their personal motivations and mindset in favor of group identity and behavior (Reicher, Spears, & Postmes, 1995; Liao, Squicciarini, Griffin, & Rajtmajer, 2016). In its extreme forms, individuals conform so completely to group norms that they relinquish individual responsibility for their decisions and actions—an effect frequently observed in sectarian or ideologically radicalized movements (Merrilees et al., 2013).

The human tendency to seek consensus and validation from others may begin as a constructive desire to better understand the group (Chung, 2018). However, in digital environments with constant and emotionally charged feedback, this tendency can evolve into a pathological need for affirmation (Weiß, Gollwitzer, & Hewig, 2024). In such contexts, de-individuated group conformity can lead individuals to participate in online behaviors—such as aggression or unlawful actions—that they would never display in offline, real-world interactions (Anderson, Brossard, Scheufele, Xenos, & Ladwig, 2013).

This psychological mechanism is closely tied to the emergence of polarization on social media platforms, where obedience to digital authority and loss of individual judgment through de-individuation reinforce one another. Scholars have identified two dominant factors driving such polarization: the individual's desire to conform to perceived group expectations and their fear of social exclusion (Panizza, Vostroknutov, & Coricelli, 2021).

### Pathological adaptation to chronic digital stress

The ill-adapted psychological subordination to digital environments or social media and the resulting progressive de-individuation are akin to some of the consequences of post-traumatic stress-disorder (Smith & True, 2014), and likely to involve a novel form of pathological adaptive learning (Bonne et al., 2004; Flor, 2008). One of the most compelling characteristics of the brain is the plasticity of neural circuits and functions (Von Bernhardi, Bernhardi, & Eugenín, 2017). It underlies the ability of the brain to

continuously adapt its functional and structural organization to relevant changes in stimulations and environments. However, although brain plasticity favours healthy processes of functional adaptation and adaptive learning, its mechanisms also govern maladaptive, i.e. pathological, changes in the brain.

This may be illustrated on the example of stressful events. The brain can learn from stressful events to respond in an adaptive manner in the future. While an optimal stress level leads to enhancement of memory performance, the exposure to extreme, traumatic or chronic stressors is a risk factor for the development of psychopathologies which are associated with memory impairment and cognitive deficits (Deppermann, Storchak, Fallgatter, & Ehrlis, 2014).

A crucial role of the accumbal and prefrontal dopamine brain pathways and inflammatory responses in the brain and body as the direct adaptive and maladaptive consequences of stress related to digital overexposure or addiction may be involved here (Ali, Janarthanan, & Mohan, 2024; Ding, Shen, Liu, & Li, 2023). In behavioural addictions (Hyman, Malenka, & Nestler, 2006), which include digital addiction (Dresp-Langley & Hutt, 2022; Ding et al., 2023), pathological brain adaptation is known to involve complex interactions between the reward system and other functional areas.

These interactions form the neurobiological correlates of the transition from the initial pleasures associated with a specific activity to compulsive behaviour (el-Guebaly, Mudry, Zohar, Tavares, & Potenza, 2011) and pathological craving (Trotzke, Müller, Brand, Starcke, & Steins-Loeber, 2020) characteristic of all forms of addiction (Hyman et al., 2006).

#### Reward Deficiency Syndrome (RDS) and digital addiction

In all addictions including digital addiction (Blum et al., 2021; Ding et al., 2023), the initially positive reward response of the brain ultimately reverses into a negative reward response (Blum et al., 2021) through psychological and physiological mechanisms of pathological adaptation. The initial pleasure associated with the activity or drug is gone, but the need to resort to the drug persists as a consequence of a neurobiological condition called Reward Deficiency Syndrome (RDS) (Blum, Febo, McLaughlin, & Gold, 2015). RDS refers to abnormal behaviours and brain mechanisms resulting from a breakdown of a cascade of reward loops in neurotransmission, most likely due to genetic and epigenetic influences (Blum et al., 2015). This involves a whole so-called anti-reward brain circuitry (Koob, 2008; Koob & Le Moal, 2005; Koob & Volkow, 2016).

The important role of neurotransmitter deregulation, i.e. progressive dopamine depletion as the anti-reward networks reinforce and consolidate in the brain (Blum et al., 2015), as well as important links to elevated corticosteroid levels and chronic stress (Koob & Volkow, 2016) have been discussed in several major review articles in association with digital addiction (Dresp-Langley & Hutt, 2022; Trotzke et al., 2020; UNICEF, 2021). Dopamine depletion and stress-related mechanisms form the neurobiological basis of craving and relapse in addiction (Trotzke et al., 2020; Blum et al., 2015; Koob & Volkow, 2016). As far as environmental trigger cues are concerned, essentially three cue types involved in craving and relapse have been identified: (a) re-exposure to addictive drugs or activities, (b) stress caused by external stressors and/or withdrawal-related internal stress, and (c) re-exposure to relevant environmental contexts (situations, people, places) associated with the drug or activity (Koob & Volkow, 2016). Although some individuals can stop compulsive behaviour on their own before it leads to chronic addiction, genetic and non-genetic factors readily explain why most of us cannot (Koob & Le Moal, 2005; Koob, 2008; Gold, Blum, Febo, Baron, & Modestino, 2015).

In digital addiction, we keep consuming technology that is not good for us because it has adverse effects on our brain health, but our brains keep craving it, even when it no longer rewards us. Compulsion combined with digital adversity (negative feed-back, cyber bullying, online harassment e.a.) explains clinical symptoms of anxiety, depression, anhedonia, and suicidal ideation (Dresp-Langley & Hutt, 2022; Blum et al., 2021; Deppermann et al., 2014; Trotzke et al., 2020) associated with digital addiction (Dresp-Langley & Hutt, 2022).

### Learned helplessness

In his book *Beyond Freedom and Dignity* written in 1971 (Skinner, 1971), the American psychologist B. F. Skinner discussed the basic mechanisms of classic and psychological conditioning. The repeated association of positive or negative (aversive) stimuli with situations and events will influence how a person feels, behaves, and act (Domjan, 2015), there is no way out. The underlying psychobiological mechanisms are non-conscious, and deeply rooted in the brain's neural networks (Gazzaniga, Ivry, & Mangun, 2019; LeDoux, 2015).

The concept of learned helplessness refers to the condition of a living individual, human or animal, where mindset and behaviour are affected by the learnt belief that the individual's actions do not matter in as far as they are perceived to not ever impact outcomes positively. In humans, this typically manifests in the perception of events, and life in general, as uncontrollable and unpredictable. At the behavioural level, the individual does not proactively respond to adversity in order to avoid or counter a negative response or outcome, not even when opportunities for avoidance or change exist. The concept harks back to experiments on dogs described by Seligman and collaborators (Seligman, 1972; Maier & Seligman, 1976). Learned helplessness theory posits that repeated exposure to uncontrollable and aversive environmental stimuli leads gradually to the firm belief that the aversive situation is inescapable. This feeling of “no way out” produces a sense of helplessness that can result in anxiety, depression, and suicide (Overmier & Seligman, 1967; Peterson, Maier, & Seligman, 1993). Learned helplessness is likely to involve the same psychological and physiological mechanisms of conditioning as those that occur in the transition from pleasurable consumption to anti-reward and RDS, which has been linked to brain evolution by some authors (Blum et al., 2015).

These mechanisms of brain conditioning are exploited cogently by some AI-driven internet technology and social media, thereby creating hostile online environments and a whole new universe of digital adversity. The association between dark patterns in digital technology and learned helplessness in consumer populations was first brought forward in 2022 in the context of an expert group meeting on digital technology and mental health of the Consumer Safety Network of the European Commission (Mathur et al., 2021). The author therein stipulates that feeling that there is no way out of manipulative technology can evolve into a generalized state of learned helplessness and psychological subordination, especially in youth and vulnerable populations, where the individual becomes a victim, and thereby an ideal target to further exploitation and abuse in the online world, and beyond.

## CONCLUSION

Since the end of the Covid-19 pandemic, the impact of digital technology on the mental health and wellbeing of individuals, in particular the young, has received considerable attention from public health organizations worldwide. Adding to concerns about increase in suicidal behaviour in the young in a society context producing ontological fears and insecurities worldwide, WHO experts worldwide witnessed a significant rise in mental health issues, anti-depressant prescription uptakes, and suicide statistics for young individuals. In France, for example, a significant increase in medical consultations for suicidal behaviors and thoughts associated with anxiety and depression among 18–24 year-olds in the global national population, with a peak in 2021, was revealed by public health barometer survey statistics (Santé Publique France, 2023). The Health Behaviour in School-aged Children (HBSC) study surveyed approximately 280,000 young people aged between ten and fifteen across 44 countries in Europe, central Asia and Canada in 2022. The report concludes on a significant proportion of youth with problematic social media use as a pattern of behaviour characterized by addiction-like symptoms such as inability to control social media usage, experiencing withdrawal when not using it, neglecting other activities in favour of social media, and experiencing negative consequences in school and daily life due to excessive use (Inchley et al., 2022). There is a worldwide consensus that the impact of digital technology on mental health urgently warrants further epidemiological and clinical research.

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