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# Virtual autism – a neurodevelopmental disorder, or the result of parental neglect?

## Autyzm cyfrowy – zaburzenie neurorozwojowe czy efekt zaniedbań rodzicielskich?

**Abstract**

**Aim.** The article is illustrative and presents a description of virtual autism, which is increasingly observed in public space, and is related to the excessive use of modern technologies. These concerns include the potential effects of children's long-term exposure and interaction with electronic devices and multimedia content that is not developmentally appropriate.

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**Materials and methods.** The data collection method was researching secondary sources, and the content analysis was done. The article was written mainly on the basis of psychological literature.

**Results and conclusion.** Based on contemporary literature on the subject, the characteristics and conditions of this phenomenon were analyzed. There is no scientific consensus on whether, or how, exposure to digital technologies may cause virtual autism, but the harmful effects of digital devices on development during infancy and middle childhood cannot be underestimated. Due to the similarity of behavioral characteristics, virtual autism can be identified with autism spectrum disorders, the genetic mechanisms of which and their implications for the neuroatypical development path have been briefly described in order to illustrate the differences between the analyzed phenomena. While neurodevelopmental factors are central to understanding autism, it is important to note that parental neglect in itself is not considered a direct cause of autism. However, the social environment and early experiences may influence the manifestation and severity of symptoms in people with ASD. At the end, postulates for parenting practice are presented, the implementation of which may contribute to reducing the risk of virtual autism and at the same time increase the development potential of modern children.

***Keywords:*** autism, autism spectrum disorder, virtual autism, exposure to digital devices, nontypical development.

**Abstrakt**

**Cel.** Artykuł przedstawia opis obserwowanego coraz częściej zjawiska o nazwie autyzm cyfrowy, związanego z nadmiernym korzystaniem dzieci z nowoczesnych urządzeń zawierających ekrany. Rodzice i profesjonaliści coraz częściej konfrontują się z negatywnymi skutkami długotrwałego narażenia dzieci na interakcję z elektronicznymi urządzeniami oraz treściami multimedialnymi niedostosowanymi do ich potrzeb rozwojowych.

**Materiały i metody.** Metodę zbierania danych stanowiło przeszukiwanie źródeł wtórnych, wobec których zastosowano racjonalną analizę treści. Artykuł przygotowano na podstawie najnowszej literatury psychologicznej dotyczącej zjawiska autyzmu cyfrowego oraz uwarunkowań zaburzeń ze spektrum autyzmu.

**Wyniki i wnioski.** W oparciu o literaturę przedmiotu dokonano analizy charakterystyki i uwarunkowań fenomenu autyzmu cyfrowego. Nie istnieje naukowy konsensus co do tego, czy i w jaki sposób ekspozycja na technologie cyfrowe może powodować autyzm cyfrowy, lecz nie można lekceważyć ich szkodliwego wpływu na przebieg rozwoju w okresie niemowlęctwa i średniego dzieciństwa. Ze względu na podobieństwo charakterystyk behawioralnych autyzm cyfrowy może być utożsamiany z zaburzeniami ze spektrum autyzmu, których genetyczne mechanizmy oraz implikacje rozwojowe zostały pokrótce opisane w celu zobrazowania różnic pomiędzy analizowanymi fenomenami. Choć czynni-

ki neurorozwojowe mają kluczowe znaczenie dla autyzmu, a oddziaływania rodziców *per se* nie stanowią jego bezpośredniej przyczyny, to jednak zaniedbywanie dziecięcych potrzeb w istotny sposób może indukować zmiany rozwojowe. Środowisko społeczne i wczesne doświadczenia mogą wpływać także na manifestację i nasilenie objawów u osób z ASD. W zakończeniu przedstawiono postulaty dla praktyki rodzicielskiej, których realizacja może przyczynić się do obniżenia ryzyka autyzmu cyfrowego, a także do podniesienia potencjału rozwojowego współczesnych dzieci. Odpowiednie wsparcie i środowisko opiekuńcze mogą pozytywnie wpłynąć także na rozwój i dobrostan dzieci autystycznych.

***Słowa kluczowe:*** autyzm, zaburzenia ze spektrum autyzmu, autyzm cyfrowy, ekspozycja na urządzenia cyfrowe, nienormatywny rozwój.

## Introduction

Excessive use of digital media can lead to various adverse developmental phenomena, i.e. concentration disorders, emotion regulation or interpersonal difficulties. This raises the issue of differentiating digital autism from other neurodevelopmental disorders and developing appropriate and effective ways of supporting and treating development. It is important to understand that autism spectrum disorder is a real, holistic and biologically determined neurodevelopmental disorder, which has its own specific diagnostic features and requires specialised diagnosis and appropriate therapy. Excessive use of digital technologies, on the other hand, can be a cause of developmental disharmony and induce serious mental health and developmental disorders in children.

Autism spectrum disorders are diagnosed on the basis of behavioural criterion symptoms, which manifest as qualitative changes in two core areas of functioning: social communication and patterns of behaviour and interests (DSM-5 Task Force, 2013; ICD-11, 2019). Deficits in social interaction and communication manifest themselves in diverse and individualised ways, most commonly as difficulties in making and maintaining eye contact (Senju, Johnson, 2009), in sharing attention (Bruinsma, Koegel, Koegel, 2004), in reading and understanding emotional states (Dawson et al, 2004) and in understanding one's own or other people's mental states (Baron-Cohen, Leslie, Frith, 1985; Rajendran, Mitchell, 2007), in establishing and carrying out social interactions, in communication or in engaging in reciprocal relationships (Constantino, Przybeck, Friesen, & Todd, 2000). Deficits in communication, both verbal and non-verbal, are characterised by a lack of social reciprocity and an inability to develop and maintain relationships with others. In addition, restricted and repetitive patterns of behaviour, interests and activities are characteristic, as manifested by stereotyped motor and verbal responses or atypical responses to sensory stimulation, as well as specific interests (South, Ozonoff,

& McMahon, 2005). Difficulties in the functioning of specific cognitive processes, i.e. perception, attention, memory and thinking (Happé, Frith, 2006) and management functions (Hill, 2004), are also an important feature.

Underlying these deficits is an abnormally functioning mechanism of social motivation, which is responsible for establishing all kinds of relationships and building social bonds and cooperating for the good of the individual and the social group. An essential component of social motivation is the undertaking of alternate actions, revealing the reciprocation response that is the essence of communicative conventional gestures, and which consists of reordering the sending and receiving of socially important information (e.g. responding to greetings or to others' questions, introducing oneself), imitating another person's action and/or the ability to engage in pretend play (Baron-Cohen, 1987). Immanent components of social motivation in the course of normative development, in addition to a readiness to initiate social behaviour in order to build and sustain bonds, are a social orientation oriented more towards people than towards mechanical objects and a tendency to prefer social rewards over material ones (Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012). There is evidence that all three aspects of social motivation are disrupted in individuals with autism spectrum disorder (ASD) (Clements et al., 2018), resulting in a focus of attention on figurative and inanimate elements and a significantly lower willingness to establish and sustain social interactions (Deckers, Roelofs, Muris, & Rinck, 2014).

Autism spectrum disorders (ASD) arise as a result of the interplay of many aetiological factors (Minshew, Sweeney, Bauman, & Webb, 2005), among which genetic causes play a significant role (Abrahams, Geschwind, 2008). The first study of MZ and DZ twins in search of genetic factors was conducted by Susan Folstein and Michael Rutter (1977). Subsequent ones revealed a 50% probability of a genetic aetiology in ASD (Hallmayer et al., 2011) and often linked common genetic mechanisms to fragile X syndrome. Nowadays, the contribution of genetic factors is estimated to be between 64% and 91% (Tick, Bolton, Happé, Rutter, & Rijsdijk, 2016; Krishnan et al., 2016), suggesting that genetic factors predominate in the aetiology of ASD compared to other common syndromes developmental disorders. Hundreds of genes interacting with a variety of – still poorly understood – biological determinants are involved in the pathogenesis of ASD (Wu et al, 2017; Careaga, Murai, Bauman, 2017) and environmental (Karimi, Kamali, Mousavi, & Karahmadi, 2017; Mundy, Henderson, Inge, & Coman, 2007 ), which is why ASD has been classified as a disorder with the most complex mechanisms and multifactorial aetiology, due to the diversity of genes regulating neurogenesis, the high variability of approximately 23 000 other genes constituting the so-called genetic background and the diverse interactions of environmental factors (Daghsni et al., 2018).

During individual prenatal development, various genetic and biological factors modify the process of neurogenesis at all its stages (proliferation, migration, cell differentiation, synaptogenesis and fibre myelination, and apoptosis), the implication of which is the emergence of neuroatypical brain organisation and a specific developmental pathway in ASD (Lahiri et al., 2013). Genes implicated in the aetiology of ASD regulate the operation of a wide variety of processes, including involvement in the formation of ion channels, synaptic vesicles for neurotransmitter transport, cell signalling, energy metabolism, amino acid metabolism, cytoskeletal structure, transport of cellular microorganelles along the axon, formation of dendritic spines, cell proliferation or migration or embryonic morphogenesis. They also take part in protein ubiquitination, the process of labelling proteins with ubiquitin to degrade them if they have the wrong structure or are currently unnecessary. Genes are involved in the formation and function of synaptic structure, synaptic plasticity, chromatin remodelling to ensure proper spatial organisation of DNA in the cell nucleus, mRNA transcription on the DNA template strand and many other processes (Krishnan et al., 2016; De Rubeis et al., 2014). Thus, multiple genes regulating multiple developmental pathways required for brain structure and function are involved in the aetiology of ASD.

The result of anatomical and functional changes occurring during non-normative prenatal development is an abnormal mechanism of functioning of neuronal networks that link distal subcortical and cortical structures interacting in the process of social cognition and behavioural regulation (Beopoulos, Géa, Fasano, & Iris, 2022). Thus, autism spectrum disorders are neurodevelopmental in nature and their prevalence has been successively increasing in the general population over the last decades and is currently estimated at 1/100 of cases (Zeidan et al., 2022); also in Poland, an exponential increase in the number of diagnoses has been observed, which, according to government representatives, may be an overinterpretation of the actual epidemiological indicators (Torchała, 2023). Regardless of the interpretation, the increase in the incidence of developmental disorders is a fact, and the negative effects of the disorder in the form of symptoms, which vary in form and intensity, may manifest themselves at different periods of an individual's postnatal development.

Due to the early damage to the normative developmental pathway and the global nature of these changes, other disorders, i.e., intellectual disability, epilepsy or genetic syndromes, often co-occur with ASD (Al-Beltagi, 2021; Bougeard, Picarel-Blanchot, Schmid, Campbell, & Buitelaar, 2021). Despite the evidence cited above suggesting a genetic basis for ASD, the nature and mechanisms explaining genetic conditions remain a subject of research aimed at unravelling the mystery. Although ASD has a definite biological cause, no biomarkers have been confirmed to date by which ASD risk can be diagnosed prenatally in order to introduce an early and effective therapeutic strategy (Frye et al., 2019). In contrast, postnatal diagnostic

studies using whole exome sequencing (WES, *whole exome sequencing*) can be successfully conducted. A retrospective study using WES in 343 children with ASD from Spain confirmed the diagnostic efficacy of the method and revealed that 75% of cases contained a *de novo* mutation variant (Arteche-López et al., 2021). On this basis, WES was identified as a first-level test for patients with neurodevelopmental disorders (Álvarez-Mora et al., 2022).

Digital technologies are creating the life of modern man due to their enormous possibilities. According to the concept of the so-called fourth industrial revolution, numerous changes are taking place in the area of the systemic use of information technologies due to the development of automation, data processing and exchange, manufacturing techniques and the organisation of the management of all processes (Furmanek, 2018). This is particularly true in the industrial sector (Industry 4.0), where digital transformation is leading to the creation of the smart factory, where pioneering business models, innovative products and services, as well as new methods of serving customers are being introduced (Schwab, 2018). The customer uses the products of the smart factory, the most widely used of which are the internet of things and the internet of people, as well as mobile phones. Easy-to-use and mobile digital devices (smartphones, tablets, laptops, etc.) have become everyday objects for citizens of the global village and affect all kinds of human activities – from learning to work to leisure and social interaction. Digital natives are increasingly younger children who, with their parents' permission, use digital devices anywhere and anytime, roaming social media, surfing the internet and playing video games. A study in China revealed that almost half of the children surveyed aged 1–3 (47.4%) use smartphones at least once a day, and about a third (36.8%) use tablets (Niu, Zhang, Zhou, 2018). The deleterious effects of mobile phone use (for half an hour a day over 10 years) are reported in studies conducted on large samples of adults. The results indicate neurodegenerative diseases or brain tumours, parotid gland tumours, fertility disorders, sleep disorders due to reduced melatonin levels. In children, on the other hand, there are: childhood leukaemia, brain tumours, neurological disorders, immune system disorders. The risk of brain cancer from long-term use of a mobile phone is much higher in younger users than in adults, due to the size of the head and the conductive properties of immature brain tissue, resulting in twice the radiation dose being absorbed during a phone call than in an adult. Also, during the prenatal developmental period, radiation from a mobile phone used by the mother is found to damage fetal development due to modification of DNA structure and gene expression processes, severe oxidative stress, redundant apoptosis of nerve cells and damage to cell membranes (Kesari, Siddiqui, Meena, Verma, & Kumar, 2013; Meregu, 2016).

The current technological advances resulting from the fourth industrial revolution, despite numerous risks, also enable the creation of innovative digital diagnostic

and therapeutic tools that can be of great support to children with ASD, their parents and therapists. Due to the specific interests and peculiar way of processing visual stimuli (Grandin, 2006) and the involvement of neuronal systemising processes (Baron-Cohen, 2002, 2008), social robots (Alabdulkareem, Alhakbani, & Al-Nafjan, 2022) and other tools involving information and communication technologies (ICT) are particularly attractive for people with ASD (Scarcella et al, 2023; Czarnecka, Zelazowska, 2023) and virtual reality (VR) (Carnett et al., 2023), providing an important rationale for their practical application. ICTs often facilitate face-to-face interaction with others, and a person with autism has the opportunity through this technology to capture the attention of a teacher (Parsons, Leonard, & Mitchell, 2006) or another person (Alcorn et al., 2011). ICTs also make it possible to establish mediated communication using a computer (Rajendran, Mitchell, Rickards, 2005) or a network (Rajendran, Mitchell, 2006). Thus, it can be inferred that their use increases the readiness to communicate between the person with ASD and others in social interactions (Porayska-Pomsta et al., 2012).

## Virtual autism

The development of ICT technology raises new questions for researchers. It is worth considering whether digital devices may contribute to developmental disorders or exacerbate neuroatypical conditions in people with ASD (Rajendran, 2013). Will people with ASD become more or less autistic under the influence of digital devices, will ICT make a person socially isolated due to primitive neurodevelopmental disorders even more withdrawn, more autistic and less likely to interact with other people?

Colloquial observations reveal that children who spend a lot of time in front of phone, computer, TV or tablet screens have developmental deficits. To describe disorders with symptoms similar to the autism spectrum, the term virtual autism was introduced by Marius Zamfir (2018) (Balan, 2018; Wieczorek-Płochocka, 2023).

Between 2012 and 2017, M. Zamfir conducted a study in two specialised rehabilitation centres in Romania on the frequency of use of the virtual environment by children aged 0–3 diagnosed as autistic and on the effectiveness of the therapy process applied to them. The children were divided into two groups according to the time spent using digital devices (screen group *vs* control group). It was found that children with ASD aged 0–3, whose caregivers reported more intensive activity in the virtual environment (more than four hours per day), revealed more social, communication and cognitive impairments (an increase of 37% between the first and second measurements) and had significantly lower therapeutic effects. Children who used digital devices to a significantly lesser extent, on the other hand,

showed less severe autistic symptoms and the effects of the therapeutic interventions carried out on them were greater. A consistent reduction in exposure resulted in an improvement in the child's cognitive and emotional-social functioning, which clearly indicates a reactive form of developmental deficits in infancy and post-infancy. Difficulties in the understanding and expression of emotions and in establishing interpersonal relationships and communication may therefore result not necessarily from a neuroatypical developmental pathway, as in genetically conditioned ASD, but from overexposure to digital devices – which is accurately captured by the term virtual autism. Sensory-motor and social-affective deprivation caused by the use of virtual environments for more than four hours a day by children aged 0-3 can activate behaviours and symptoms similar to those observed in children with ASD. Based on the results of the cited studies, an information campaign was developed for professionals and parents. Its aim was to build public awareness of the harmfulness of digital devices (i.e., tablets, smartphones, TVs, computers, laptops, etc.) for children aged 0–3, as well as the possibility of reducing instances of psychomotor and communication disorders in children's development by introducing reasonable limits on stimulation and exposure to harmful interactions.

In children diagnosed as autistic, abnormal development of the nervous system may occur as a result of watching television, tablets or mobile phones, due to a lack of mental, motor, sensory, emotional and psychosocial stimulation. In this case, therefore, it is not a matter of the destruction of neurological connections, but of their failure to form as a result of insufficient and developmentally inadequate stimulation. From the virtual environment, the child only perceives specific sensations (visual and/or auditory) and is unable to link these sensations to other types of sensation: vestibular, tactile, olfactory, gustatory, resulting in disorders of sensory-motor intelligence and intermodal integration. Lack of appropriate stimulation and therapeutic intervention (before the age of 2 or 3) will result in an exacerbation of symptoms, accentuating behaviours from the autism spectrum, whose therapy will be increasingly difficult and costly.

## Intensity and duration of exposure to digital devices

Since the first publication on digital autism, there has been growing interest in the phenomenon. Two recently published systematic reviews reveal detailed analyses of the results of studies exploring the associations of screen exposure with autistic disorders (putatively autistic or digital autism) (Slobodin, Heffler, & Davidovitch, 2019; Sarfraz et al., 2023). Most of the studies included in these analyses reveal that children exposed to prolonged contact with digital devices manifest non-normative behaviours

and developmental deficits, the intensity of which is directly proportional to the time spent in front of the screen. These disorders emerge in children as a result of exposure regardless of their initial condition and developmental trajectory. For children with ASD, social, communicative and cognitive functioning disorders are intensified as a result of exploration, and a significant factor significantly associated with the development of ASD is the length of exposure to digital devices.

Donna Hermawati and her team (2018) conducted a study dedicated to analysing the symptoms of developmental disorders occurring in children with greater access to electronic media on a daily basis. The results showed that children who spent less than three hours a day watching had delayed language development and short attention span, while children who spent more than three hours a day watching had language delay, attention deficit disorder and hyperactivity. More than half of the children surveyed (66.6%) did not have any interaction with their parents while using digital devices, all showed speech delay and short attention span, and 66.6% of the children additionally showed hyperactivity.

More hours spent interacting with screen devices increases the likelihood of virtual autism (or ASD), and particularly increases the severity of social interaction disorders (Alrahili et al., 2021). Passive television and film viewing for 1–2 hours per day can severely disrupt neurotypical development and lead to the manifestation of ASD (Hu, Johnson, Teo, Wu, 2020), and viewing more than three hours per day is revealed in the form of developmental deficits in the M-CHAT-R screening test (Md Zaki Fadzil, Murad, 2020). Children with shorter exposure to screens have a lower risk of ASD symptoms, but to completely exclude their reactive form, a complete ban on screen use in early childhood is advocated. The main reason for leaving a child in direct and exclusive contact with a screen for several hours is the lack of time for cooperative play on the part of the parents (Dehiol, Dawood, Alrubaee, 2022). Changing home organisational habits leads to significant improvements in children's functioning, which is indicative of the reactive nature of virtual autism.

## Developmental sensitivity to the impact of digital devices

The degree of maturity of the nervous system is an important factor in the aetiology of virtual autism. Contact with electronic media before the age of 2 has a particularly significant impact on language and cognitive development (Kushima et al., 2022). An interesting study was conducted by a team of Chinese researchers (Chen et al., 2021). Their aim was to assess the association between early exposure to screens and the occurrence of autistic behaviour in preschool children. The study was conducted in 29 461 child-guardian diads to obtain information on leisure organisation and leisure

activities. The results showed that a younger starting age, longer daily time spent in front of a screen and longer total exposure time to digital devices since the child's birth were associated with the occurrence of autistic behaviour in pre-school age children. The risk of disorders during the preschool period increased proportionally to both the daily time spent in front of the screen and the cumulative exposure time. Furthermore, cross-tabulation analysis showed that the first three years of life are a period of vulnerability to noxious stimulation, and that exposure increases the risk of autistic behaviour.

Early exposure also leads to sleep disorders in children by suppressing the secretion of endogenous melatonin under the influence of blue light emitted from electronic screens (Thompson, Christakis, 2005). Insufficient sleep is a predictor of childhood developmental disorders such as attention deficit hyperactivity disorder, emotional problems and cognitive difficulties, as well as symptoms of other neurodevelopmental disorders (Cheng et al., 2021; Lin et al., 2019). Prolonged exposure can also lead to reduced outdoor activities (Venetsanou, Kambas, Gourgoulis, & Yannakoulia, 2019). Outdoor activities provide opportunities for play and communication with peers, which in turn is crucial for the development of young children's social skills (Hinkley, Brown, Carson, & Teychenne, 2018). The frequency of caregiver-child interactions, sleep duration and level of participation in outdoor activities are important mediators of the relationship between exposure time and behaviours characteristic of virtual autism (Suchert, Hanewinkel, & Isensee, 2019).

The period of greatest sensitivity may also extend into middle childhood. Increased exposure to harmful light-emitting diode (LED) screens or virtual media can affect the brain development process in children under six years of age, and symptoms after prolonged exposure are similar to autism spectrum disorders (Bibi et al., 2022). Children exposed to virtual media for more than two hours per day (compared to children with exposure of less than two hours per day) showed more severe impairments in speech/communication, social interaction, sensory and emotional sensitivity, as well as disturbed motor and behavioural patterns and cognitive deficits. The duration of screen exposure may be both directly and indirectly related to the risk of developing neurodevelopmental disorders (Melchior et al., 2022).

Children with ASD are more susceptible to prolonged exposure than children with neurotypical development, so such exposure may exacerbate disorder symptoms and developmental deficits (Slobodin, Heffler, Davidovitch, 2019). Early exposure is associated with an increased risk of developing ASD compared to late exposure or no exposure in the early years of life (Dehiol, Dawood, & Alrubaee, 2022; Chen et al., 2022). At a younger age (around age 1), the brain is more susceptible to modifiers of genetically driven processes that influence later development than above age 3, when certain developmental milestones have already been reached (Kushima et al., 2022).

## Balancing time in front of the screen – practical tips for healthy child development

In an era dominated by the presence of digital devices, the impact of excessive time spent in front of a screen is a significant concern. A crucial task for parents and caregivers is to establish thoughtful practices and boundaries regarding children's screen use to create a balanced and healthy environment for their development. The clinical picture of reactive digital autism can be very similar to that of ASD. However, despite the similarities, there are important differences that imply specific practical interactions.

There is no scientific consensus on whether or how exposure to digital technologies can cause autism. It is important not to underestimate autism spectrum disorders as their aetiology is multifactorial and symptoms are diverse. Although parental neglect is not considered a cause of autism spectrum disorders, it can significantly influence the intensity of symptoms, as can excessive use of technology.

This article presents practical suggestions to minimise time spent in front of a screen and promote all-round child development. A healthy balance between technology use and other developmental activities is important for children's overall well-being. It is advisable for parents to consciously manage the time their children spend in front of a screen and provide a variety of experiences, including social interaction, physical activity and time for other creative activities.

1. Towards a proper diagnosis:
– precise diagnosis with modern diagnostic techniques using whole exome sequencing (WES) – genetic testing is helpful in diagnosing autistic disorders; the data obtained can significantly resolve whether the disorder is neurodevelopmental or reactive in nature (Jiang et al., 2014).

2. A no screen zone for infants and limited time in front of a screen for pre-schoolers (DeFrank, 2022):
– children under 2 years of age should avoid exposure to screens,
– preschoolers can use educational content or digital toys for up to one hour a day,
– older children and adolescents should limit time spent with electronics to 2-3 hours per day to prevent potential developmental delays and behavioural addictions,
– in the event of excessive device use, the introduction of a two-week holiday without a phone is advocated.

3. Minimising time in front of a screen for the sake of developing creativity (Jawed, Graham, & Smith, 2023):

– limiting time in front of a screen allows children to focus on other creative activities,
– participation in a variety of non-virtual activities helps to improve various skills, boosts self-confidence and triggers attentiveness for better understanding of the world.

4. Diverse activities (Camilleri, Maras, & Brosnan, 2024):
– encouraging sports and physical activities to develop team skills, empathy and "outside the box" thinking,
– the limited and controlled use of the screen allows for the comprehensive development and involvement of children in a variety of developmental activities.

5. Positive reinforcement (Dijkhuis, Ziermans, Van Rijn, Staal, & Swaab, 2016):
– reinforcing self-regulation and self-discipline – encouraging appropriate behaviour, rewarding compliance with screen time limits,
– if the child reduces screen exposure time from two hours to one – reward for a disciplined approach.

6. Social interaction through sport (Van Biesen et al., 2023):
– participation in sport promotes social interaction, cooperation, fair play and the importance of maintaining positive relationships for success,
– initiatives such as group games build a sense of community and cooperation.

7. Regular meals:
– establishing a routine of regular meals helps to maintain a healthy lifestyle,
– sharing family meals is also an opportunity for bonding and communication,

8. Elimination of blue light before bedtime (Chen, Yeh, 2019; Jawed, Graham, & Smith, 2023):
– minimising exposure to blue light-emitting screens before bedtime to ensure better sleep quality,
– encouraging relaxation activities, such as reading, instead of screen-based activity before bedtime.

9. Leisure planning (Lord, Wilson, 2023):
– help with leisure planning by focusing on important and favourite activities to avoid the pitfalls of screen addiction.

10. Contact with nature (Hinkley, Brown, Carson, & Teychenne, 2018):

– discovering the beauty of the surrounding world offers an alternative to screens,
– contact with nature reduces stress and stimulates curiosity,
– encouraging outdoor activities and communing with nature is an important part of prevention.

11. Playing online games with children:
– participating in online games with older children instead of banning them,
– using the situation as an opportunity to understand children's digital world, manage it and promote responsible online behaviour.

## Summary

Virtual autism, despite having similar symptomatology to autism spectrum disorders, is not a separate disorder described in current classifications. Instead, it is a concept that metaphorically characterises the essence of reactive developmental deficits increasingly observed in young children, conditioned by early contact with electronic devices such as computers, smartphones, tablets, televisions or video game consoles. Excessive digital media use refers to a situation in which a person, especially a child or adolescent, spends too much time using these devices in relation to current developmental needs. Overexposure to screens can lead to a range of negative physical, emotional and social health effects, in the form of various developmental difficulties, such as social isolation, reduced motor skills and physical activity, problems in face-to-face communication. In addition, exposure to blue light emitted by screens leads to sleep disturbances, disrupted diurnal rhythms, and an increased risk of other health problems such as obesity, visual defects, headaches or postural defects. It can also induce an increased risk of emotional problems such as depressive disorders, anxiety disorders or low self-esteem, related to excessive comparison with others on social media or a decrease in school and academic performance due to distraction and a reduced ability to focus on cognitive tasks.

Therefore, it is important to moderate and monitor the time children and adolescents spend interacting with digital devices, promoting a balance between technology use and other activities such as physical activity, outdoor play or face-to-face social interaction and sporting competition. Monitoring the timing of exposure to digital devices is key to ensuring well-being and healthy development during childhood, when the psychological and behavioural foundations for the development of normatively realised adulthood are formed (Suldo, Riley, & Shaffer, 2006; Eryilmaz, 2012). The sense of well-being may change depending on the changing developmental context and developmental processes taking place (Kielar-Turska, 2011), but many researchers

emphasise that promoting children's psychological well-being must be considered a priority (Rask, Åstedt-Kurki, Tarkka, Laippala, 2002; Konu, Lintonen, Rimpelä, 2002).

By implementing exposure time monitoring strategies, parents and carers can effectively influence the all-round development of children and young people, reducing the impact of negative factors and promoting a healthy balance between online and offline activities.

In a world saturated with screens, responsible parenting includes guiding children towards a balanced and healthy lifestyle. The demands presented in the article offer a practical approach to reducing time in front of a screen, encourage a variety of activities and support the all-round development of the child on a life path leading to a responsible, healthy and balanced adulthood.

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