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The time of contact with the media as a potential source of behaviours similar to the features of autism spectrum disorders in children aged 6–10

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Summary

Aim. The aim of the study was to see if and to what extent the length of time spent in front of a TV, computer, laptop or tablet screen differentiates the development of children.

Material and methods. The study included 46 girls and 55 boys aged 6–10. The children were tested with the IDS-2 test, while parents were asked to fill out questionnaires, regarding demographic information, time of contact with media and child development. Diagnosis was made for ASD, ADHD, depressive symptoms and anxiety disorders.

Results. The results indicated significant differences between children spending more than two hours a day in front of a computer or TV and those with less contact time, in terms of large motor development and the social-emotional sphere in the test used to diagnose autism.

Conclusions. The results are consistent with reports indicating a potential link between media contact time and ASD traits in children. It is therefore reasonable not only to limit the amount of time early school-age children spend in contact with the media, but also to closely monitor those who exceed this time limit.

Key words: children with ASD, child development diagnosis, media exposure

Introduction

Currently, the media are an integral part of human life. While this statement can be considered constant and unchanging, the very scope of the concept of the media is constantly changing. In most publications, this term defines all non-interactive means of communication, including printed materials (books, magazines and newspapers), media (television and radio), film and music. In turn, computer, tablet, Internet, and social media are considered "new media". Due to the specificity of operation (technological advancement) and impact on the user (aspect of possible interactivity), the authors of this article focused on the so-called "screen-based media", which include

technologies such as: television, computer, mobile phone, Internet, etc. [1]. Available reports indicate a constantly growing prevalence of this particular group of media among children, and an increasing use time already in children of several months [2].

Technological development ensures numerous benefits. The media provide wide access to information, enable interactive cooperation in the performance of tasks, e.g. international projects (eTwining) or communication of people from distant places or people who for various reasons cannot move freely outside the home or leave it. Social media can also be used to improve well-being and promote healthy behaviours. There are many examples in scientific publications of the positive influence of the media on the development of children. It has been shown that:

(1) at the age of 24 months, the child can learn words during live video conversations with an adult [3] or from carefully designed, interactive screen interfaces [4];
(2) well-designed television programs, such as *Sesame Street*, can improve cognitive functions, literacy and social skills of children aged 3 to 5 [5];
(3) applications of Sesame Workshop types have a high effectiveness in developing reading and writing skills in pre-schoolers [6];
(4) the Bedtime Math application, based on the active cooperation of the parent and the child, proved to be effective in developing mathematical competences [7];
(5) training using *Tetris* improved imaginary rotation and spatial visualisation in children [8].

These are few examples concerning children of pre-school and early school age. It should be remembered that scientific research has confirmed the effectiveness of only a few applications or games [9] out of many that are classified by manufacturers as so-called educational. In addition, it is important that this effectiveness referred to the so-called close transfer [10, 11]. It is also worth noting that children of preschool or early school age are the least numerous group in research on the impact of media on human development [12, 13].

More research on the aforementioned group of children concerned the issues of e-books and the use of the media in the learning process. However, scientists have shown here that the effectiveness of e-education is conditioned by the real presence of an adult who interacts with a child [14] or the lack of multimedia additions in the texts contained in e-books [15, 16]. Recent research has also shown that reading information texts is more effective when paper is used as a medium. This is the case regardless of the level of competence in the use of new technologies [17].

Summing up, psychologists and educationalists have a long emphasis on both the advantages [5] and the disadvantages of children's contact with the media [14]. However, if we analyse the literature in terms of the subject of "excessive, long-lasting contact with media", we will see that a vast majority of researchers point only to statistically significant negative consequences. They include:

– physical aspects: obesity [18, 19], impaired eyesight, faulty posture, disorders of fine and gross motor skills development, sleep disturbances [20, 21];

- cognitive aspects: attention deficit, poor active and passive speech development, multitasking [22, 23], schematicity of actions, reading difficulties [24, 25];
- social and emotional aspects: difficulties in expressing and reading emotions, loneliness, disturbed family relations [26–28].

In addition, recent research has shown that the longer the child's contact time with the media, the worse the results in terms of crystallized intelligence (dependent on experience and stimuli in the development environment) and fluid intelligence [29]. Those disorders develop even in infants and have consequences in the child's educational process [30, 31]. In the literature on the subject in recent years, it is increasingly possible to find conclusions regarding the relationship of the media with specific developmental disorders in children, including the aforementioned spheres of development. The media are considered to be the cause of disorders such as: ADHD with hyperactivity and/or impaired concentration, depression [32] or autism spectrum disorders [33].

Scientists and practitioners agree that ASD is a neurodevelopmental disorder that usually begins early in life and is characterized by deficits in social interactions, communication and limited and repetitive patterns of behaviour, interests or activities [34]. Among the theories explaining the causes of this disorder, multifactorial theory is currently the most popular, in which genetic conditions are combined with the influence of the broadly understood environment [35]. Recently, the researchers began to pay attention to the relationship between the number of children diagnosed with ASD and the availability of media [36, 37]. A model of the gene-media-brain relationship was also proposed. It explains how early exposure to the media may result in disorders from the autism spectrum.

Therefore, the question arises as to how to limit the negative impact of the media, because it is not possible to eliminate them from the lives of modern children. Some scientists emphasize that the positive impact of the media is eliminated by excessive use by children and devoting less time to other cognitive or social activities [38]. Other hypotheses assume that the source of the negative impact of the media on development are the technical aspects of the technology or the type of content that these technologies convey [39, 40]. In 2013, American Academy of Paediatrics (AAP), based on the current results of international research, prepared guidelines for the use of the media by children. At that time, it was recommended that up to 2 years of age children should not have any contact with the media, from 2 to 5 years – up to an hour of high quality programs in the presence of a parent, and from 6 years of age – two hours (with ensuring the conditions as before) [30]. In 2016, the AAP modified these recommendations, inter alia, by increasing the limit of two hours a day for older children and placing more emphasis on sustainable development, i.e. providing the child with a more responsible amount of movement and sleep [31].

This would mean that in the prophylaxis of the negative impact of the media, the contact time is of secondary importance. Several years ago, research by Chojak [41] showed no linear relationship between the time of contact with media among preschool

and early school-age children and their level of school readiness. The same research revealed, however, that if children spent more than 2 hours a day in contact with a computer, TV or telephone, there were significant differences in their development compared to children with contact time less than 2 hours. Therefore, the question arose: does 2 hours not constitute the so-called safe use of technology in relation to children of early school age? Was AAP's complete abandonment of this guideline correct?

Aim

Faced with doubts that do not find their solution in the available literature, another study was undertaken. The purpose of the conducted analyses was to see if there are differences between groups of children with different times of contact with media, independent of their level of development (having a diagnosis of ASD, ADHD, developmental dyslexia, anxiety disorders or depressive disorders).

Material and methods

The study was conducted in 2021. The participants were recruited using a registration form due to the period of the pandemic. Parents agreed to have the child examined and provided with their data in accordance with the GDPR and completed an epidemiological questionnaire.

Children reported by legal guardians were pre-selected considering several conditions. The research was carried out by a psychologist, who initially excluded from participation in the research people whose intelligence ratio was below the norm. The criteria for exclusion from the diagnosis involved also: disease in the child or his/her family (other than chronic) or taking medication by the child in the last two weeks before registration and a history of diagnosed brain injuries.

The research was carried out using the method of interview and observation during the carried out psychological tests with children and their parents. The ICD-10 classification, then in force in Europe, was adopted as the basis for diagnosis.

Children were diagnosed using the *Intelligence and Development Scale for children aged 5 – 10* by Grob, Meyer and Hagmann-von Arx (*Intelligence and Development Scales* – IDS) in the Polish adaptation by Jaworowska, Matczak and Fecenec (2009). The Intelligence and Development Scales IDS provide a comprehensive assessment of the abilities and competences of children aged 5–10. They are intended for individual research, and consist of 19 tests covering six areas of the child's functioning, i.e. cognitive abilities, psychomotor skills, socio-emotional competences, mathematics, language, and the motivation of achievements. The scales are used to assess the level of intelligence, determine the child's strengths and weaknesses, determine the level of school maturity and diagnose capable children (with high intellectual abilities).

The reliability of the results in the scales of liquid, crystallized and general intelligence is very high, and the reliability of the remaining 19 tests is satisfactory, similar to the original version of the tool. The high validity of IDS during the adaptation and normalization of the test was also confirmed.

Parents of the examined children completed:

- CONNERS 3-R test – full version for the parent;
- *Autism Spectrum Diagnosis Questionnaire Set* ASRS – full version for the parent;
- A *set of Questionnaires for the Diagnosis of Depression in Children and Youth* CDI-2 – full version for the parent;
- *Symptomatic Scales of Anxiety Disorders* (selected scales: "separation anxiety", "social anxiety", "generalised anxiety", "panic attacks");
- The *Dyslexia Risk Scale* (for parents of children after the first and second grade of primary school) or the *Dyslexia Risk Scale for children entering school* (for children undergoing annual pre-school preparation and primary school students).

CONNERS 3-R test (Conners, 2018) adapted by Wujcik and Wrocławska-Warchala is used to diagnose ADHD – a hyperactivity disorder with attention deficit and the most common disorders and difficulties associated with it: oppositional defiant disorders and behavioural disorders. The tool is used for screening, multidimensional diagnosis of difficulties experienced by the child and assessment of the probability of ADHD. The content scales include: "Inattention", "Hyperactivity/impulsivity", "Learning problems", "Executive functions", "Disobedience/aggression", "Relationships with peers", and on the DSM symptom scale – "ADHD attention deficit", "ADHD hyperactivity/impulsivity", "Behavioural disorders", "Oppositional defiant disorders". The screening questions refer to anxiety and depression. There are three control scales (positive impression, negative impression, inconsistency index). Additionally, the test includes questions about maladjustment and additional open-ended questions.

ASRS adapted by Wrocławska-Warchala and Wujcik is used to diagnose a wide range of behaviours associated with autism spectrum disorders (problems in communication skills, attention deficits, difficulties in contacts with peers and adults). The full versions enable description of various dimensions of a child's functioning. ASRS is characterised by very high reliability, stability and validity.

The *set of Questionnaires for the Diagnosis of Depression in Children and Youth* CDI-2 adapted by Wrocławska-Warchala and Wujcik is used to diagnose the symptoms of depression in children. The obtained results are the basis for determining the overall result, as well as the results on the scales: "Emotional difficulties" and "Difficulties in functioning". Reliability and validity of the test were determined to be high, and its absolute stability was satisfactory.

Symptomatic Scales of Anxiety Disorders are aimed at facilitating the process of diagnosing individual anxiety disorders occurring in children and adolescents. The sheets contain a list of symptoms, information about the required time frame for the assessment, a list of factors that exclude a diagnosis, and information on the number of symptoms necessary to make a diagnosis for seven symptom scales developed based on the DSM-5: "Agoraphobia", "Specific phobia"," "Separation anxiety", "Social anxiety disorder", "Generalised anxiety disorder", "Selective mutism", and "Panic

attacks". The scales used in this study were "Separation anxiety disorder", "Social anxiety disorder", "Generalised anxiety disorder", and "Panic attacks", which which were filled by a psychologist during observation and conversation.

The *Dyslexia Risk Scale for school children* (SRD-6) makes it possible to make an initial assessment of the possible risk of specific difficulties in reading and writing. The following are assessed: fine motor skills, gross motor skills, visual functions, language functions – perception, language functions – expression and attention. SRD is a questionnaire designed for both individual children and entire groups/classes. It consists of the same scales as the SRD-6. The assessing person rates each statement on the SRD using a four-point scale and compares the total score with the norms provided in the textbook. The overall score allows us to determine whether a given child belongs to a group at risk for dyslexia and the level of risk (borderline, moderate or high).

Participants

After applying exclusion criteria, data from 102 children were ultimately included in the statistical analysis. The mean age of the group of children using media less than 2 hours per day was 7 years and 11 months, while in the group of children using electronic devices for longer periods of time, it was 8 years and 6 months. Detailed characteristics are presented in Table 1.

Table 1. **Characteristics of the study group**

Age of participant (years)	%	Sex	%	Type of family	%	Number of siblings	%	Place of residence	%
6	13	woman	45	full	83	no	14	City	66
7	21	man	44	incomplete	6	1	51	Village	34
8	29			reconstructed	4	2	20		
9	25			foster	7	3 and more	15		
10	13								

The least mothers of the researched children were up to 30 years of age (5%), and 17% of mothers were between 31 and 35 years old. Almost half of mothers turned 35, but not yet turned 41 (n = 50). The remaining mothers (30%) were over 40 years of age. Most of them were graduates of higher education institutions (87%). 10% of mothers completed secondary school, and a few completed vocational school education. 67 mothers were employed under an employment contract (66%), and 3% under a contract of mandate. 16% of mothers ran their own businesses. Other women did not work for a living (15%).

Over half of fathers of the researched children were over 40 years of age (52%); 42% of father were between 35 and 40 years of age and 10% – under 36 years of age. Nearly ¾ of fathers graduated from higher education, and 18% – secondary schools. The remaining fathers completed vocational schools (9%). 6 fathers were unemployed.

62% of fathers were employed under an employment contract. 3% of fathers received a pension, and 29% ran their own businesses.

Results

Based on the results of the descriptive statistics and analysis of the normality of the distribution of the variables under study, parametric tests were used for further steps.

The interview revealed that 45% of the participants had been subjected to a medical, pedagogical and/or psychological diagnosis in the past. Professionals have confirmed the occurrence of various disorders. The remaining children were never subjected to a specialist diagnosis (55%). It turned out that almost the same number of children diagnosed and undiagnosed in specialists used the media for up to 2 hours and over 2 hours a day (Chi-square = 0.751; $df = 1$; $p = 0.386$).

It was decided to check whether there were differences between children with certain disorders and children who had not previously been diagnosed in terms of their time of using laptops, computers and tablets. For this purpose, a Chi-square test was carried out.

It was found that the number of children not previously diagnosed and children: with autism spectrum (Chi-square = 0.194; $df = 1$; $p = 0.659$), with ADHD (Chi-square = 1.675; $df = 1$; $p = 0.196$), with depression (Chi-square = 0.697; $df = 1$; $p = 0.404$), with anxiety disorders (Chi-square = 0.001; $df = 1$; $p = 0.972$), and with the risk of developmental dyslexia (Chi-square = 0.670; $df = 1$; $p = 0.413$), using the media for up to 2 hours and more than 2 hours a day, was similar. Almost as many girls and boys use the media for the same amount of time during the day (Chi-square = 0.751; $df = 1$; $p = 0.386$). There is also no relationship between the use of electronic equipment by children and the type of family in which they are raised (Chi-square = 0.509; $df = 1$; $p = 0.475$), their place of residence (Chi-square = 4.612; $df = 1$; $p = 0.704$), the number of siblings (Chi-square = 1.917; $df = 3$; $p = 0.590$), mother's education (Chi-square = 1.366; $df = 2$; $p = 0.505$), mother's professional status (Chi-square = 4.449; $df = 3$; $p = 0.212$), father's age (Chi-square = 2.803; $df = 2$; $p = 0.246$), father's education (Chi-square = 1.439; $df = 2$; $p = 0.487$), and father's professional status (Chi-square = 4.612; $df = 3$; $p = 0.217$).

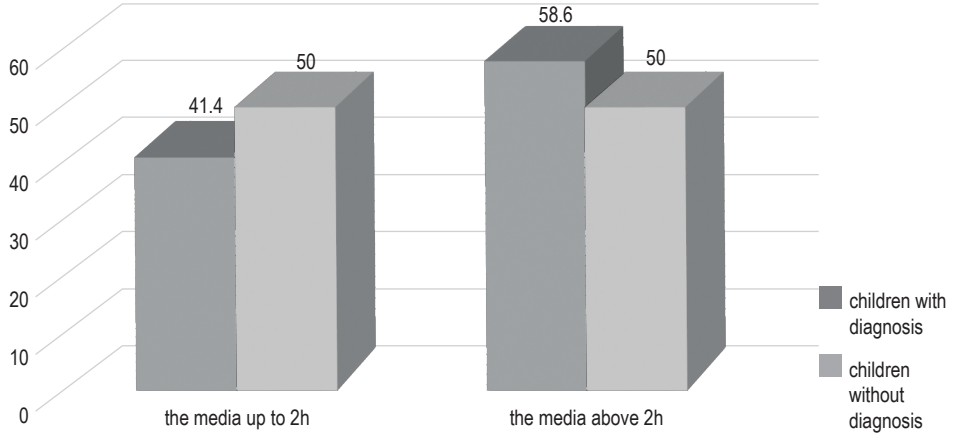

Figure 1. **Number of children who were previously diagnosed and undiagnosed, using the media for up to 2 and over 2 hours per day**

In the case of two variables, i.e. the age of children (p <0.001) and the age of their mothers (p <0.05), a significant Chi-square test result was obtained, which allows for rejecting the null hypothesis and adopting an alternative hypothesis with a significant relationship between the analysed variables.

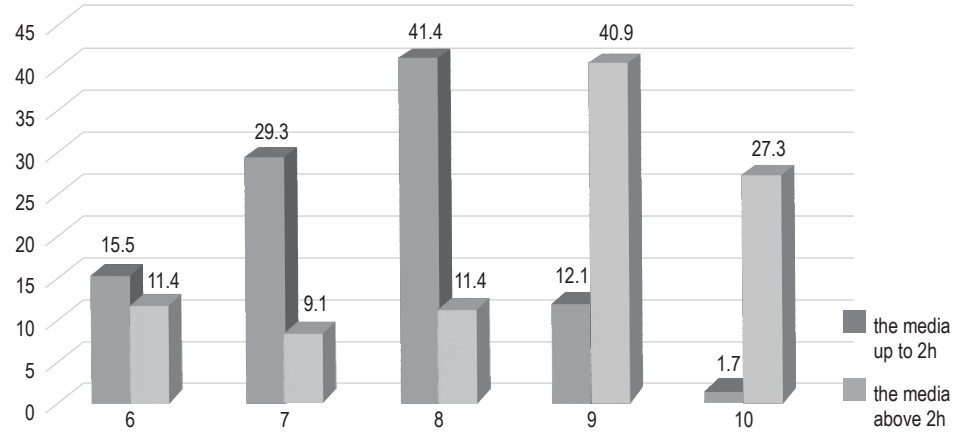

Figure 2. **Age of children using the media up to 2 and over 2 hours a day**

It is apparent that among six-, seven – and eight-year-olds, the vast majority spend less than two hours a day in contact with the media. This represents 86.2% of the group of all respondents with such contact time. In contrast, nine – and ten-year-olds mostly use new technologies 2 hours or more (68.2% of this group).

The Chi-square test value indicates a significant relationship between the age of the children participating in the research and their use of the media for up to 2 hours and over 2 hours per day (Chi-square = 34.515; *df* = 4; *p* <0.001). It turned out that younger children (from 6 to 8 years of age) use electronic equipment for a shorter period of time (up to 2 hours) compared to older children (9–10 years of age). More than 40% of 9-year-olds and 27% of 10-year-olds spend more than 2 hours a day with the media.

A similar relationship was also found in the case of the variable: the age of the mothers of the researched children.

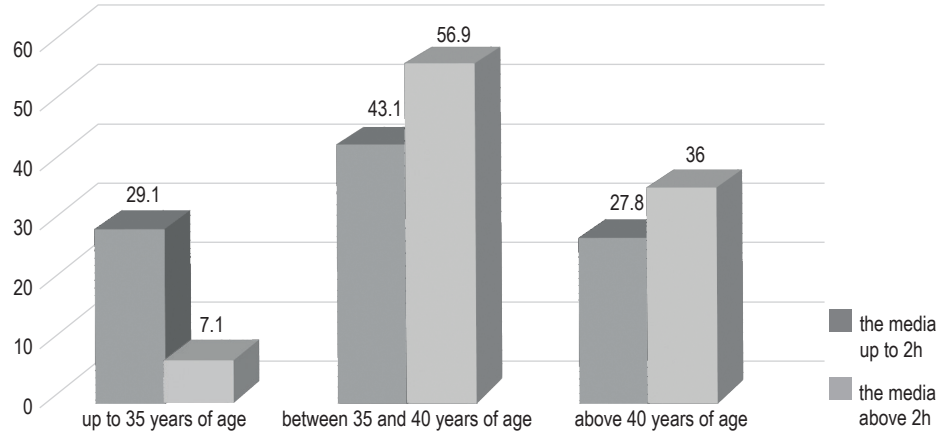

Figure. 3. **Age of the mothers of the researched children using the media up to 2 and over 2 hours a day**

The results show that only among the children of mothers under the age of 35 does the vast majority spend less than 2 hours a day in contact with the media. Children with longer contact account for only 7.1% of this entire group. In aging mothers, the proportion changes.

Based on the obtained data, it can be concluded that there is a relationship between the age of mothers of the researched children and the frequency of using the media by them (Chi-square = 6.277; *df* = 2; *p* <0.05). Children of mothers between 35 and 40 years of age more frequently use electronic equipment more than 2 hours a day than children of mothers up to 35 years of age and over 40 years of age.

In order to compare the results obtained by children participating in the research, who use tablets, laptops and computers with varying frequency, a Student's *t*-test was carried out on independent trials. The following tables contain data on the mean, standard deviation, Student's *t*-test, and statistical significance levels.

At the beginning, it was checked whether there were differences between the means obtained by the participants on all used scales. The results were statistically significant only in: ASRS, SRD/SRD-6 and *Anxiety Disorder Symptom Scales*.

Table 2. **Mean difference between children using the media up to 2 hours and over 2 hours a day in the Autism Spectrum Diagnosis Questionnaire Set ASRS**

Variable	A group of respondents using media	*M*	*SD*	*p*	Student's *t*	*p*
ASRSNZ (unusual behaviour)	up to 2 h/d	52.67	11.545	0.658	2.006	0.048
	above 2 h/d	48.27	10.155			
ASRSST (stereotypies)	up to 2 h/d	49.12	10.320	0.005	3.452	0.001
	above 2 h/d	42.91	6.870			

M – mean; *SD* – standard deviation; *p* – significance level; Student's *t* – test for two independent samples

The analysis of the results obtained on the basis of the Student's *t*-test for independent samples allows to formulate the conclusion that children participating in the research, who spend time in front of electronic equipment with different frequencies, differ statistically significantly in the range of means on two scales: ASRSNZ ($p < 0.05$) and ASRSST ($p < 0.001$). This means that children who use the media for a longer period of time show significantly greater difficulties in situations that require tolerating changes during routine activities. They react more strongly to specific sensory experiences, and engage more in senseless stereotypies in behaviour.

Table 3. **Mean difference between children using the media up to 2 hours and over 2 hours a day in the SRD/SRD-6 range**

Variable	Group of participants using the media	*M*	*SD*	*p*	Student's *t*	*p*
SRDMD (gross motor skills)	up to 2 h/d	1.78	0.899	0.008	-2.216	0.029
	above 2 h/d	2.23	1.159			

There were statistically significant differences in the mean results obtained by children from the compared groups on the SRDMD scale ($p < 0.05$). This proves that children using the media for more than 2 hours a day obtained significantly worse results in the field of motor skills than children using electronic devices up to 2 hours a day. Parents rated their mobility in terms of whole-body movements less well. In their opinion, children run slower, have more difficulties with balance, are less able to ride a bike or scooter, and are less efficient in physical games than children who use the media for a shorter period of time.

Table 4. **Difference in means between children using the media for up to 2 hours and more than 2 hours a day in the range of Symptomatic Anxiety Disorder Scale**

Variable	Group of participants using the media	*M*	*SD*	*p*	Student's *t*	*p*
PA (panic attacks)	up to 2 h/d	0.00	0.000	0.001	-2.385	0.019
	above 2 h/d	0.09	0.291			

The value of the Student's *t*-test indicates the occurrence of statistically significant differences between the mean results obtained by children from the compared groups on the NP scale ($p < 0.05$). Parents of children using electronic equipment up to 2 hours a day did not observe symptoms of panic attacks. Such symptoms were noticed by few parents of children spending more free time with the use of laptops, computers and tablets.

In order to determine the time spent with the media by the researched children on the basis of independent variables, a regression analysis was used to examine the relationships, when the dependent variable is a discontinuous variable, on a dichotomous scale. As explanatory variables (predictors), variables characterising the researched persons were adopted: age of children and their gender, place of residence, education of parents, their professional status, age of parents, psychoeducational diagnosis carried out in children in the past, and all scales included in the used research tools.

Among the many analysed categories of media usage time assessment, eight of them were significantly related to the adopted independent variables. The obtained results describing significant relationships between the examined variables are presented in Table 5.

Table 4. **Regression result – dependent variable: time of media use by the researched children**

Independent variable indicators	R = 0.710; R^2 = 0.504; cR^2 = 0.457; F (8.84) = 5.820			
	β	***B***	***t***	***p***
Age	0.357	0.137	4.366	0.001
PA (panic attacks)	0.300	0.733	3.757	0.001
ASRSST (stereotypies)	-0.196	-0.011	-2.132	0.036
SRDMD (gross motor skills)	0.264	0.124	3.115	0.003
Father's age	2.994	0.020	0.256	0.004
ASRSSZ (stiffness in behaviour)	-2.566	-0.012	-0.251	0.012
Psychopedagogical diagnosis	-2.412	-0.081	-0.201	0.018

The model was found to be well suited to the data $F(8.84) = 10.673$; $p > 0.001$. Conducting a regression allows for explaining more than 45% of the variance in the time of using the media by children ($R2 = 0.457$). Age of children (beta = 0.357; $p < 0.001$) turned out to be the strongest predictor, which proves that the older children are, the more time they spend in front of laptops or tablets. Panic attacks (beta = 0.300; $p < 0.001$) was the second statistically significant predictor. This result indicates that the higher the panic attack score, the longer the use of electronic equipment by children is. The model also includes: ASRSST (beta = – 0.196; $p < 0.05$), ASRSSZ (beta = – 2.566; $p < 0.05$) and variable "psychopedagogical diagnosis" (beta = – 2.412; $p < 0.05$). This means that the higher the score of children in terms of stereotypies in behaviour (they engaged in pointless, repetitive behaviours) and stiffness in behaviour (they had difficulty tolerating changes in the order of the day and in routine activities), the more often

they used the media for more than 2 hours a day. In turn, children who were diagnosed by psychologists and educators in the past used electronic equipment less frequently. In addition, the higher the score of children on the "Gross motor scale" (difficulties in performing tasks involving the whole body and requiring coordination on the left – right side) (beta = 0.264; p <0.01) and the older their fathers were (beta = 2.994; p <0.01), the more often they used laptops, tablets and computers over 2 hours a day.

Discussion

The research was carried out during the coronavirus pandemic. In the research group of children aged 6–10 years, there were children in the so-called developmental norm and those diagnosed with various disorders. There was no difference between the groups in the distribution of the time of using new technologies, therefore the health factor was not considered in the subsequent calculations. The aim of the conducted analyses was to check whether there are differences between groups of children with different time of contact with the media, independent of their level of development (having the diagnosis of ASD, ADHD, developmental dyslexia, anxiety disorders or depression).

Statistical analyses of the results showed that both among children without previously diagnosed disorders and among those with them, younger children spent less time in contact with technologies. However, this situation did not apply to children of mothers between 35 and 40 years of age, i.e. women who were professionally active – their sons and daughters were much more likely to use electronic equipment for more than 2 hours a day than children of mothers up to 35 years of age and over 40 years of age. The age of the father turned out to be the predictor of shorter time spent without technology – the older the father, the longer the child's contact time with the media. This means that demographic factors can play a significant role in shaping the child's behaviour towards technology.

The conducted research also showed significant differences in the development of the researched children. A group of children using the media for over two hours a day was characterised by a significantly lower level of physical development in the field of gross motor skills (slower running, difficulties with balance, and thus with cycling or scooter riding). This is consistent with the results of previous research, which indicates a correlation between more frequent and longer contact of children with new technologies and the growing number of students with obesity, postural defects or difficulties in visual and motor coordination [33, 34]. Some researches indicate that the aforementioned effects are stronger in children diagnosed with ASD as a more susceptible group [35, 42, 43]. Motor disorders are not only characteristic of ASD (they also occur in children with ADHD or Down's syndrome), but it can be assumed that motor problems in infancy may be associated with the development of speech and gestures, which may have consequences in the child's cognitive or social development [44]. Sitting, reaching for objects or walking, allow you to gain new experiences and interact. In turn, difficulties in movement discourage children from team games, while the lack of visual-motor coordination significantly hinders the learning and education

process. Therefore, motor development remains the first of the areas in which we can see disturbing signals of developing diseases or developmental disorders in infants [45]. The obtained results therefore confirm the previous reports on this subject.

Intergroup differences also appeared in terms of socio-emotional development in terms of results of the test which is used in the diagnosis of children with ASD. Children using the media for a shorter period of time tolerated changes better and were less likely to engage in meaningless stereotypies in behaviour. The stiffness of behaviour, sensation and thinking in children with prolonged contact may result from the mechanisms associated with the onset of autism spectrum disorders. Previous research confirms that the aforementioned features are specific for children with ASD [46, 47] and are very intense in this group. Common features of these behaviours include: stereotyped or repetitive motor movements, use of objects or speech; insistence on identity, inflexible adherence to routines or ritualised patterns of verbal or non-verbal behaviour; highly limited, fixed interests of abnormal intensity or concentration; and over – or hyporeactivity to sensory stimuli or unusual interest in sensory aspects of the environment [48]. Stereotypies are commonly observed in various developmental, psychiatric and neurological disorders other than ASD, including Rett syndrome, Brittle X chromosome syndrome, intellectual disability, schizophrenia, Parkinson's disease, dementia, Tourette's syndrome, and obsessive-compulsive disorders, which may lead to problems with differential diagnosis or coexistence with ASD [49, 50]. In ASD, however, they occur more often, are more intense and clearly do not have anxiety-reducing function, while any attempt to modify them may trigger strong panic attacks [51–53]. In the researched group, anxiety scales did not differentiate the groups, while clear differences concerned the scale of panic attacks – their intensity was greater in the group of children using the media for a longer period of time.

Considering the above, it can be concluded about the potential correlation between the time of contact with the media and the occurrence of features in children that are similar to those characterising children with ASD. The possible effects of excessive contact with the media similar to the features of ASD were also indicated by other researchers [54–57]. In the conducted research, it was proved not only that the time of contact with the media is associated with developmental disorders with ASD features, but also that there is a cause and effect relationship regarding these two variables [56]. Scientific publications – with caution, but increasingly – state that excessive contact with the media of young children (up to the age of 3) may cause autism spectrum disorders [58]. For older children, there is still a lack of research to document a cause-effect relationship. Probably that is why in the literature on the subject, one can find proposals for a new unit – the electronic screen syndrome (ESS). This disorder is generally perceived by the prism of misregulation, understood as the inability to modulate mood, attention and level of stimulation in a manner adequate to the stimulus and its environment. Children with ESS exhibit symptoms of excessive constant agitation, which is visible in emotional dysregulation, disturbance in attention and concentration, insomnia or dysregulated sleep, hyperactivity. However, these changes can be relatively easily reversed through the so-called reset, i.e. the complete cut-off of the child from access to the media [59].

It is also important to note that studies have not only pointed out the relationship between media contact time and children's development, but have also highlighted predictors of the length of this time. It turned out that the older the child, the more often he or she reaches for new technologies [60, 61]. Stronger panic attacks, stereotypies and rigidity in behaviour, as well as greater impairment in gross motor development also resulted in longer contact time with media [62]. Based on the above, it can be concluded that there are probably bilateral relationships in the situation of children with disorders, for example, the greater the rigidity in behaviour exhibited by a child, the more often he or she reaches for new technologies. If this frequency exceeds 2 hours a day, it is very likely that his/her disorder will intensify. At the same time, new difficulties may appear regarding stereotypy or gross motor development.

This cycle can be stopped through the diagnostic process of children. Diagnosis has been shown to be a predictor of a decrease in the time children spend in contact with tablets, phones, etc. Perhaps this is happening as a result of increased awareness among parents (through their involvement in the diagnosis) regarding the negative impact of technology on the child. Another reason may be that the diagnosis often motivates the parent to pay more attention to the child, to provide additional specialised support.

Conclusions

The obtained results allow to make a conclusion about the significant negative impact of new technologies on children who use them for more than 2 hours a day. This situation seems to be independent of the child's previous state of health. Intergroup differences relate to gross motor skills, stereotypy in behaviour and low flexibility for changes associated with panic attacks. These are features mostly considered typical for children with ASD. However, the conducted research did not consider other variables related to the way of spending free time (outdoor movement), the way of using the media (in the presence of a parent or not), the content with which the child had contact, the attitudes of parents or possible therapies or classes in the field of psychological and pedagogical assistance. More variables should be analysed in detail in further research. In addition, longitudinal research should be planned, considering the possibility of temporarily depriving children of access to new technologies. Such actions will allow for a more precise examination of the cause-and-effect relationship and an attempt to resolve the discussion regarding the definition of the new disorder.

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