




Mateusz Mołoń ^{1,2}, Małgorzata Janda ^{2,3}

The impact of COVID-19 pandemic and distance learning on physical and mental health of Polish students

¹ Department of Biology, Institute of Biology and Biotechnology, University of Rzeszów, Rzeszów, Poland

² Social Primary School No. 1 in Rzeszów, Rzeszów, Poland

³ University of Rzeszów Polonia Centre, Rzeszów, Poland

ABSTRACT

Introduction and aim. In Poland, on 25 March 2020, distance learning, which for many people was known only from literature, entered into force. As a result, education could no longer be provided in its current form and was therefore provided online. Therefore, the main aim of the presented research was an attempt to verify the pandemic and distance education impact on students psychophysical conditions and satisfaction.

Material and methods. Some primary school students (grades 6th-8th), secondary school students from the Subcarpathian Voivodeship in Poland and also some university students from foreign countries completed an anonymous survey on the impact of the COVID-19 pandemic on their physical and mental condition as well as on some aspects of distance education. The research was conducted in December 2021 and 804 students (Primary and Secondary School) and 64 university students completed the survey.

Results. Both the primary and the secondary school students claimed they were quite satisfied with distance education. The mostly approved aspect of online education was the fact that the time of learning was fitted to students' needs. Difficulties in distance learning indicated by students were mainly connected with their mental health. Therefore, many students suffered from mental health and concentration problems, unwillingness to be active, apathy. The pandemic was also a stress factor for students and a reason why they were in a bad mood. The pandemic was the reason for an increased interest in natural sciences among 31.3% of primary school students, among 20.8% of secondary school students and among 17.3% of university students from foreign countries. Distance education influenced physical health of almost half of the respondents in both types of schools. The pandemic had an impact on mental health state of almost half of primary school students. 65% of secondary school students said that the pandemic influenced both their mental and physical health. In case of university students the pandemic did not influence their physical health in a significant way (65.4%). The study shows that primary school students used the Internet mainly to play games (almost 50% of the respondents), watch films, listen to music, do homework. Online lessons were only 20% of the answers.

Conclusion. There has been a significant impact of COVID-19 on students in elementary school, high school, and university. This resulted in negative mental and physical effects. Respondents were stressed, depressed, and unmotivated. Approximately half of them engaged in physical activity very rarely or rarely. Even though they were satisfied with online learning, which was caused by the COVID-2019 pandemic, the greatest problem was mental concentration problems, lack of motivation, and social isolation.

Keywords. COVID-19, distance learning, e-learning, students

Corresponding author: Mateusz Mołoń, e-mail: mmolon@ur.edu.pl

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Introduction

A pandemic is defined as “an epidemic that occurs worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people”.¹ Although there has been much debate about the flu virus, its variants, and epidemic, 2020 changed our lives with the advent of a new epidemic.²⁻⁴ The first cases of COVID-19 disease caused by the SARS-CoV-2 coronavirus were identified on November 17, 2019 in Wuhan City (Hubei Province, Central China). However, the officially infectious disease COVID-19 was declared a pandemic by the World Health Organization (WHO) on 11 March 2020. Initially, the disease occurred only in Wuhan, and then in whole China. In mid-February 2020, the first outbreaks of infections were recorded in South Korea, Iran and Italy. The first case of SARS-CoV-2 infection in Poland was reported on 4 March 2020. Until April 19, 2022, 5,985,818 cases of infection were recorded in Poland, 115,838 deaths were registered. But why is this coronavirus variant so dangerous? This is mainly because the virus spreads easily between humans. So far, the virus has been detected in nasal and pharyngeal secretions, sputum, urine, feces, tears and blood.^{5,6} Additionally, the possibility of infection by the virus is made possible by its ability to ‘survive’ on metal, glass or plastic surfaces for several days at room temperature. However, surface disinfection can effectively inactivate viruses by procedures with 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute.⁷ The SARS-CoV-2 virus infects mainly the respiratory system, causing acute atypical pneumonia and acute respiratory distress syndrome in severe cases. In addition, it can also spread through the nervous system, resulting mainly in the loss of smell and taste due to the virus attacking the olfactory and taste receptors.⁸ Coronaviruses, as RNA viruses, use (error-prone) polymerase to replicate their RNA genetic material. Consequently, their genome tends to accumulate mutations during each replication cycle, which is natural and serves to better adapt to human organisms and increase virulence.⁹ The increasing number of infections and the emergence of new forms of viruses requires the introduction of restrictions, including education. Therefore, distance education has become a huge challenge for teachers and students. The advantage of online education, also called distance education, electronic education, teaching online, e-learning or e-education is avoiding stagnation among teachers and students. Online education makes it possible for students to adapt to changes, to improve their practical skills, to participate in interesting and varied classes. Kubiak defined distance education as a method of educational process in conditions when teachers and students (university students) are far away (sometimes considerably), apart from traditional ways of communication using also present-date, very modern telecommunication

technologies to transmit information, and transferring sounds, videos, computer data and printed materials.¹⁰ What is more, contemporary technologies enable direct contact in real time between teachers and students using audio or video conferences, regardless of the distance between them. Online teaching can take different forms. There is a correspondence model, a multimedia model and a synchronous model, but the most effective is an asynchronous model based on using interactive multimedia and materials published on the Internet.¹¹ All the methods and forms of work, usually attractive to students and accepted by them, gained special meaning in the time of COVID-19 pandemic which required the distance form of education from March 2020 and maintained it to some extent till December 2021. It turned out that the fact of staying for many months at home, the lack of contacts with peers and teachers, participating in distance education system everyday, was experienced and assessed by children and teenagers in different ways. E-learning was still an attractive, innovative form of work. It made educational process possible to continue and in a specific form online education enabled contacts with peers, teachers and educators. However, it was not a direct contact. It was impossible to function in informal, free, stationary education realities. There appeared some problems with concentration, motivation to work, functioning in a new schedule, problems with technical equipment and others.

Aim

The main aim of the presented research was an attempt to verify the pandemic and distance education impact on students psychophysical conditions and satisfaction. Students assessment of the new dominant form of education, their fears concerning the pandemic or accepting the existing situation were verified with the use of surveys, discussed and interpreted in this study

Material and methods

Some primary school students (grades 6th-8th), secondary school students from the Podkarpackie (Subcarpathian) Voivodeship in Poland and also some university students from foreign countries completed an anonymous survey on the impact of the COVID-19 pandemic on their physical and mental condition as well as on some aspects of distance education. Students assessed online lessons, their access to the computer equipment, the influence of their surroundings and their place of staying on the quality of education. On the one hand they stated the most problematic situations and on the other hand they pointed at the factors motivating them to study. Respondents also specified if the COVID-19 pandemic was a danger for them and described its impact on their physical and mental health, they assessed their interests in natural

sciences and some aspects of their physical activities before and during the COVID-19 pandemic.

The anonymous surveys were sent to several chosen primary and secondary schools in Podkarpackie Voivodeship and also to university students from foreign countries studying Polish as a foreign language at universities in Rzeszów, Poland. The research was conducted in December 2021 and 804 students and 64 university students completed the survey (Tab. 1). Most of the respondents in primary schools were girls (155), the minority were boys (114). It was similar in secondary schools with corresponding 395 girls and 140 boys. Among university students from foreign countries 77% were women. The majority of the respondents live in towns/cities.

Table 1. Sex, type of school and place of residence

| Primary school (6th-8th grade) | | Secondary school | |
|-----------------------------------|---------|------------------|---------|
| Female | Male | Female | Male |
| 155 | 114 | 395 | 140 |
| Place of residence | | | |
| town/city | village | town/city | village |
| 54 | 215 | 288 | 247 |
| Σ 269 | | Σ 535 | |
| Σ 804 | | | |

Results

As shown in Figure 1, both the primary and the secondary school students claimed they were quite satisfied with distance education (40%). Only 10% expressed their strong dissatisfaction with the above mentioned form of education.

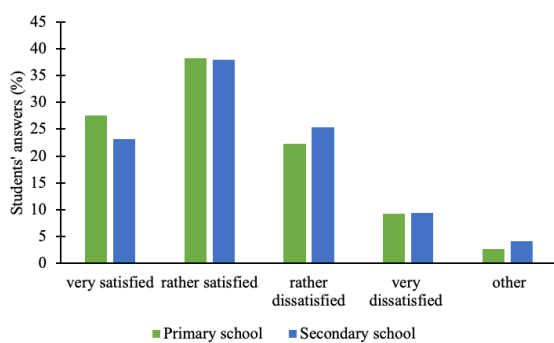


Fig. 1. Level of satisfaction with distance learning among primary and secondary school students

The optimum satisfaction with online lessons seems to be justified taking into account the fact that information technology is fully accepted by the youth of today. Information technology is a friendly working environment for young people where they pursue their hobbies and special interests, gain new information and even stay in contact with other people.

For students “the digital world, new information and communication technology is a natural world. They live, learn and fulfil their own dreams in that world”.¹² Taking into account new technologies seems “normal to them, the knowledge conveyed in a traditional way without using available technology is not quite attractive.”¹² It is also confirmed by students in their assessment of the positive and negative aspects of online education.

Innovative, virtual forms of classes were approved by over 30% of the respondents (Tab. 2). But the mostly approved aspect of online education was the fact that the time of learning was fitted to students’ needs. Secondary school students presented a different evaluation.

Table 2. Positive and negative aspects of distance education

| Positive aspects of distance education | | |
|--|--------------------|----------------------|
| Answers | Primary school (%) | Secondary school (%) |
| innovative, virtual classes | 31.3 | 19.5 |
| the time of learning is fitted to students’ needs | 39.6 | 61.0 |
| permanent contact with teachers and peers | 21.6 | 6.6 |
| other | 7.5 | 12.9 |
| the lack of direct contact with others | 34.3 | 33.1 |
| difficulties in understanding and remembering the information learned during lessons | 28.7 | 27.7 |
| technical problems | 29.5 | 27.5 |
| other | 7.5 | 11.6 |

Their priority was fitting the time of learning to their needs (over 60%), meanwhile innovative and virtual forms of classes were approved by 19.5% of students.

Distant learners experienced lower level of organisational stress and higher level of work satisfaction.¹³ Many secondary school students claim that online education is appropriate for them “considering peace and quiet, the lack of school stress, the opportunity to devote more time to their own interests”.¹⁴ However, at the same time “they mostly suffer from severe lack of direct contact with other people, peers, teachers. It is no surprise to indicate deficiencies in the field of personal contact, taking into account the fact that students value it significantly”.¹⁴

It should be emphasised that the above mentioned regularity can be seen among primary as well as among secondary school students. Moreover, both groups described difficulties in understanding and remembering the information learned during lessons (28.7% primary school students and 27.7% secondary school students) and technical problems (29.5% primary school students and 27.5% secondary school students). Nevertheless, the

biggest problem in distance education proves to be different. The biggest problem in online education for the secondary school students was the problem with concentration (26.8%) and the lack of motivation (21.9%) (Tab. 3). For the primary school students the biggest problems were: the problem with concentration (23.5%) and the lack of contact with friends (20.1%).

Table 3. What was the biggest problem in distance learning for you?

| Answers | Type of school | |
|---|--------------------|----------------------|
| | Primary school (%) | Secondary school (%) |
| planning everyday learning | 11.9 | 8.1 |
| dealing with some stress | 6 | 9.7 |
| the lack of the direct contact with a teacher | 9.3 | 5.2 |
| problems with concentration | 23.5 | 26.8 |
| sharing the computer, technical problems | 15.7 | 10.3 |
| the lack of contact with friends | 20.1 | 18.0 |
| the lack of motivation | 13.4 | 21.9 |

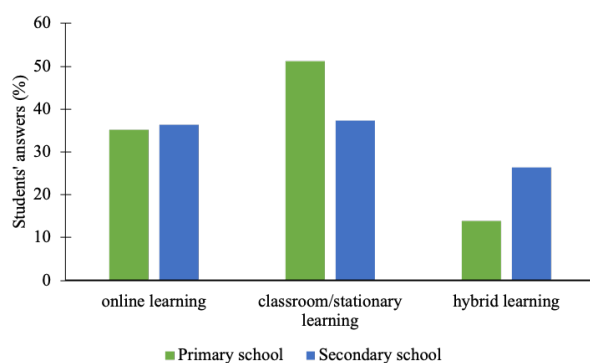


Fig. 2. Choosing the educational method preferred by students

Difficulties in distance learning indicated by students were mainly connected with their mental health. Young people need to have contacts with peers and to create their own identity. The necessity of staying at home in isolation during the COVID-19 pandemic and limited opportunities of development had a negative impact on natural needs of young people. Therefore, many students suffered from mental health and concentration problems, unwillingness to be active, apathy. In that context, students' answers about their preferred form of learning appear to be significant.

The majority of respondents were in favour of traditional education: 51.1% primary school students and 37.3% secondary school students (Fig. 2). The least desired way of learning was hybrid education because it meant a limited teachers' contact with their students.

Teachers were not able to pay attention to one group of students only, they shared their attention between students in the classroom and online students.

The relation between teachers and students is crucial, especially for secondary school students (70.6%) but also for primary school students (54.9%).

Table 4. Does the COVID-19 pandemic influence the teacher-student relations?

| Answers | Type of school | |
|---------|--------------------|----------------------|
| | Primary school (%) | Secondary school (%) |
| yes | 54.9 | 70.6 |
| no | 45.1 | 29.4 |

According to Jacek Pyżalski „the two most important areas of relations (...) are peer relations inside class groups and teacher-students relations”.¹⁵ They were specific during the isolation caused by lockdown. Nevertheless, students understand that physical distance cannot significantly influence students' contacts with other people. It cannot limit them, or even disable the supporting, motivating relations that help to overcome some difficulties.

Considering the fact that relations with teachers and peers are important for respondents, it is surprising who they chose to ask for help during online education. The great majority of students (60.1% - primary school students, 66.3% - secondary school students) declared that they coped with online learning difficulties on their own (Tab. 5).

Table 5. Who helps you during the distance education?

| Answers | Type of school | |
|-------------------------------------|--------------------|----------------------|
| | Primary school (%) | Secondary school (%) |
| parents | 20.1 | 6.2 |
| siblings | 9 | 4.1 |
| I have lessons with a private tutor | 6 | 15.4 |
| I learn on my own | 60.1 | 66.3 |
| I cannot cope with learning | 4.9 | 8.1 |

Furthermore, the people who are most frequently addressed by children and youth during difficult situations are: their mother (55.2% - primary school students, 37.8% - secondary school students) and friends (19% - primary school students, 36.1% - secondary school students) (Tab. 6). The pandemic became the time when children and youth looked at their relatives and friends from a different perspective.

Parents are able to help “to see a wider perspective beyond the limits and changes resulting from epidemic situation”, whereas friends have the ability to participate empathically in peers' life.¹⁶

Facing the pandemic situation and the necessary participation in online education, factors motivating to work were really essential. It turned out that in both study groups the grades were very important (opinion

expressed by 37.7% primary school students, 35% secondary school students). Primary school students mentioned their parents' satisfaction (25.7%) and the fact that they wanted to gain some knowledge (24.6%). For secondary school students the grades were almost as important as getting some knowledge (36%) (Tab. 7).

Table 6. Who did you ask for help when you had some problems?

| Answers | Type of school | |
|--|--------------------|----------------------|
| | Primary school (%) | Secondary school (%) |
| my mum | 55.2 | 37.8 |
| my dad | 8.2 | 3.9 |
| my siblings | 8.6 | 10.5 |
| my grandmother or my grandfather | 2.2 | 1.7 |
| a form teacher/ a teacher | 4.1 | 2.4 |
| an educator/ a psychologist | 0.7 | 1.9 |
| a priest | 1.1 | 4.1 |
| a helpline/an institution providing help | 0.7 | 1.3 |
| a friend | 19 | 36.1 |
| the head teacher | 0 | 0.2 |

Table 7. What motivated you?

| Answers | Type of school | |
|---------------------------------|--------------------|----------------------|
| | Primary school (%) | Secondary school (%) |
| the grades | 37.7 | 35 |
| I wanted to gain some knowledge | 24.6 | 36 |
| teachers praised me | 5.2 | 2.1 |
| my parents were pleased | 25.7 | 14.4 |
| other | 6.7 | 12.5 |

The willingness to get some knowledge in both educational groups is worth paying attention to, especially if we take into account all the difficulties that students had to cope with: isolation, psychosomatic problems, concentration problems. Nevertheless, the awareness of developing some knowledge and skills created a mature attitude in children and teenagers and it did not eliminate one of the basic educational aims.

According to WHO health is defined as a state of complete physical, mental and social well-being. Thus it is a key factor determining motivation. Therefore, we asked the respondents about their feelings during the COVID-19 pandemic. Interestingly, as it is shown in Table 8 regardless of the age and school, approximately 40% of students were reluctant to do any activities.

The pandemic was also a stress factor for students and a reason why they were in a bad mood. It was manifested as depression and sadness. Primary school students expressed their opinion that the pandemic did not

have a significant impact on their mental health (17.2%). They actually pointed to tiredness resulting from computer work. Some secondary school students claimed that all the responses suggested by the authors were related to their health during the pandemic, but some individuals said that the pandemic was a factor causing social anxiety, loneliness, helplessness. Only 17% of secondary school respondents claimed that the pandemic was the positive time for their feelings because they were able to develop their hobbies, concentrate on secondary school leaving examination preparations, manage time in a better way, relax and motivate to gain general knowledge.

Table 8. How did you feel because of the COVID-19 pandemic?

| Answers | Type of school | | |
|----------------------------------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| stressed | 25.7 | 18 | 27 |
| sad | 16.8 | 23.4 | 20 |
| reluctant to perform any actions | 40.3 | 36.7 | 38 |
| other | 17.2 | 21.9 | 15 |

University students from foreign countries who came from the eastern Europe (Ukraine, Belarus) as well as from Asian countries (Vietnam, South Korea) and studying Polish as a foreign language necessary to start a university in Poland were also taken into account. In majority they were also reluctant to do any activities (38%) in spite of the fact that the first months spent in Poland were supposed to prepare them for the future education and to make it possible for them to learn about Polish culture, language, existing in society. They also felt stressed (27%) and depressed (20%) which made it difficult for them to learn and also made them isolated. Learning a foreign language was an excessive burden not only because they had to be fully involved and cope with linguistic difficulties but mainly because of the pandemic.

The stress factor often motivates people to learn about its reasons and results. It is often seen in disasters, wars or epidemics. That is why students were asked if they had learnt anything about viruses and natural sciences during the COVID-19 pandemic. As it is presented in Table 9 the knowledge about viruses did not increase in case of only 9.7% of primary school students, 7.7% of secondary school students and 8.1% of university students from foreign countries.

Summing up, the knowledge about viruses was higher among secondary school students, it can be seen in the "yes, definitely" answers (45.5%) and among university students (51.9%). Clearly, students developed their knowledge about viruses on their own or with the help of their teachers. It seems that teach-

ers had a key role in education process because the amount of information that appeared in public (on the Internet, on TV, in newspapers) and was often fake, was proportionately increasing during the pandemic. Therefore, it was substantial to filter the latest scientific knowledge published in reviewed and prestigious magazines.

Table 9. Did you learn a lot about viruses during the COVID-19 pandemic?

| Answers | Type of school | | |
|----------------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| definitely yes | 38.8 | 45.5 | 51.9 |
| yes, a little | 51.5 | 46.8 | 40 |
| definitely no | 9.7 | 7.7 | 8.1 |

However, as it is shown in Table 10 the pandemic itself was the reason for an increased interest in natural sciences among 31.3% of primary school students, among 20.8% of secondary school students and among 17.3% of university students from foreign countries. The result seems to be surprising, especially among secondary school students and university students who chose natural sciences and who had specific interests and attended specific class profiles chosen by themselves (rarely general profiles).

Table 10. Have you become more interested in natural science in relation to the COVID-19 pandemic?

| Answers | Type of school | | |
|---------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| yes | 31.3 | 20.8 | 17.3 |
| no | 68.7 | 79.2 | 82.7 |

As it was shown before, students during the COVID-19 pandemic felt stressed, sad, reluctant to perform any activities. However, the above mentioned general statement was influenced by different factors including: contacts with family, parents and friends, increasing restrictions, lockdown, dealing with problems but also the direct presence of the virus. Therefore, the respondents were asked if the COVID-19 virus was a danger for them. Interestingly, as it is shown in Table 11, the majority of students in both school types claimed that the virus was just a little danger for them. About 25% of primary school students and 21% of secondary school students said that the virus was a significant danger for them.

In both types of schools less than 20% of respondents indicated that the virus was not a danger for them at all. University students from foreign countries answered in a similar way. 67.3% among them said that the virus

was just a little danger for them. 19.2% of the respondents claimed that it was a significant danger for them. 13.5% pointed at the virus as no danger at all.

Table 11. Is the COVID-19 virus a danger for you?

| Answers | Type of school | | |
|--------------------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| yes, very much | 24.6 | 21 | 19.2 |
| just a little | 57.5 | 60.5 | 67.3 |
| it is not a danger | 17.9 | 18.5 | 13.5 |

A hypothesis was formulated that the main stress factor among students was not the virus itself but the pandemic state, as it is shown in Table 12. That is why respondents were asked about their physical and mental health. As it is presented in Table 12, the pandemic influenced physical health of almost half of the respondents in both types of schools. Interestingly, mental health state depended on the age of the respondents.

Table 12. Does the COVID-19 pandemic influence your physical and mental health?

| Answers | Influence on physical health | | |
|---------|------------------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| yes | 48.9 | 48.9 | 34.6 |
| no | 51.1 | 51.1 | 65.4 |
| Answers | Influence on mental health | | |
| | Primary school (%) | Secondary school (%) | University (%) |
| yes | 48.9 | 65.2 | 50 |
| no | 51.1 | 34.8 | 50 |

The pandemic had an impact on mental health state of almost half of primary school students. 65% of secondary school students said that the pandemic influenced both their mental and physical health.

In case of university students the pandemic did not influence their physical health in a significant way (65.4%). However, the impact on their mental health was the same when we compare the positive and negative answers (respectively 50%). Therefore, it is clearly shown that the pandemic had a crucial impact on university students' mental as well as physical health.

Online education during the COVID-19 pandemic is on the one hand a way of contact between teachers and students. On the other hand, as experts repeatedly inform, it caused sight problems. Therefore, students were asked how much time they had spent in front of computer screens, tablets or smartphones and what they had used the Internet for. Interestingly, about 20% of primary and secondary school students spent more than 6 hours a day using the Internet (Table 13.)

The majority of students in both groups spent 3 hours a day in front of the screens. As it is presented in

Table 14 the Internet was not used mainly in order to take part in online lessons as it is suggested by many educationists. The study shows that primary school students used the Internet mainly to play games (almost 50% of the respondents), watch films, listen to music, do homework. Online lessons were only 20% of the answers. Secondary school students used the Internet mainly to listen to music, use social media, watch films, contact with other people. Online lessons time was only 7% of the time spent on the Internet. Additionally, secondary school students used the Internet to play games and to do homework significantly less than primary school students.

Table 13. How much time do you spend on the Internet a day?

| Answers | Type of school | | |
|---------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| 1 hour | 12.3 | 3 | 0 |
| 2 hours | 15.7 | 5.8 | 3.8 |
| 3 hours | 21.3 | 26 | 13.5 |
| 4 hours | 17.2 | 23.8 | 23.1 |
| 5 hours | 8.6 | 14.6 | 32.7 |
| 6 hours | 5.2 | 10.9 | 19.2 |
| more | 19.8 | 21.3 | 7.7 |

In case of university students from foreign countries the largest group (32.7%) spent 5 hours a day using the Internet. They used social media most often (19.1%), listened to music (17.4%), and only approximately 10% took part in Polish as a foreign language lessons using the Internet. Their online lessons attendance was satisfactory. However, it is alarming that they spent a great number of hours in front of their computer screens, watching films or using social networking sites.

The pandemic and spending time in front of TV and computers screens in a passive way had a bad impact on students' physical health. Polish children body mass has increased in the fastest way in Europe. According to WHO in the last 20 years the number of overweight children has grown three times and Polish teenagers are

Table 14. What do you use the Internet for? (choose max. 3 answers)

| Answers | Type of school | | |
|-------------------------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| having online lessons | 19.4 | 6.9 | 10.4 |
| playing games | 46.6 | 23 | 6.1 |
| doing homework | 37.7 | 27.2 | 2.6 |
| using social media | 28 | 50.7 | 19.1 |
| watching films | 39.9 | 43.3 | 15.7 |
| listening to music | 38.4 | 61 | 17.4 |
| developing my interests | 15.7 | 19.7 | 11.3 |
| contacting other people | 41.4 | 44.9 | 17.4 |

Table 15. How often were you physically active during online education?

| Answers | Type of school | | |
|-------------|--------------------|----------------------|----------------|
| | Primary school (%) | Secondary school (%) | University (%) |
| very rarely | 12.8 | 10.1 | 3.8 |
| rarely | 34.6 | 34.1 | 59.6 |
| often | 37.2 | 36.3 | 30.8 |
| very often | 15.4 | 19.5 | 5.8 |

in the world lead as far as obesity is concerned. Currently in Poland 31% of boys and 20% of girls are overweight and 13% of boys and 5% of girls suffer from obesity. Unfortunately, the pandemic and several lockdowns will certainly increase the numbers. Therefore, respondents were asked how they were keeping fit. As it is showed in Table 15 the type of school did not influence the frequency of physical activities during online education. About 50% of students in both types of schools claimed that they often or very often did physical exercises. Un-

Table 16. How often did you do any physical exercises before the COVID-19 pandemic and during online education?

| Answers | Type of school | | | | | |
|------------------------------------|--------------------|-----------------|----------------------|-----------------|----------------|-----------------|
| | Primary school (%) | | Secondary school (%) | | University (%) | |
| | Befor pandemic | During pandemic | Befor pandemic | During pandemic | Befor pandemic | During pandemic |
| once a week | 9 | 15.8 | 5.8 | 10.7 | 11.5 | 19.2 |
| twice a week | 10.2 | 11.7 | 19.1 | 11.4 | 17.3 | 19.2 |
| three times a week | 12 | 18.8 | 25.5 | 14.8 | 23.1 | 11.5 |
| four times a week | 18.8 | 8.3 | 11.4 | 9.9 | 19.2 | 11.5 |
| five times a week | 10.2 | 6 | 4.1 | 9 | 5.8 | 1.9 |
| six times a week | 3.8 | 2.6 | 1.7 | 3 | 0 | 0 |
| everyday | 20.7 | 16.9 | 7.3 | 11.8 | 3.8 | 3.8 |
| very rarely, several times a month | 7.9 | 7.9 | 13.3 | 14.0 | 11.5 | 17.3 |
| I didn't do any exercises | 7.5 | 12 | 11.8 | 15.4 | 7.7 | 15.4 |

fortunately, the second half of students answered “rarely” or “very rarely”.

The results concerning physical exercises frequency before and during the pandemic were shown in Table 16. About 20% of primary school students and about 30% of secondary school students chose the answer “rarely” (less than several times a month) or did not exercise at all. However, it seems positive, that 60% of students were active in some way at least once a week. 60% of university students answered “rarely” and only over 30% “often”. Before the pandemic majority of respondents were active twice, three or even four times a week. During the pandemic they were often active once or twice a week. There is also quite a large group of university students who did not do any physical activities at all – the number of them increased during the COVID-19 pandemic.

Discussion

In Poland, on 25 March 2020, distance learning, which for many people was known only from literature, entered into force. As a result, education could no longer be provided in its current form and was therefore provided online. This new approach was a great logistical challenge not only for teachers and students (often including parents), but also verified the IT competences of teachers at all levels of education. Due to the pandemic, all didactic and educational tasks in schools were to be carried out using distance learning techniques. According to the definition, distance learning is a method of conducting the didactic process in conditions where teachers and students are distant from each other and are not in the same place.¹⁰ Teachers at work had to take into account their own and their students’ technical capabilities, hardware, and software necessary to manage distance learning. The digital technologies-based distance learning process has become a reality. A significant challenge during the pandemic in the context of education was to ensure appropriate teacher-student relations. It is an important aspect of the functioning of the school under the conditions of direct classical teaching. An individual approach was a difficult task from the student’s perspective, especially for students with educational problems. With the lesson time limited to 30 minutes, it seems that this task was almost impossible to accomplish. However, working with students at distance forced teachers to conduct lessons creatively. Nevertheless, the most important thing in remote education in the context of students was maintaining mental comfort in a situation of discouragement, anger, or bitterness. It seems that a hard lockdown and large limitations in movement and contacts with peers were of key importance in the mental sphere of the students. Distance learning had many advantages and disadvantages. The disadvantages include the lack of contact in

the teacher-student and student-student relationship, difficulties with concentration of students, problems with checking the student’s independence, low physical activity resulting from too long work at the computer, a lot of material to learn, and problems in the organization of work. On the other hand, the advantages include individual adaptation of the workplace to learning and active use of interactive sources of knowledge (provided by educational platforms, including publishing houses). A certain advantage was also the time savings resulting from the lack of commuting.

Here, we are the first to show that distance learning has a negative impact on both the mental health of students and their physical condition. In the context of physical condition and the increase in the number of people with obesity in children in Poland, it seems that the subsequent studies that will be carried out after the pandemic will show even greater health problems for children and adolescents. From the perspective of physical activity, a big problem was the lack of physical education lessons, resulting in an even greater reduction in physical activity. Many teachers, doctors and school management expressed their concerns about the long time spent in front of computer screens, tablets, or smartphones. Interestingly, our research shows unequivocally that during the pandemic, distance learning was only a small fraction of the time students spent their time. As it turns out, primary school students in particular used this time for games. Therefore, it seems that the lack of self-discipline, hygiene at work, and some problems in the child-parent relationship resulted in too much time spent in front of the screens of the devices. As we have shown, a big problem during distance learning was the lowering of mood and general mental state in the vast majority of respondents, regardless of the study group. However, in our opinion, in the context of science education, the pandemic had a positive impact by increasing interest in science education, which in the future may have a positive impact on the choice of an appropriate career development path.

Some recent data from Ecuadorian students show that 63.78% of students want to return to on-site classes regardless of their conditions of Internet connection and their available learning tools. In addition, older students and students from higher semesters were found to think that online classes are better than face-to-face classes and want to continue in online education.¹⁷ Stressful situations can have a significant impact on education success; however, there is not clear link between anxiety, work, and social dysfunction related to learning impairments. In the case of Brazilian students, 42.9% of the respondents experienced symptoms of generalized anxiety disorders and more than half had moderate to severe functional impairment. These data showed that psychological distress and anxiety states might influence

performance during remote learning, which highlights the importance of investigating measures of anxiety and functional impairment as part of the remote-learning curriculum.¹⁸ In turn, recent data also showed that Dutch students were missing a proper structure in lessons and was a decreased in the understanding and enjoyment of the students in all courses. What crucial, teacher data demonstrate that the teachers needed guidance from the schoolboard.¹⁹ The COVID-19 pandemic has resulted in a devastating threat to human society in terms e.g. health, and lifestyle. As was reported, immobilization due to hospitalization or inactivity due to quarantine and social distancing can negatively regulate the ability of many organ systems to resist to infection and increase the probability of disease.²⁰ In pandemic context and physical activity, the WHO plan is WHO plan. To prevent and reduce inactivity, the WHO designed a global plan named the Global Action Plan on Physical Activity 2018–2030 (GAPPA) in 2017 (in 2016 goals were established). As was rightly argued, a COVID-19 pandemic affected various aspects of our lives, including physical activity.^{21,22} Some studies have shown that physical activity decreased during the pandemic. Therefore, the WHO should review the GAPPA and update the goals according to the state of physical activity after the pandemic.²³

In general, our findings seem to be in line with general trends around the world. And this mainly concerns the deterioration of the psychophysical state of the human population. After the pandemic has resolved, subsequent psychophysical health monitoring studies should be performed to verify the impact of the pandemic on children and adolescents.

Conclusion

There has been a significant impact of COVID 19 on students in elementary school, high school, and college. This resulted in negative mental and physical effects. Respondents were stressed, depressed, and unmotivated. Approximately half of them engaged in physical activity very rarely or rarely. Even though they were satisfied with online learning, which was caused by the Coronavirus pandemic, the greatest problem was mental - concentration problems, lack of motivation, and social isolation.

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Author contributions

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M.M. and M.J.; Writing – Original Draft Preparation, M.M. and M.J.; Writing – Review & Editing, M.M.; Visualization, M.M.; Supervision, M.M.; Project Administration, M.M.; Funding Acquisition, M.M.

Conflicts of interest

The authors declare that they have no competing interests.

Data availability

The data sets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Ethics approval

Not applicable

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