

**Original research paper**

**PHYSICAL ACTIVITY AND HEALTH PROBLEMS  
OF STUDENTS IN SOUTHERN SERBIA  
DURING THE STATE OF EMERGENCY**

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**Abstract.** *The COVID-19 pandemic affected practically every country in the world and changed how people lead their daily lives. The purpose of research was to ascertain the relationship between physical activity levels and the incidence of health issues among pupils. This research was conducted using an anonymous online survey that contained selected questions from the World Health Organization's health behavior in schoolchildren (HBSC questionnaire). The sample of participants consisted of 500 elementary and high school students from the territory of southern Serbia. It was observed that less than 1% of students reported having poor health, while 6% of participants said that they were dissatisfied with their health overall, compared to 94% of students who reported being satisfied with their health. Additionally, a total of 88% of students evaluated their lives with the highest marks, out of which 28% considered their lives to be the greatest they could possibly be. 90% of participants from this sample of students in southern Serbia reported engaging in physical activity three or more times per week, whereas only 3% of students reported engaging in physical activity only once a week or not at all. The key finding of this study proved that students who engaged in greater physical activity had fewer health issues than students who engaged in the least amount of physical activity. There are numerous benefits to being physically active, including how it influences the maintenance of human health and helps children grow and develop properly. Therefore, the importance of this work is reflected in the possibility of gaining knowledge about physical activity during the state of emergency and the connection between physical activity and health problems that emerged among students in southern Serbia during the COVID-19 pandemic.*

**Key words:** COVID-19, physical health condition, elementary school, high school

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## 1. INTRODUCTION

Nearly every nation in the world was affected by the COVID-19 pandemic, which significantly altered people's daily lives. As a result of the stringent measures established in order to stop the epidemic, people became encouraged to lead sedentary lifestyles and to ignore the daily recommendations for physical activity. In order to stop the transmission of this disease, it has become common practice to take social and physical isolation measures and close down companies, schools, kindergartens, and other facets of people's entire social lives. However, these restrictions have made it challenging for people to go about their daily lives regularly (Bass et al., 2020).

Physical activity is a very broad term; according to the World Health Organization, it is defined as any movement that results from the activity of the skeletal muscles and that involves the expenditure of energy. According to recommendations made by the World Health Organization (WHO 2020), adults should exercise 150 to 300 minutes per week at a moderate intensity, 75 minutes per week at a vigorous intensity, or at an appropriate combination of physical activity of varying intensity. Hypokinesia, the medical term for inactivity, is one of the most common disorders of the contemporary era and is sometimes referred to as the "pandemic of inactivity" (Castañeda-Babarro, Arbillaga-Etxarri, Gutiérrez-Santamaría, & Coca, 2020; Stanković, Nejić, & Stojiljković, 2020).

Training and all sporting events for kids and adults were outlawed during the time when restrictive measures were being implemented to combat the COVID-19 pandemic. People who wished to keep physically active during the "lockdown" opted most frequently for at-home workouts.

The most crucial external component for a child's growth and development is proper nutrition, paired with frequent physical activity. However, the public places a lot of emphasis on the type, quantity, and manner of eating while placing insufficient emphasis on physical exercise and lowering sedentary lifestyles (Ostojić et al., 2009). A sedentary person is one who is not physically active enough, spends their working hours sitting in an office without moving, and then exhibits the same pattern of behavior in their free time. On the other hand, a physically active person cleans their home, uses active transportation instead of passive means, and moves around in their free time (Thomas et al., 2008). Technology development influences the sedentary lifestyle, and new technological developments swiftly supplant children's play.

A healthy lifestyle is strongly dependent on the general populace engaging in adequate physical activity. The relationship between physical activity and health has been the subject of extensive investigation. A healthy lifestyle includes regular, well-balanced physical activity, which can reduce the risk of cardiovascular disease by up to 50%. Additionally, regular physical activity effectively controls body weight, which might be a risk factor for the development of certain diseases. Insufficient physical activity is frequently linked by researchers to an imbalance in a person's psychological health and the emergence of a variety of psychological issues (Maugeri et al., 2020).

Due to the aforementioned importance of physical activity and its connection with people's health, as well as the problems that restrictive measures brought about during the COVID-19 pandemic, it is necessary to focus our attention on people's health problems and their reduced physical activity. In this regard, the aim of this study is to examine the connection between the quantity of physical activity and the occurrence of health problems among students in southern Serbia during the state of emergency.

## 2. METHODS

This research was conducted using an anonymous online survey that contained selected questions from the World Health Organization's health behaviour in schoolchildren - HBSC questionnaire. The validity and reliability of the questionnaire used in this research was proven in the study Booth, Okely, Chey, & Bauman, (2001). Moreover, this research was conducted in 2021, when the COVID-19 pandemic caused a state of emergency.

### 2.1. The Sample of Participants

In this study, a total of 500 participants were recruited to examine the connection between the quantity of physical activity and the occurrence of health problems among students in southern Serbia during the state of emergency. The sample of participants consisted of elementary school students in the fifth grade, seventh grade, and the first grade of high school. Specifically, 30% (150 students) of the participants were from the fifth grade, 34% (170 students) from the seventh grade, and 36% (180 students) from the first grade of high school. The gender distribution of the participants revealed that 53% (265 individuals) were male, while 47% (235 individuals) were female. The age range of the participants spanned from 11 to 15 years. All participants were from urban areas in southern Serbia to ensure a diverse representation. Understanding the impact of the state of emergency on the health of students in this region is crucial, given the current context. By examining the quantity of physical activity and its relationship to health problems, this study aims to contribute valuable insights into promoting healthier lifestyles and well-being among school-going children during challenging times. In addition to having documented parental approval, the students willingly consented to take part in this study. Moreover, the students were informed in detail about the protocol of the entire study as well as its goal.

### 2.2. A sample of Measuring Instruments

Selected inquiries pertaining to the health issues experienced by students in southern Serbia during the state of emergency and their physical activity were used for the research's objectives. The questions regarding the health condition of the students were related to the frequency of stomach pains, headaches, nervousness, depression, irritability/being in a bad mood, difficulty falling asleep and dizziness that they experienced.

### 2.3. Data Processing Methods

We initially processed the data by calculating absolute and relative frequencies to gain insights into the distribution of the variables under investigation. Subsequently, we utilized the chi-square test to examine distributional differences between the variables. The chi-square test is a statistical method that allows us to assess whether there are significant associations or dependencies between categorical variables. By setting a statistical significance level of  $p \leq 0.05$ , we aimed to determine if any observed differences in distribution were likely to be meaningful or merely due to chance. The results of this test provided valuable information for understanding the relationships and patterns present within our dataset.

## 3. RESULTS

In a sample of 500 students from southern Serbia, it was observed that less than 1% of students gave their health a poor rating, and a total of 6% of participants reported that they were not satisfied with their health, while 94% of participants claimed that they were satisfied with their overall health. Additionally, in this sample of students from southern Serbia, a total of 88% of students evaluated their lives with the highest marks (grades from 7 to 10), out of which 28% considered their lives to be the greatest they could possibly be. Table 1 shows the frequency of participants' responses to questions related to health and life satisfaction.

**Table 1** The frequencies and percentages of satisfaction with health and life (N=500)

| Questions                       | Grade  |         |           |           |
|---------------------------------|--------|---------|-----------|-----------|
|                                 | Bad    | Good    | Very good | Excellent |
| How would you rate your health? | 4 (1%) | 30 (6%) | 113 (23%) | 353 (71%) |

  

| Questions                     | Grade  |        |        |        |        |         |         |          |           |           |           |
|-------------------------------|--------|--------|--------|--------|--------|---------|---------|----------|-----------|-----------|-----------|
|                               | 0      | 1      | 2      | 3      | 4      | 5       | 6       | 7        | 8         | 9         | 10        |
| How would you rate your life? | 0 (0%) | 4 (1%) | 2 (0%) | 4 (1%) | 8 (2%) | 15 (3%) | 23 (5%) | 86 (17%) | 112 (22%) | 106 (21%) | 140 (28%) |

The values are the frequencies (percentage) of the participants' responses

The majority of students in southern Serbia trained three or more times a week, i.e., 90% of participants from this sample, while only 3% of students trained only once a week or not at all (Table 2). A total of 5% of the pupils in the sample were at the lowest level of physical activity (level 1). Additionally, 23% were at the second level, and 30% trained between 5 and 6 days a week (level 2). Notably, 37% of the students in the sample indicated that they were physically active every day.

**Table 2** Frequency of physical activity per week (N=500)

| The number of days per week | f   | (%)   |
|-----------------------------|-----|-------|
| 0                           | 11  | (2%)  |
| 1                           | 7   | (1%)  |
| 2                           | 27  | (5%)  |
| 3                           | 52  | (10%) |
| 4                           | 64  | (13%) |
| 5                           | 97  | (19%) |
| 6                           | 56  | (11%) |
| 7                           | 186 | (37%) |

Table 3 shows the frequencies of the participants' responses to questions related to the frequency of health problems they experienced in the last month. The majority of students in southern Serbia reported that, in the previous month, they rarely or never experienced a stomach ache (54%), headache (67%), or dizziness (86%), compared to the entire sample of participants. Also, most participants did not feel depressed (74.3%) or have difficulty falling asleep (60%). At least once a week, between 12% and 14% of pupils had the

mentioned complaints, except for dizziness, which was less common (7%), and difficulty falling asleep, which was more common, reported by 25% of the sample. Up to 2% of the students in the sample experienced stomachaches, headaches, dizziness, and feelings of depression every day, while 5% of the students experienced difficulties falling asleep.

The majority of students in southern Serbia, however, were in a bad mood at least once a month (60%) and felt nervous (63%). Furthermore, 32% of the students reported being in a bad mood at least once a week, and even 41% reported feeling nervous. Additionally, 7% of students reported feeling nervous on a daily basis.

**Table 3** Frequency of health complaints (N=500)

| Symptoms                         | How often in the last month |              |             |                      |           |
|----------------------------------|-----------------------------|--------------|-------------|----------------------|-----------|
|                                  | Rarely or never             | Once a month | Once a week | Several times a week | Every day |
| Stomach pain                     | 270 (54%)                   | 168 (34%)    | 32 (6%)     | 24 (5%)              | 6 (1%)    |
| Headache                         | 335 (67%)                   | 96 (19%)     | 34 (7%)     | 27 (5%)              | 8 (2%)    |
| Nervousness                      | 183 (36%)                   | 111 (22%)    | 114 (22%)   | 58 (11%)             | 34 (7%)   |
| Depression                       | 371 (74%)                   | 66 (14%)     | 38 (7%)     | 16 (3%)              | 9 (2%)    |
| Irritability/being in a bad mood | 196 (39%)                   | 141 (28%)    | 107 (22%)   | 45 (9%)              | 11 (2%)   |
| Difficulty falling asleep        | 267 (60%)                   | 81 (16%)     | 63 (12%)    | 34 (7%)              | 27 (5%)   |
| Dizziness                        | 430 (86%)                   | 37 (7%)      | 15 (3%)     | 11 (3%)              | 6 (1%)    |

The values are the frequencies (percentage) of the participant's responses

Table 4 displays the findings of the Pearson Chi-square test, which was used to examine the significance of the relationship between the amount of physical activity and the frequency of health problems (contingency table individually for each health complaint). All observed frequencies in the contingency table are greater than 5, except for the tested relationship between the level of physical activity and life satisfaction, wherein more than 20% of the cells have less than 5 participants, which is why it was not taken into account for further analysis. At a significance threshold of  $p \leq 0.05$ , the chi-square test revealed that the obtained frequencies differ from the frequencies expected by chance in at least one cell of the contingency table. The alternative hypothesis, that there is a statistically significant correlation between the level of physical activity and health satisfaction and between the level of physical activity and health complaints, is therefore accepted as true, and it is concluded that they are not independent and that the observed frequencies are more likely to occur.

Therefore, Pearson's Chi-square test indicates a statistically significant relationship between the level of physical activity and satisfaction with health ( $\chi^2(3) = 7.68$ ;  $p = 0.05$ ), abdominal pain ( $\chi^2(3) = 19.43$ ;  $p < 0.001$ ), headaches ( $\chi^2(3) = 16.14$ ;  $p < 0.001$ ), nervousness ( $\chi^2(3) = 32.10$ ;  $p < 0.001$ ), depression ( $\chi^2(3) = 22.95$ ;  $p < 0.001$ ), irritability ( $\chi^2(3) = 28.03$ ;  $p < 0.001$ ), difficulty falling asleep ( $\chi^2(3) = 18.78$ ;  $p < 0.001$ ) and dizziness ( $\chi^2(3) = 16.74$ ;  $p < 0.001$ ).

By examining the values in the contingency table, we can discern that the students with the lowest level of physical activity ( $\leq 2$ /week) were mostly satisfied with their lives (84.4%); however, as the level of physical activity increased, this percentage of students rose until it reached 95.2% for those who engaged in physical activity every day. However, we discovered that the majority of students who engaged in physical activity twice a week or less (53.5%) reported experiencing abdominal pain, and this proportion of students did not change significantly as levels of physical activity increased—only 33.9% of students in this sample of participants reported experiencing pain at the highest level of physical activity. At all levels of

physical activity, the majority of students did not experience headaches; however, it is unclear whether there is an association between a person's physical activity levels and headaches. Nevertheless, the group that engaged in daily physical activity had the lowest percentage of participants experiencing headaches (21.7%), compared to those who engaged in other levels of physical activity (37.8%, 36.8%, and 40.5%). The majority of southern Serbian students in the sample who did not engage in daily physical activity reported feeling anxious, compared to the majority of those who did (52.4%). On the other hand, the majority of students across all levels did not experience depression, but the group who exercised fewer than three times per week (level 1) had the greatest percentage of responders (46.7%) who reported experiencing depression. With increased physical activity, the percentage of depressed individuals decreased, and in the sample of students who participated in daily physical exercise, the percentage was only 17.5%. Students who did not engage in daily physical exercise were more likely to report having a bad mood, mainly level 1 students (75.6%), and this proportion tended to decline over time; as a result, the percentage in the group with the highest level of physical activity was 46.6%. The majority of students in the south Serbia district who engaged in physical exercise fewer than five days per week reported having trouble falling asleep, but only 29.1% of those students who engaged in the highest level of physical activity reported having this problem. Dizziness was more common among students who engaged in daily physical activity (6.3%) than among those who engaged in other levels of physical activity (15.6%, 21.9%, and 16.6%). Thus, the connection between dizziness and the level of physical activity is unclear, despite the fact that they are interdependent. Finally, the majority of children did not feel lightheaded throughout all types of physical activities.

**Table 4** Satisfaction with one's health, life and health problems depending on the level of one's physical activity

| Questions                 | The level of physical activity |            |             |             | Pearson $\chi^2$ test |                                       |
|---------------------------|--------------------------------|------------|-------------|-------------|-----------------------|---------------------------------------|
|                           | 1                              | 2          | 3           | 4           |                       |                                       |
| Satisfaction with health  | NO                             | 7 (15.6%)  | 9 (7.9%)    | 8 (5.2%)    | 9 (4.8%)              | $\chi^2_{(3)} = 7.68$ ;<br>p = 0.05   |
|                           | YES                            | 38 (84.4%) | 105 (92.1%) | 145 (94.8%) | 180 (95.2%)           |                                       |
| Satisfaction with life    | 1                              | 2 (4.4%)   | 1 (0.9%)    | 3 (2%)      | 4 (2.1%)              | $\chi^2_{(6)} = 4.41$ ;<br>p = 0.62   |
|                           | 2                              | 3 (6.7%)   | 14 (12.3%)  | 15 (9.8%)   | 14 (7.4%)             |                                       |
| HBSC life                 | 3                              | 40 (88.9%) | 99 (86.8%)  | 135 (88.2%) | 171 (90.5%)           | $\chi^2_{(3)} = 0.92$ ;<br>p = 0.82   |
|                           | NO                             | 3 (6.7%)   | 9 (7.9%)    | 11 (7.2%)   | 10 (5.3%)             |                                       |
| Stomach pain              | YES                            | 42 (93.3%) | 105 (92.1%) | 142 (92.8%) | 179 (94.7%)           | $\chi^2_{(3)} = 19.43$ ;<br>p < 0.001 |
|                           | NO                             | 21 (46.7%) | 63 (55.3%)  | 66 (43.1%)  | 125 (66.1%)           |                                       |
| Headache                  | YES                            | 24 (53.5%) | 51 (44.7%)  | 87 (56.9%)  | 64 (33.9%)            | $\chi^2_{(3)} = 16.14$ ;<br>p < 0.001 |
|                           | NO                             | 28 (62.2%) | 72 (63.2%)  | 91 (59.5%)  | 148 (78.3%)           |                                       |
| Nervousness               | YES                            | 17 (37.8%) | 42 (36.8%)  | 62 (40.5%)  | 41 (21.7%)            | $\chi^2_{(3)} = 32.10$ ;<br>p < 0.001 |
|                           | NO                             | 12 (26.7%) | 30 (26.3%)  | 43 (28.1%)  | 99 (52.4%)            |                                       |
| Depression                | YES                            | 33 (73.3%) | 84 (73.7%)  | 110 (71.9%) | 90 (47.6%)            | $\chi^2_{(3)} = 22.95$ ;<br>p < 0.001 |
|                           | NO                             | 24 (53.3%) | 74 (64.9%)  | 118 (77.1%) | 156 (82.5%)           |                                       |
| Irritability              | YES                            | 21 (46.7%) | 40 (35.1%)  | 35 (22.9%)  | 33 (17.5%)            | $\chi^2_{(3)} = 28.03$ ;<br>p < 0.001 |
|                           | NO                             | 11 (24.4%) | 31 (27.2%)  | 54 (35.3%)  | 101 (53.4%)           |                                       |
| Difficulty falling asleep | YES                            | 34 (75.6%) | 83 (72.8%)  | 99 (64.7%)  | 88 (46.6%)            | $\chi^2_{(3)} = 18.78$ ;<br>p < 0.001 |
|                           | NO                             | 21 (46.7%) | 57 (50%)    | 84 (54.9%)  | 134 (70.9%)           |                                       |
| Dizziness                 | YES                            | 24 (53.3%) | 57 (50%)    | 69 (45.1%)  | 55 (29.1%)            | $\chi^2_{(3)} = 16.74$ ;<br>p < 0.001 |
|                           | NO                             | 38 (84.4%) | 89 (78.1%)  | 126 (82.4%) | 177 (93.7%)           |                                       |

The values are frequencies (percentage).

Levels: 1., 0-2 days/week; 2nd, 3-4 days/week; 3rd, 5-6 days/week; 4., 7 days/week.

#### 4. DISCUSSION

The aim of this study was to investigate the connection between the level of physical activity and the frequency of health problems among students in southern Serbia during the state of emergency caused by the COVID-19 pandemic. Our results align with several studies that have shown children being less physically active during the pandemic (Zhou et al., 2020; Bates et al., 2020). Social isolation and restrictions during the pandemic have significantly decreased the degree of physical activity among both male and female students (Zhou et al., 2020). A survey of Canadian children and adolescents revealed a substantial decline in meeting recommended guidelines for physical activity during the COVID-19 pandemic (Moore et al., 2020), further highlighting the challenges faced during such periods.

Despite the challenges, our findings demonstrated a statistically significant relationship between one's level of physical activity and satisfaction with health and health-related issues. While the relationship between physical activity levels and health satisfaction did not reach statistical significance ( $p = 0.82$ ), our results show that an increase in physical activity is associated with a higher percentage of students reporting satisfaction with their health. These findings are consistent with earlier studies that have explored the relationship between physical activity levels and health-related outcomes (Chen, Ho, & Ahmed, 2020; Hawker, 2012). Notably, our study adds to the literature by examining this relationship during a state of emergency, providing valuable insights into students' health and well-being in challenging circumstances.

Moreover, our study aligns with research indicating that physical activity has a positive impact on children's and adolescents' moods during the COVID-19 epidemic (Zhang et al., 2020). Engaging in regular physical activity was associated with reduced symptoms of nervousness, depression, and difficulty falling asleep. This highlights the potential of physical activity as a protective factor for students' emotional well-being, even in the face of additional stressors during a pandemic.

Besides the effects of the COVID-19 pandemic, we also observed a relationship between physical activity levels and specific health issues. Students with higher levels of physical activity reported lower frequencies of abdominal pain, headaches, and dizziness compared to those with lower activity levels. These findings support previous research indicating that regular physical activity may contribute to reduced health complaints (Valois et al., 2004; Milde-Busch et al., 2010). However, it is essential to recognize that lifestyle factors, such as coffee and alcohol use, may also influence these health outcomes. Additionally, continuous high-intensity exercise may not always be advisable, as it may lead to discomfort in the locomotor apparatus (Kujala, Taimela, & Viljanen, 1999).

Considering the collective findings, promoting physical activity among students remains crucial for enhancing their overall health and well-being. Encouraging regular physical activity, even during challenging circumstances like a state of emergency, can have positive effects on students' health satisfaction, mood regulation, and specific health complaints. By understanding the relationship between physical activity and health outcomes, schools and communities can design targeted interventions to support students' overall health and resilience, even amidst unforeseen disruptions.

Despite the contributions of this study, some limitations should be acknowledged. The use of self-reported questionnaires to assess physical activity may introduce biases and inaccuracies. Future research could benefit from incorporating objective measures, such as accelerometers, to provide more reliable data on students' physical activity levels.

Additionally, a larger and more diverse sample could further enhance the generalizability of the results.

In conclusion, this study sheds light on the importance of regular physical activity for students' health and well-being, especially during challenging periods like the COVID-19 pandemic. The findings emphasize the potential benefits of maintaining physical activity for students' overall health satisfaction, emotional well-being, and specific health complaints. By promoting physical activity even during adverse circumstances, we can strive to improve students' health outcomes and foster their resilience in the face of adversity.

## 5. CONCLUSION

Physical activity has proven to be vital for students' health and well-being, even during challenging periods such as the state of emergency caused by the COVID-19 pandemic. Our research, conducted on a sample of 500 students from southern Serbia, highlights the importance of regular physical activity for students' overall health satisfaction and the frequency of health problems they experience. Most students in the sample engaged in regular physical activity, and this was associated with higher satisfaction with their health and reduced reports of health issues.

The significance of our study lies in the insights gained about physical activity during the state of emergency and its relationship with health problems among students. These findings can aid in designing appropriate physical exercise programs for students, especially during challenging times. As future research unfolds, it will be valuable to explore physical activity patterns further, using objective measures like accelerometers to complement self-reported data. With continued efforts to promote physical activity among students, we can enhance their well-being and overall health, even amidst unforeseen circumstances.

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## **FIZIČKA AKTIVNOST I ZDRAVSTVENE TEGOBE UČENIKA JUŽNE SRBIJE U USLOVIMA VANREDNOG STANJA**

*Pandemija Covid 19 prisutna je u gotovo svim zemljama sveta i dovela je do promene svakodnevice čoveka. Cilj ovog rada bio je utvrditi povezanost nivoa fizičke aktivnosti i učestalosti zdravstvenih tegoba učenika južne Srbije u uslovima vanrednog stanja. Uzorak ispitanika u ovom istraživanju činilo je 500 učenika osnovne škole sa teritorije južne Srbije. Uočeno je da manje od 1% učenika ocenjuje svoje zdravlje kao loše, a ukupno 6% ispitanika nije zadovoljno svojim zdravljem, dok je 94% učenika zadovoljno svojim zdravljem. Takođe, ukupno 88% učenika ocenjuje svoje zdravlje najvišim ocenama od čega 28% smatra da je njihovo zdravlje najbolje moguće. Većina učenika južne Srbije je trenirala tri ili više puta nedeljno, tj. 90% ispitanika iz ovog uzorka, dok je svega 3% učenika treniralo samo jednom nedeljno ili nijednom. Rezultati istraživanja ukazuju na to da su učenici koji su bili fizički aktivni u većoj meri u manjoj meri imali zdravstvene tegobe nego učenici na najnižem nivou fizičke aktivnosti. Benefiti bavljenja fizičkom aktivnošću su brojni, fizička aktivnost utiče na očuvanje zdravlja čoveka i doprinosi pravilnom rastu i razvoju deteta. Značaj ovog rada ogleda se u mogućnosti dolaženja do saznanja o fizičkoj aktivnosti tokom vanrednog stanja, o povezanosti fizičke aktivnosti i zdravstvenih tegoba koje su se pojavljivale kod učenika južne Srbije tokom pandemije Covid 19.*

*Ključne reči: Covid-19, zdravstveno stanje, osnovna škola*