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Physical Activity of Middle School Students from Cluj-Napoca during the Covid-19 Pandemic

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Abstract: Physical activity has numerous health benefits, including better cardiorespiratory fitness, skeletal health, psychological health and reducing obesity. However, more than 80% of adolescents worldwide are not active enough, failing to meet the recommended 60 minutes of daily physical activity, and due to COVID-19 restrictions, the percentage might be even higher. Objective: This study aimed to investigate the level of physical activity and its influencing factors in a sample of 333 middle school students (mean age = 12.93, SD = 1.20) from Cluj-Napoca, Romania, during the COVID-19 pandemic. Methods: A cross-sectional study was conducted and two instruments were used to assess interest variables, the Physical Activity Questionnaire for Older Children and the Cues, Perceived Benefits and Barriers to Physical Activity Questionnaire. Results showed a low level of physical activity in our sample for both male (M = 2.76, SD = 0.76) and female (M = 2.62, SD = 0.63) adolescents. The most commonly reported cue to physical activity was "encouragement from parent(s) to exercise", the most prevalent perceived benefit was "to stay in shape", and the most powerful barrier was "wanting to do other things with personal time". Conclusion: Understanding adolescents' cues, perceived benefits and barriers to physical activity could help teachers and coaches to provide suitable programmes, and parents or peers to support adolescents. Discussion includes implications for practice and guidelines for policymakers and participants.

Keywords: *physical activity; children; adolescents; sport; COVID-19.*

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Introduction

According to the World Health Organization (WHO) (2020a), physical activity is defined as "any bodily movement produced by skeletal muscles that requires energy expenditure" and it involves activity during leisure, transport or as part of one's work. It has multiple health benefits for the general population, such as preventing cardiovascular disease, diabetes, hypertension, cancer, obesity and osteoporosis (Warburton, 2006). Moreover, it has mental health benefits, improving mood and reducing symptoms of depression and anxiety (Penedo & Dahn, 2005). Physical activity during adolescence is positively correlated with adult physical activity, suggesting a carryover effect into adulthood (Barnekow-Bergkvist et al., 1996). Adolescent physical activity has both short-term benefits, including bone and mental health improvements and long-term benefits in bone health (Hallal et al., 2006).

Recommended physical activity levels for children and adolescents include 60 minutes per day of moderate-to-vigorous intensity, mostly aerobic exercise (World Health Organization, 2020b). However, this goal is far from being accomplished, which has led the WHO to design a "Global Action Plan on Physical Activity and Health 2018-2030" that aims at a 15% reduction in global physical inactivity by 2030 (World Health Organization, 2018). According to the World Health Organization (2020b), one in four adults is not active enough, and in the case of adolescents, the situation is even more dramatic, revealing that 81% of those aged 11 to 17 do not meet the recommended levels of physical activity.

Regarding adolescents in Romania, the 2018/2019 report on Health Behaviour in School-Aged Children reveals that physical activity levels have decreased since the 2014 report, and sedentary behaviours are increasing (World Health Organization, 2020a). According to the World Health Organization (2020a), the percentage of adolescent girls who engaged in moderately vigorous daily physical activity in 2018 was 10% compared to 16.30% in 2014, and in the case of boys, it was 17.80% in 2018 compared to 29.10% in 2014. The numbers are even lower for older adolescents. Only 6.9% of girls and 15.6% of boys aged 15 years met the WHO target of 60 minutes of daily physical activity (World Health Organization, 2020a).

Additionally, the recent COVID-19 outbreak has had a devastating impact on physical activity worldwide. Lockdown measures have restricted free movement in many countries for long periods, wearing masks has limited physical activity, and social distancing measures have made most team sports impossible to play. Several studies assessed the impact of

COVID-19 on physical activity. Tison et al. (2020) investigated changes in the step count of 455,404 unique users from 187 countries before and after the global pandemic, and results showed that step counts significantly decreased globally after the COVID-19 outbreak. Changes were more evident in regions with high infection rates where lockdown measures were instituted; however, physical activity decreased even in countries that had not instituted lockdown measures (Tison et al., 2020). In another study that aimed to assess the impact of the COVID-19 pandemic on the physical activity behaviour of adult Canadians, results showed that inactive participants reported lower physical activity levels since the COVID-19 outbreak, while active participants became more physically active (Lesser & Nienhuis, 2020), These results raise the concern that sedentary groups might become even less physically active due to restrictive measures.

In order to increase adolescents' physical activity levels, practitioners and policymakers need to understand the underlying reasons for participation. The most common barriers to physical activity are "lack of time", "lack of energy" and "lack of motivation", followed by "high costs", "health problems", "lack of infrastructure", "discomfort", "lack of skills", "fear of injuries", "lack of a safe space", "lack of a training partner", "insufficient physical activity programmes", "lack of support" and "lack of transportation" (Weinberg & Gould, 2011). A systematic review of the literature identified three categories of barriers to physical activity: individual factors (attitudes, perception, motivation), social factors (family, friends and participants in the physical activity field) and environmental factors (practice opportunities and access to physical activities) (Martins et al., 2015). According to Ar-yuwat et al. (2013), important cues to physical activity are: "having a friend to exercise with", "having a friend who encourages exercise" and "having organized physical activities outside of school"; regarding perceived benefits, it seems that "to stay in shape" could be one of the main motivating factors.

The *purpose* of this study was twofold: first, to investigate adolescents' physical activity prevalence during the COVID-19 pandemic, and second, to describe perceived cues, benefits and barriers to physical activity in our sample.

Methodology

Participants

A total of 333 middle school students (mean age = 12.93, *SD* = 1.20) were recruited from two schools in Cluj-Napoca, Romania. First, the

consent of each school board was obtained, and then the students' parents were approached, explained the aim of the study and asked for consent. Students were also explained that participation was voluntary and they had the right to withdraw from the study at any time, for any reason. After obtaining the parents' and students' consent, the latter completed questionnaires regarding their physical activity during the past seven days.

Study design and setting

We used a descriptive, cross-sectional design in two middle schools in Cluj-Napoca, Romania. The study took place online between October 28 and November 11, 2020. This period was characterised by temperatures ranging between 0° C and 16° C and low precipitation levels.

Cluj-Napoca is the largest city in the Transylvania region of Romania, which was declared a European City of Sport in 2018 (ACES Europe, 2018). Its inhabitants have multiple physical activity options provided by 25 sports facilities (some of which free of charge), more than 100 active sports associations, a Paralympic association, five prestigious sports clubs, several parks, playgrounds, public and private gyms (Visit Cluj, 2021).

Despite the great number of options, due to epidemiological issues caused by the COVID-19 pandemic, most of these physical activity opportunities were unavailable. Some sports facilities were closed, and others required appointments or were limited to a restricted number of participants to maintain social distancing (7 m^2 per person). Sports associations also operated with restrictions, including regulations reducing to ten the maximum number of athletes allowed to train together, shortening the training duration, and banning athletes to use their own equipment for team sports. Regarding outdoor sports, regulations allowed groups of up to ten persons to practise together. Physical activity at school was also affected, and physical education classes took place exclusively online.

Instruments

We assessed physical activity levels using the Physical Activity Questionnaire for Older Children (PAQ-C) (Kowalski et al., 2004). According to the authors, PAQ-C is a self-administered, 7-day recall questionnaire, with nine items scored on a 5-point Likert scale used to evaluate physical activity levels for students aged 8 to 14. This instrument has acceptable levels of internal consistency (α = 0.79 for the first assessment, α = 0.89 for the second assessment), test-retest reliability (r = 0.75 for males, r = 0.82 for females), convergent validity (r = 0.57 with

activity rating, $r = 0.41$ with the Leisure Time Exercise Questionnaire, $r = 0.39$ with Caltrac motion sensor, $r = 0.46$ with the seven-day recall interview, $r = 0.28$ with the Canadian home fitness test), divergent validity (no relationship with the behavioural conduct scale), construct validity ($r = 0.48$ with perceptions of athletic competence) (Crocker et al., 1997; Kowalski et al., 1997). Slight adjustments were made to the PAQ-C questionnaire. For Item 1, we substituted the following sports: rowing/canoeing, baseball/softball, football, street hockey, floor hockey, ice skating, cross-country skiing, ice hockey/ringette. Instead, we placed more culturally relevant sports: "oina" (a Romanian traditional national sport similar to rounders), rugby, handball, gymnastics, tennis, climbing, martial arts, table tennis and track and field. Also, Item 4 (physical activity during lunch break) was excluded for cultural reasons, as there were no special lunch breaks during the school programme, except for recess, which was already covered at Item 3 (physical activity during recess).

We also used the Cues, Perceived Benefits and Barriers to Physical Activity Questionnaire (Tergerson & King, 2002) to evaluate students' physical activity determinants. This questionnaire has three subscales (cues, benefits and barriers), each of them with 12 items ranging on a 7-point Likert scale. As stated by Tergerson and King (2002), this instrument has good psychometric properties: reliability ($r = 0.621$ for cues, $r = 0.744$ for benefits, and $r = 0.770$ for the barrier subscale), internal consistency ($\alpha = 0.803$ for cues, $\alpha = 0.846$ for benefits, and $\alpha = 0.900$ for the barrier subscale).

For both questionnaires, we used a back-translation procedure (Brislin, 1970). One author translated the original version of questionnaires from English to Romanian. Then, a second investigator blindly translated the output back to English. Next, we compared the two versions resulted and resolved discrepancies by discussing until a consensus was reached.

Data analysis

We described the characteristics of our sample using means, standard deviations, frequencies and percentages. Differences between the two gender groups were assessed by independent sample t-tests.

Results

Demographic characteristics

Table 1 presents adolescents' demographic characteristics and physical activity background. An approximately equal percentage of

participants were female (48.3%) and male (51.7%), and most of them were healthy during our study (89.2%). Adolescents in our sample reported that they regularly attended PE classes (94.5%); however, just a few of them were members of school-based sports teams (8.1%) or outside-of-school sports teams (40.2%). Most of our participants reported that they had a parent who encouraged them to exercise (94.9%); however, only 58% of adolescents said they had a physically active parent. Regarding peer influence, it appears that 86.2% of study participants have at least a friend who exercises.

Table 1. Demographic characteristics and physical activity background of adolescents

Item	Category	Frequency (%)	$M \pm SD$
Age (years)	10-11	2 (0.60%)	12.93 ±
	11-12	104 (31.23%)	1.20
	12-13	64 (19.21%)	
	13-14	71 (21.32%)	
	14-15	91 (27.32%)	
	15-16	1 (0.30%)	
Gender	Female	161 (48.3%)	
	Male	172 (51.7%)	
Do you have a friend who exercises?	Yes	287 (86.2%)	
	No	46 (13.8%)	
Do you have a parent who exercises?	Yes	193 (58.0%)	
	No	140 (42.0%)	
Do you have a parent who encourages you to exercise?	Yes	316 (94.9%)	
	No	17 (5.1%)	
Are you currently trying to lose weight?	Yes	138 (41.4%)	
	No	195 (58.6%)	
Are you a member of any school-based sports team?	Yes	27 (8.1%)	
	No	306 (91.9%)	
Are you a member of a sports team outside of school?	Yes	134 (40.2%)	
	No	199 (59.8%)	
Do you regularly attend PE classes?	Yes	315 (94.6%)	
	No	18 (5.4%)	
Were you sick last week?	Yes	36 (10.8%)	
	No	297 (89.2%)	

Source: Authors' own conception

Physical activity levels

Results in terms of physical activity levels are presented in Table 2. Our sample had a low level of physical activity (M = 2.69, SD = 0.70). Levene's test for equality of variances was significant for the physical activity item (F = 5.343, p = 0.021); therefore, we performed an independent sample

t-test with equal variances not assumed in order to investigate differences between boys and girls in physical activity levels. Results suggest that there is no significant difference between the scores for boys (M = 2.76, SD = 0.76) and girls (M = 2.62, SD = 0.63); $t(326) = 1.892$, p = 0.059.

The most common physical activity among boys was walking (M = 3.47, SD = 1.268), followed by running (M = 2.90, SD = 1.413) and skipping (M = 2.67, SD = 1.495). Other popular physical activities for boys were: bicycling (M = 2.24, SD = 1.497), soccer (M = 1.88, SD = 1.288), basketball (M = 1.67, SD = 1.199) and tag (M = 1.61, SD = 1.045). Similarly, for girls, walking (M = 3.48, SD = 1.323) was the favourite type of physical activity, followed by skipping (M = 2.61, SD = 1.419) and running (M = 2.56, SD = 1.341). Other physical activities commonly practised by girls were: dance (M = 2.43, SD = 1.486), tag (M = 1.63, SD = 1.011) and bicycling (M = 1.55, SD = 0.993).

Table 2. Physical activity levels of adolescents

	N	***M*** [a] **± *SD***
Physical activity levels (general)	333	2.69 ± 0.706
Physical activity levels (boys)	172	2.76 ± 0.764
Physical activity levels (girls)	161	2.62 ± 0.632

[a] Mean scores based on a 5-point Likert scale
Source: Authors' own conception

Perceived cues to physical activity

Results (Table 3) show that "parent encouragement" (M = 5.22, SD = 1.854), "participation in physical education classes" (M = 4.98, SD = 2.014), "having friends to exercise with" (M = 4.55, SD = 1.990), "being reminded of the health benefits of physical activity" (M = 4.59, SD = 1.939) and "having organized physical activities outside of school" (M = 4.41, SD = 2.106) are important perceived cues for adolescents' physical activity. Regarding differences between boys and girls, they significantly differ on a few items: girls perceived "seeing spring/summer clothes that they would like to buy", $t(331) = 2.832$, $p < 0.01$, "looking at oneself in the mirror", $t(331) = 4.515$, $p < 0.01$, "seeing pictures of physically fit people", $t(331) = 2.363$, $p = 0.01$, and "watching exercise on TV or the Internet", $t(331) = 3.309$, $p < 0.01$, as more important cues than boys. On the other hand, boys perceived "being reminded of the health benefits of physical activity", $t(331) = 2.350$, $p = 0.01$, as a higher-level cue for physical activity than girls.

Table 3. Perceived cues to physical activity

Cues	***M*** [a] ± ***SD***
Having a parent who encourages me to exercise	5.22 ± 1.854
Taking a physical education class in school	4.98 ± 2.014
Having a friend to exercise with	4.66 ± 1.990
Being reminded of the health benefits of physical activity	4.59 ± 1.939
Having organized physical activities outside of school	4.41 ± 2.106
Looking at myself in the mirror	4.17 ± 2.197
Having a friend who encourages me to exercise	4.13 ± 2.032
Having a parent who exercises	4.12 ± 2.083
Watching exercise on TV or the Internet	3.64 ± 2.102
Seeing spring/summer clothes that I would like to buy	3.34 ± 2.186
Seeing pictures of physically fit people on TV, on the Internet or in magazines	3.20 ± 2.131
Reading about exercise in magazines or on the Internet	3.13 ± 2.020

[a] Mean scores based on a 7-point Likert scale
Source: Authors' own conception

Perceived benefits of physical activity

Table 4 shows perceived benefits of physical activity ordered by impact. The three most likely benefits of physical activity perceived by adolescents in our sample were "to stay in shape" (M = 5.49, SD = 1.616), "to have fun" (M = 5.25, SD = 1.926) and "to increase energy levels" (M = 5.23, SD = 1.658). Other notable benefits were "for cardiovascular fitness" (M = 5.20, SD = 1.908), "to become strong" (M = 5.19, SD = 1.843) and "to improve self-esteem" (M = 4.95, SD = 2.011). Independent sample t-tests for individual items showed that boys perceived the following benefits as more important than girls: "to become strong", $t(331) = 3.884$, $p < 0.01$, "for cardiovascular fitness", $t(331) = 2.248$, $p = 0.02$, "to be competitive", $t(331) = 2.299$, $p = 0.02$, and "to be accepted by friends", $t(324) = 2.730$, $p < 0.01$. For the item "to be accepted by friends", we reported an adjustment under independent sample t-tests with equal variances not assumed, since Levene's test for equality of variances was significant.

Table 4. Perceived benefits of physical activity

Benefits	***M*** [a] ± ***SD***
To stay in shape	5.49 ± 1.616
To have fun	5.25 ± 1.926
To increase my energy level	5.23 ± 1.658

For cardiovascular fitness (to protect my heart)	5.20 ± 1.908
To become strong	5.19 ± 1.843
To improve my self-esteem (feel better about myself)	4.95 ± 2.011
To do something active with other people	4.32 ± 1.996
To reduce stress	4.27 ± 2.116
To become more physically attractive to others	4.08 ± 2.253
To lose weight	4.05 ± 2.360
To be competitive (enjoy competing with others)	3.54 ± 2.280
To be accepted by my friends	2.65 ± 2.059

[a] Mean scores based on a 7-point Likert scale

Source: Authors' own conception

Perceived barriers to physical activity

As shown in Table 5, adolescents reported that the main barriers to physical activity were "wanting to do other things" (M = 4.02, SD = 1.933), "lack of time" (M = 3.83, SD = 1.977), "tiredness" (M = 3.09, SD = 1.903) and "lack of motivation" (M = 2.92, SD = 2.021). An independent sample t-test showed that females were more likely than males to perceive "tiredness", $t(331) = 2.496$, $p = 0.01$, as an obstacle to physical activity. In contrast, boys were more likely than girls to perceive "lack of enjoyment", $t(329) = 2.248$, $p = 0.02$, "lack of interest", $t(329) = 2.144$, $p = 0.03$, "lack of skills", $t(319) = 3.463$, $p < 0.01$, and "low perceived importance of physical activity", $t(315) = 3.754$, $p < 0.01$, as significant barriers to exercise. For these last items, Levene's test for equality of variances was significant, therefore we reported results under independent sample t-tests with equal variances not assumed.

Table 5. Perceived barriers to physical activity

Barriers	$M^a \pm SD$
I want to do other things with my time	4.02 ±1.933
I do not have time to exercise	3.83 ± 1.977
I am too tired	3.09 ± 1.903
I am not motivated to exercise	2.92 ± 2.021
I do not have a place to go and exercise	2.74 ± 1.996
I do not enjoy exercising	2.53 ± 1.975
I do not have a safe environment in which to exercise	2.47 ± 1.972
I am not interested in exercising	2.44 ± 1.942
I do not think that exercise will give me the results that I want	2.32 ± 1.893
I do not know how to exercise	2.26 ± 1.788
I think that exercise is too hard	2.13 ± 1.567
I do not think exercise is important	2.11 ± 1.921

[a] Mean scores based on a 7-point Likert scale

Source: Authors' own conception

Discussion

This study investigated physical activity levels, perceived cues, benefits and barriers to physical activity in a sample of adolescents (mean age = 12.93, *SD* = 1.20) from Cluj-Napoca, Romania, during the COVID-19 pandemic. Most of the participants were healthy during the study (89.2%) and reported that they regularly participated in physical education classes (94.6%). However, only 8.1% reported that they were school-based sports team members, and 40.2% were members of an outside-of-school sports team (40.2%).

Even if most parents encouraged their children to exercise (94.9%), a high percentage of parents (42.0%) were not physically active themselves. According to Yao and Rhodes (2015), parental support through encouragement is moderately associated with child and adolescent physical activity; furthermore, even though specific parent behaviours like praising, watching the child participate in physical activity, engaging in physical activity with children, transporting the child to places where they can be active and providing equipment, all have small effect sizes (r = 0.14-0.28), and overall, parental support seems to have a moderate effect size. Parental modelling has a significant role in building a social norm concerning physical activity, especially during preadolescent years, but as the child matures, peer influence becomes more relevant (Gustafson & Rhodes, 2006). In regard to gender, it seems that father-son physical activity is positively associated, which should be considered when targeting boys' physical activity (Yao & Rhodes, 2015). Overall, these results suggest that parents need to support adolescents to exercise primarily through encouragement but also through other specific behaviour and modelling.

Our sample had a mean level of physical activity of 2.76 (*SD* = 0.76) for boys and 2.62 (*SD* = 0.63) for girls. According to the PAQ-C Manual, most studies that used the same instrument reported mean physical activity levels ranging between 2.56 and 3.16 for females and 2.85 and 3.44 for males (Kowalski et al., 2004). However, the authors used varied study conditions; therefore, differences in culture, climate, age or time of the year could be variables that might influence the results, making them difficult to interpret. In a study that took place in a nearby region of Romania (Bihor county), adolescents from urban areas aged between 11 and 14 years averaged a mean score of physical activity of 2.89 (*SD* = 0.69) (Lukács & Hanțiu, 2018).

The most common ways of being active for both boys and girls were walking, running and skipping. This was not surprising considering the restrictions and recommendations to avoid the use of equipment such as balls and to maintain social distancing. On the other hand, sports that are

traditionally practised in Romania, such as gymnastics, handball and oina, were among the least popular for adolescents in our sample. This is worrying because Romanian sports performance has been declining lately, especially in cases where this country once had a tradition of excellence. We believe the lack of coherence and consistency in policies supporting sports performance in Romania is responsible for these results. There is currently a no long-term strategy to establish the country's high-performance sports priorities, the steps needed to achieve superior results and the specific means required to achieve this goal.

This study also investigated perceived cues, benefits and barriers to physical activity. As argued previously, it seems that parent encouragement is a more prevalent cue than having a physically active parent. Besides "parent encouragement", the following cues were of high importance in our sample: "taking a physical education class in school", "being reminded of the health benefits of physical activity" and "having organized physical activities outside of school". Firstly, based on these results, we can suppose that physical education classes could promote an active lifestyle not only directly but indirectly as well, offering a cue to exercise. Second, organizing physical activities outside of the school schedule could further contribute to children's physical activity levels, which means once again that practitioners in this field have an essential role in promoting movement. Third, except for a few TV and radio spots and other isolated initiatives, there is currently no major national campaign to promote physical activity. Given the initiative of the World Health Organization (2018) to reduce the level of physical inactivity in the period 2018-2030, such campaigns need to be considered high priority. To be effective, they should use the communication channels of the target audience but also specific strategies according to the needs and particularities of the different targeted categories.

Most after-school sports programmes are organized around sports performance, which is predominantly competitive. However, "to be competitive" was not a considerably perceived benefit of physical activity in our sample. It seems that it is more important for adolescents "to stay in shape", "to have fun", "to increase energy levels" or "to improve cardiovascular fitness". The results suggest that physical activity programmes should be organized so as to primarily meet the needs of these children.

The most common barriers to physical activity in our study were: "wanting to do other things", "lack of time", "tiredness" and "lack of motivation". These findings are consistent with other studies that have investigated children's barriers to physical activity. Other considerable perceived obstacles were "having no place to exercise" and "having no safe

environment". The occurrence of these obstacles is most likely related to the COVID-19 pandemic. The closure of the activity of most sports facilities and clubs limited the possibilities to practise physical activities. Moreover, public health specialists recommended avoiding most sports activities to prevent infection with the SARS-CoV-2 virus.

Our study has several limitations. First, the sample consisted of children aged 11 to 15 years from an urban area. Therefore, we can extrapolate these results to children of these ages. Also, we used a convenience sample consisting of students from two schools in Cluj-Napoca. Future studies should use stratified sampling and include children of multiple ages. Second, the use of questionnaires in measuring physical activity levels is subject to errors, especially when a detailed interpretation of exercise intensity, dosage or the extent of resulting health benefits is of interest (Shephard, 2003). Further research should use both questionnaires and objective methods such as pedometers, accelerometers or global positioning units (GPS) to assess physical activity levels. Third, we used a descriptive, cross-sectional design. Subsequent research could use more complex study designs that establish relationships between variables.

Conclusion

In summary, this was the first study to assess the physical activity levels of adolescents from Cluj-Napoca during the COVID-19 pandemic and their perceived cues, benefits and barriers to exercise. Given the low levels of adolescent physical activity, regulators should create action plans on physical activities and sedentary behaviours. Similarly, qualitative physical activity programmes should be designed and promoted, and parents should provide support taking into account the cues, benefits and barriers to physical activity to create more active adolescents.

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