

The impact of the COVID-19 pandemic on swimmers in Poland

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Abstract

Study aim: To assess the impact of the COVID-19 pandemic on health, lifestyle, training loads and competition starts of swimmers in Poland in 2020.

Material and methods: The study was conducted in the form of a questionnaire on group of 123 Polish swimmers in 2020. The survey asked about differences in training, lifestyle and well-being following the introduction of pandemic restrictions. The mean age of the athletes was 23 years $\pm$ 7.6 and training experience 10 years $\pm$ 5.3.

Results: The majority of swimmers (81%) were satisfied with their health status. Respondents did not experience changes in sleep quality and length during the COVID-19 pandemic. A large proportion of respondents (83%) did not follow a special diet, while they were willing to use supplementation (58.5%). Respondents stated that the pandemic did not affect their physical activity outside of training. The athletes evaluated negatively the changes in training and competition conditions caused by the pandemic ($p < 0.0001$).

Conclusions: The study showed that the COVID-19 pandemic did not have a major impact on the health, sleep and physical activity of swimmers in Poland in 2020, while it had a negative impact in terms of training conditions and sport competition.

Key words: SARS-CoV-2 virus – Swimming – Physical activity – Sports competition – Lifestyle

Introduction

The development of the COVID-19 pandemic has affected all areas of life, including sport [34]. The most important sport event, the Olympic Games in Tokyo, have been postponed. The pervasive fear caused a large number of countries to opt for a so-called ‘lockdown’, with negative consequences for all sports [7, 24]. The athletes were not allowed to use sports facilities and were left only with individual training. Professional sport and competition involved continuous testing for the SARS-CoV-2 virus. Special safety precautions were taken during competition; athletes were ordered to wear masks to the moment of start [21].

The European Parliament resolution of 10 February 2021 on the impact of COVID-19 on youth and on sport stressed that “the COVID-19 pandemic is having devastating consequences on the entire sports sector at all levels, especially on sporting organisations and clubs, leagues, gyms and fitness centres, athletes, coaches, staff, and sport-related business, including sports event organisers and sports media; considers that the road to recovery will

be challenging and underlines the need for targeted relief measures” [10]. The devastating effect of COVID-19 pandemic on various aspects of sport and athletes at all levels and types of sport was also observed outside of Europe – in Australia [9], Japan [18], USA [19], Brazil [13], South Africa [25], Turkey [29] and other countries [14]. Haan et al. [14] analyzed both physical and mental effects of the COVID-19 pandemic and the imposed restrictions and regulations on athletes in soccer, hockey, rugby, cricket, athletics, netball, basketball, handball, endurance running, cycling, track and field, swimming, squash, golf, tennis and karate.

In Poland, sports facilities were closed from 20th of March 2020, with the shutdown of swimming pools lasting until 6th of June 2020. The opening of the swimming pools took place under sanitary restrictions such as number of person limits and mandatory covering mouth and nose with a mask. The following months brought a gradual rise in number of people allowed at the facilities until the so-called “second wave” caused the facilities to close again on 17th of October 2020. Despite the subsequent obstacle to athletes, most were able to continue training at the swimming pool. The government’s restrictions did not

include national team athletes, resulting in tens of thousands of athletes being called up to the national swimming team. The condition for the appointment to the national team was just the registration of the athlete by the club and a valid licence from the Polish Swimming Federation [17].

The International Society of Sports Psychology has issued a statement that the postponement of the Olympic and Paralympic Games may result in a major career break and potentially evolving in a loss of identity, motivation and desire to continue training. Additionally, the stress of a pandemic can cause sleep and appetite disturbances [28]. It was also found that athletes had an increased incidence of anxiety during isolation. According to some studies, this problem affected as many as 52% of athletes [25]. Studies have shown that people who had a greater decrease in physical activity complained about their well-being [27]. The growing uncertainty among athletes, made a large proportion of them vulnerable to a deterioration in their well-being [2].

Therefore, the identification of areas influenced by the period of lockdown in swimming may help sport professionals and athletes to monitor health, sleep, nutrition, training loads and injuries upon return to sport and pre-lockdown habits and routines. Such data may reveal potential deficits regarding sport preparation and help to develop and implement evidence-based programs and guidelines for safe return of swimmers to sport and competitions. Thus, the aim of the study was to assess the impact of the COVID-19 pandemic on health, lifestyle, training

loads and competition starts of athletes training swimming in Poland in 2020.

Material and methods

A total of 145 swimmers participated in the study. The inclusion criteria was training swimming in 2020. The exclusion criterion was complete lack of training after the declaration of the pandemic state in Poland. After analyzing the responses, 123 respondents met the inclusion criteria (59 females, 64 males). The study was conducted in compliance with Declaration of Helsinki. Due to the non-invasive nature of the study through surveys, this type of data collection did not require institutional ethical approval from the Ethics Committee of the Jozef Pilsudski University of Physical Education, Warsaw. Nevertheless, the participants were assured their data was confidential and anonymised during data analyses.

The general characteristic of the study participants is presented in table 1.

The survey was conducted between 1.03.2021 and 6.04.2021 among athletes who trained swimming in 2020. The survey was distributed among the athletes in the form of a link to a Google form. The respondents were asked to answer 53 questions. The first set of questions covered data such as gender, age, body weight, education, sports class and training experience. The second part of the survey contained questions about health, sleep and diet. The next aspect examined in the questionnaire was physical

Table 1. Characteristics of the analyzed Polish swimmers ($\bar{x} \pm SD$)

Parameter		All (n = 123)	Women (n = 59)	Men (n = 64)
Age [yr]		22.7 ± 7.6	21.6 ± 6.9	23.7 ± 8.2
Body height [cm]		175.4 ± 10.1	167.8 ± 6.8	182.4 ± 7.1
Body weight [kg]		70.9 ± 15.7	61.9 ± 8.3	79.1 ± 16.5
Education [number of people]	Basic	26	14	12
	Secondary	60	28	32
	Higher	37	17	20
Sport class [number of people]	Lack	60	32	28
	Master class	10	3	7
	International master class	1	1	
	Class I	24	8	16
	Class II	21	12	9
	Class III	7	3	4
Training experience [yr]		9.6 ± 5.3	8.7 ± 4.6	10.4 ± 5.7

activity outside training and its changes due to the COVID-19 pandemic. The following part of the questionnaire included questions about changes in training and competitions. The final set of questions included issues about the athletes' knowledge of the COVID-19 pandemic threat and infection prevention.

Participants were asked to complete a questionnaire consisting of 53 questions (appendix 1). The survey was anonymous. The form was sent out electronically.

The questionnaire included questions on the following areas:

1. Health
2. Sleep
3. Diet
4. Physical activity
5. Training
6. The impact of the COVID-19 pandemic on changes in training conditions
7. Participation in competitions
8. Knowledge of SARS-CoV-2 virus

Statistical analysis

Statistical analysis was performed using SPSS Statistics 27.0. Mean values ($\bar{x}$) and standard deviation (SD) were calculated for the data. Some of the data were presented as percentages. In addition, the chi-square test of concordance was used to examine whether there was a significant difference between the observed and expected values, tested at 5% level of significance. The chi-square test of independence was used to examine the relationship between the gender of the participants and the responses to the questions

on health, lifestyle, training and competition participation. Statistical significance was set at an alpha level of $p \leq 0.05$.

Results

Respondents were asked to rate their health on a 5-grade scale. On a scale from 1 to 5 (1 meant very bad and 5 meant very good health) most answers were in the range 4–5 (80.3% of respondents). Individuals in the study group significantly more often rated their health status as good and very good than expected ($p < 0.05$). The analysis of data by gender of respondents did not show any statistically significant correlation between gender and questions related to the assessment of health status.

Only 20.3% of respondents answered that the COVID-19 pandemic had negatively affected their health, and 79.7% did not notice any changes in their health. Respondents who felt that their health had deteriorated mainly indicated a decline in performance, mental health and greater exposure to injury (figure 1).

The results regarding sleep are presented in table 2. Analysis of the data in terms of the gender of the respondents showed no significant relationship between gender and sleep-related responses. Participants were significantly more likely to respond that their sleep was not changed during the COVID-19 pandemic and indicated a medium level of sleep satisfaction ($p < 0.05$). The average sleep duration was 7.2 ± 1 hours.

A special diet before the pandemic period was followed by 17% of the respondents. The others did not pay

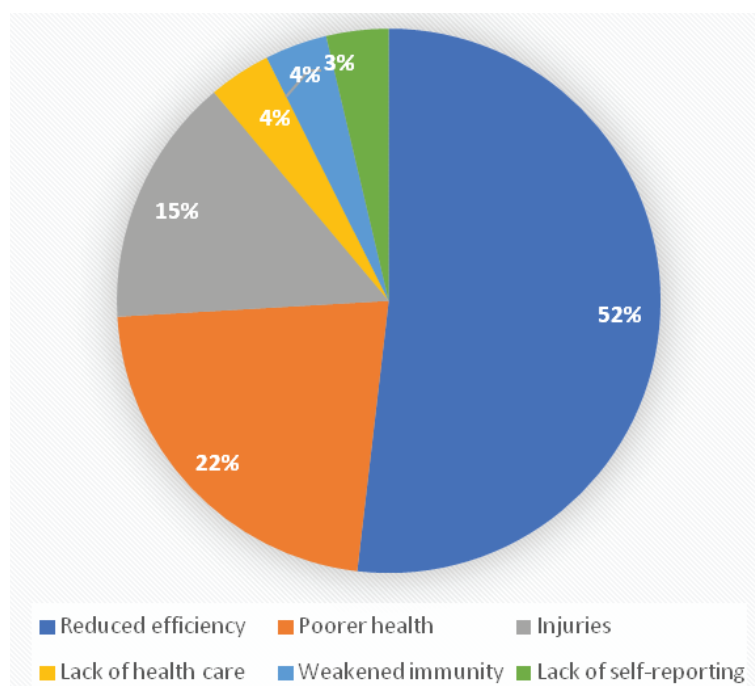


Figure 1. Reasons for deterioration in health among Polish swimmers

Table 2. Swimmers responses (frequencies) to sleep during the COVID-19 pandemic

Swimmers		All (n = 123)	Women (n = 59)	Men (n = 64)
Changes in sleep	Sleep prolongation	39	16	23
	Shortening of sleep	18	10	8
	No changes	66	33	33
Satisfaction with the number of hours of sleep	Very low	8		
	Low	25		
	Medium	53		
	High	28		
	Very high	9		

Table 3. Physical activity outside training of the athletes training swimming ($\bar{x} \pm SD$)

Physical activity		All (n = 123)	Women (n = 59)	Men (n = 64)
Outdoors	Frequency [times/week]	3.2 $\pm$ 1.8	3.2 $\pm$ 1.8	3.3 $\pm$ 1.9
	Duration [min]	71.4 $\pm$ 34.2	67.7 $\pm$ 28.5	74.6 $\pm$ 38.9
Indoor	Frequency [times/week]	3.0 $\pm$ 2.2	3.3 $\pm$ 1.7	2.8 $\pm$ 2.5
	Duration [min]	51.6 $\pm$ 34.7	57.0 $\pm$ 31.0	47.2 $\pm$ 37.3

Table 4. Data on time and number of activities during the week ($\bar{x} \pm SD$)

Workout		Swimming workout	Strength workout	Endurance workout	Speed workout
Number of training units	All (n = 123)	6.3 $\pm$ 3.4	2.4 $\pm$ 1.4	3.2 $\pm$ 2.4	2.4 $\pm$ 2.4
	Men (n = 64)	6.3 $\pm$ 3.5	2.6 $\pm$ 1.5	3.0 $\pm$ 2.5	2.6 $\pm$ 2.6
	Women (n = 59)	6.3 $\pm$ 3.3	2.1 $\pm$ 1.2	3.4 $\pm$ 2.3	2.1 $\pm$ 2.1
Time of training units [min]	All (n = 123)	92.3 $\pm$ 31.1	56.5 $\pm$ 28.9	65.0 $\pm$ 38.0	53.9 $\pm$ 53.9
	Men (n = 64)	88.8 $\pm$ 30.8	59.2 $\pm$ 28.5	65.7 $\pm$ 41.3	56.6 $\pm$ 42.0
	Women (n = 59)	96.0 $\pm$ 31.3	53.5 $\pm$ 29.3	64.1 $\pm$ 34.4	50.9 $\pm$ 38.9

much attention to the diet. Most often, the athletes did so for weight reduction and to improve athletic performance. More than half of the respondents (52.5%) changed their diet during the pandemic. Among women, 59% perceived changes in their diet and among men, 45% of those surveyed. Supplementation was used by 58.5% of the respondents, mainly to improve athletic performance and to supplement vitamin deficiencies, and the most frequently swimmers reached for vitamins, creatine and protein. The analysis of the data in terms of the gender of the respondents did not show any significant correlation between gender and the answers related to diet or supplementation.

In the study group, 61.8% of people declared undertaking physical activity in their free time (table 3). Swimmers were significantly more likely to undertake physical

activity outside training than expected ($p < 0.05$). More than half (61%) of the women was engaged in outdoor activities in their free time. Among male respondents, 62.5% were active outside of training. Analysis of the data by gender of the respondents showed no significant relationship between gender and responses related to undertaking physical activity.

Details of the answers about respondents' training are shown in table 4. Analysis of the data by gender of the respondents showed no significant relationship between gender and training responses.

81 athletes responded that the COVID-19 pandemic affected the number of workouts (figure 2). It was stated significantly more often than expected ($p < 0.05$). More than half of the respondents (55%) indicated a decrease in the

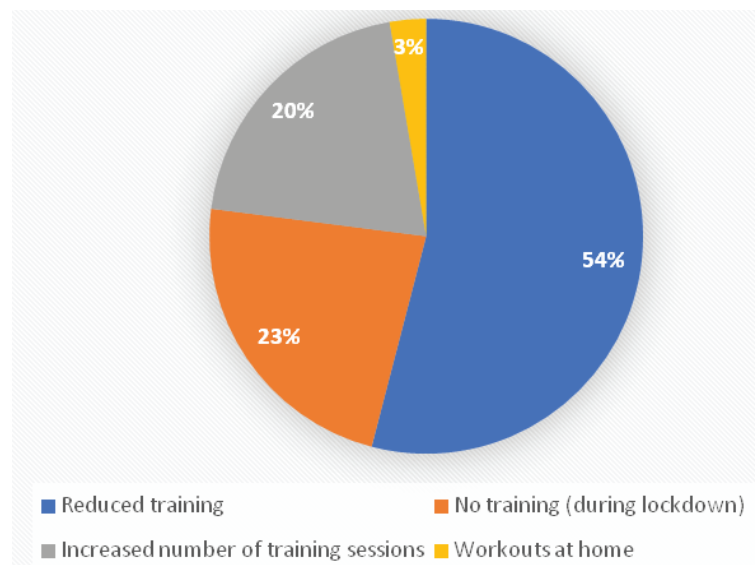


Figure 2. The impact of the COVID-19 pandemic on swimming training

number of kilometres swum during training in 2020, significantly more often than expected ($p < 0.05$). A deterioration of training conditions was indicated by 60% of the respondents, 20% reported no change and 20% responded that training conditions had improved.

Out of 123 respondents, 64 people took part in sports competitions in 2020. Most frequently the respondents declared competing in 1–4 competitions in the traditional formula in 2020. 18 athletes took part in correspondence competitions. All of them competed in sport events without public participation. The respondents were also asked to evaluate the competition in the correspondence formula and without the participation of the public. Most of the respondents (56%) had a negative opinion about such forms of competition, 33% had presented a positive feedback.

The next question concerned the opinion of the athletes as to when the pre-pandemic sports competition will return. Most respondents were presenting the opinion that competition would return after 10–16 months (30%), more than 16 months (26%) and 6–10 months (25%).

Discussion

The research conducted allowed us to assess the impact of the COVID-19 pandemic on Polish athletes swimming training in 2020. The results showed how presence of virus and pandemic threat affected health, lifestyle, training conditions and competition starts.

The surveyed swimmers assessed their health as rather good. Similar were the responses regarding the assessment of the deterioration of health by the COVID-19 pandemic. Almost 80% of the respondents indicated that their health did not changed for worse. Those who indicated that their

health had deteriorated mostly perceived a decrease in performance, and 1/4 of the athletes complained about their mental health. The reasons for health deterioration in our study overlapped to a large extent with a study of athletes from South Africa [25]. Polish swimming athletes similarly to South African respondents were affected by decreased well-being, performance and negative health outcomes. The reduction in psychological well-being indicated by the Polish respondents may result in a major impact on premature termination of sport careers. A study on athletes training in the National Collegiate Athletic Association [12] showed that those who had difficult social contact and did not receive adequate support during pandemic were more prone to become depressed and end their sporting careers.

Almost 1/3 of the study participants reported an increase in sleep during the pandemic. The length of sleep on average satisfied respondents. Pillay et al. [25] showed that 79% of participants experienced changes in their biological clock in terms of sleeping hours and found sleep insufficient. In a study by Stanton et al. [31] 40.7% of participants complained about their sleep. Changes associated with unsatisfactory sleep meant that many more people had depressive states, anxiety and malaise. The Netherlands Sleep Registry undertook an assessment of how the COVID-19 pandemic affected the sleep of people who already had related disorders [20]. They found that one-fifth of the subjects who slept well before the pandemic lost its regularity, which was associated with a decline in well-being [30]. They showed that the stress of losing health, work and other important elements of life caused many people to complain of sleep disturbances [30]. Objective measurements were also made of the effects of pandemic COVID-19 on the sleep of swimmers [8]. Study

participants wore activity monitors to record their activity over a 2-week period in 2020. From the data collected, the subjects slept on average 27 min longer and got up 38 min later.

The majority of athletes in our study (82.9%) did not follow any diet and did not pay special attention to the food they consumed. The reason for these responses may be rather low competitive level of the swimmers (most athletes without a sports class). The athletes who paid attention to their food intake did so, mainly because they wanted to lose weight and improve their athletic performance. Half of the athletes did not perceive dietary changes during the pandemic. In a study by Pillay et al. [25] more than half of the athletes (53%) found their diet worsened during the pandemic. The athletes felt that their diet was degraded mainly by excessive consumption of carbohydrates (76% of those surveyed) and fizzy drinks (36%). A significant number felt that they consumed too much processed food (20%) and 34% hydrated poorly. One in ten participants had fallen into alcoholism. In the study by Stanton et al. [31] this was as high as 26.6%. Ammar et al. [1] surveyed adult Australians for dietary changes caused by the COVID-19 pandemic. In most cases, the quality of meals consumed deteriorated significantly. Mattioli et al. [23] assessed the impact of quarantine on lifestyle, including nutrition. The results of the study were similar to those in previous publications, but in this particular survey it was found that the biggest change in diet was the underconsumption of fruit and vegetables in the daily diet.

Despite of the lack of special diet, athletes in our study were willing to use supplementation (58.5% of respondents), most often due to the desire to improve sport performance. The researchers highlight the positive effects of creatine, beetroot juice and beta alanine on athletes training for swimming. Among the respondents in our study, the most popular dietary supplements were vitamins, creatine and protein. A similar study among South African athletes found that only 32% supplemented their diet with supplementation. African athletes most commonly used a multivitamin and vitamin C (36% each), while 15% used protein [25]. The study by Grant et al. [11] showed that basketball and baseball athletes during the COVID-19 pandemic regularly used vitamins (87% of participants). In the study by Szewczyk and Poniewierka [32] it has been shown that 86% of athletes use creatine as a supplement, mainly to improve performance and speed up recovery after training.

The athletes in our study were keen to undertake physical activity outside of leisure time training. In a study by Pillay et al. [25] 75% of the athletes indicated that the pandemic caused them to decrease the intensity and frequency of their exercise. Of the whole respondents, 36% indicated that they undertook high-intensity physical activity despite the isolation, and 39% did physical activity lasting

between 45–60 min. In our study, respondents exercised for longer (on average 71 min). Stanton et al. [31] conducted a study in which 48.9% of people were not satisfied with their physical activity during pandemic. The decrease in physical activity in the study by Curtis et al. [8] was 50 min per week in February 2020 and April 2020. The vast majority of participants decreased physical activity in the swimming pool and in sports that require more participation, while cycling time increased. In Spain, a study was conducted on 3800 adults aged 18–64 years [4]. In the questionnaire, respondents stated that their physical activity had decreased by 16.8% and time spent walking by 58.2%. The rate of those who exercised at least 75 min per week decreased by 10.7%. Martinez-Ferran et al. [22] showed that even a short period of limited physical activity combined with a caloric surplus can cause a tendency to weight gain, development of diabetes and abdominal obesity. This lifestyle may further contribute to the severe course of SARS-CoV-2 infection and numerous complications [26]. It was shown in international study on 1047 participants from Asia, Africa and Europe [1] that there was a decrease in physical activity associated with the COVID-19 pandemic in an overwhelming number of respondents. On average, daily sitting time increased from 5 to 8 hours. Another survey of 1,021 adults was conducted in the United Arab Emirates about lifestyle changes during the COVID-19 pandemic [6]. 38.5% stopped physical activity at all and 36.2% used electronics for 5 or more hours a day. In a study on 12526 athletes from 142 countries [33] it was found that professional athletes started to cope with training disadvantages better than amateur athletes. The reason for these might have been greater knowledge of the athletes and their longer training habits.

More than half (65.9%) of the athletes in our study felt that the COVID-19 pandemic had affected the amount of training, with 76% of athletes complaining about a lack or reduction in training. The reduction in training meant that more than half of the respondents perceived a decrease in the number of kilometres swum during training and described themselves as not satisfied with their training during the pandemic. Haddad et al. [15] showed that swimmers in many countries found it difficult to train regularly. The researchers indicated that there was great number of athletes during the COVID-19 pandemic who were training at home.

Despite the pandemic, some of the sporting competitions in 2020 were held in a traditional way and more than half of the athletes took part in sporting competition. Only 33% of the respondents evaluated the correspondence and non-spectator competition in a positive way. Hagen et al. [16] and Carmody et al. [3] conducted a study which showed that athletes during the COVID-19 pandemic experienced a reduction in the number of starts during the season. The researchers recognised that it was not just the

virus that was the cause of fewer competitions. Of great importance, especially at the international level, were the regulations introduced in individual countries. In our study, only 17% of the respondents indicated that sporting competition had already returned to its pre-pandemic state. The survey by Pillay et al. [25] was conducted one year prior to our study. When asked when they thought they would return to pre-pandemic training 50% of the athletes responded that they were unsure when sport would return to normal. Despite the uncertainty, when asked if athletes would feel comfortable if they were to return to training during the pandemic, 50% said they would feel confident. When swimmers who were uncertain about training were asked what would make them feel more confident, the most popular answer was special prevention. South African athletes would have no problem competing behind closed doors. 82% of respondents were in favour of this form of competition. In our own research, only 33% of respondents were positive about this form of competition.

The analysis of the data in terms of the gender of the respondents did not show any significant correlations between gender and the answers related to health status, lifestyle, training and competitions. This may indicate that the situation of women and men practising swimming in Poland during the COVID-19 pandemic was similar in terms of the analysed factors. Pillay et al. [25] obtained similar results. The Central Statistics Office data [5] showed that women during the COVID-19 pandemic were significantly more likely to experience low life satisfaction (36.7%), worry about their health and be prone to negative dietary changes. One in five men experienced decreased well-being as a result of the COVID-19 pandemic.

Limitations

Survey in an electronic form may be found unreliable due to the lack of control on the respondents. Respondents presented varied sporting levels, which may cause differences in answers. Future surveys should be carried out on more unified groups of athletes.

Conclusions

COVID-19 pandemic did not affect the health, sleep, diet and physical activity ratings of the majority for swim trainees studied. However, COVID-19 pandemic caused deterioration of training conditions affecting the number of training units and kilometres swum. Sports competition during the COVID-19 pandemic were evaluated negatively by the athletes. Lost opportunities to compete and uncertain training conditions may have long-lasting effects on both athletes and the sports industry.

Conflict of interest: Authors state no conflict of interest.

References

1. Ammar A., Brach M., Trabelsi K., Chtourou H., Boukhris O., Masmoudi L., Bouaziz B., Bentlage E., How D., Ahmed M., et al. (2020) Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. *Nutrients*, 12(6): 1583. DOI: 10.3390/nu12061583.
2. Ammar A., Trabelsi K., Brach M., Chtourou H., Boukhris O., Masmoudi L., Bouaziz B., Bentlage E., How D., Ahmed M., et al. (2021) Effects of home confinement on mental health and lifestyle behaviours during the COVID-19 outbreak: insights from the ECLB-COVID19 multicentre study. *Biol. Sport*, 38(1): 9-21. DOI: 10.5114/biolsport.2020.96857.
3. Carmody S., Murray A., Borodina M., Gouttebarge V., Massey A. (2020) When can professional sport recommence safely during the COVID-19 pandemic? Risk assessment and factors to consider. *Br. J. Sports Med.*, 54(16): 946-948. DOI: 10.1136/bjsports-2020-102539.
4. Castañeda-Babarro A., Arbillaga-Etxarri A., Gutiérrez-Santamaría B., Coca A. (2020) Physical Activity Change during COVID-19 Confinement. *Int. J. Environ. Res. Public Health*, 17(18): 6878. DOI: 10.3390/ijerph17186878.
5. Central Statistics Office. (2020) Social Impact of COVID-19 on Women and Men, <https://www.cso.ie/en/statistics/socialconditions/socialimpactofcovid-19onwomennandmen/>. [date of access 18.11.2021]
6. Cheikh Ismail L., Osaili T.M., Mohamad M.N., Al Marzouqi A., Jarrar A.H., Abu Jamous D.O., Magriplis E., Ali H.I., Al Sabbah H., Hasan H., et al. (2020) Eating Habits and Lifestyle during COVID-19 Lockdown in the United Arab Emirates: A Cross-Sectional Study. *Nutrients*, 12(11): 3314. DOI: 10.3390/nu12113314.
7. Constandt B., Thibaut E., De Bosscher V., Scheerder J., Ricour M., Willem A. (2020) Exercising in Times of Lockdown: An Analysis of the Impact of COVID-19 on Levels and Patterns of Exercise among Adults in Belgium. *Int. J. Environ. Res. Public Health*, 17(11): 4144. DOI: 10.3390/ijerph17114144.
8. Curtis R.G., Olds T., Ferguson T., Frayssé F., Dumuid D., Esterman A., Hendrie G.A., Brown W.J., Lagiseti R., Maher C.A. (2021) Changes in diet, activity, weight, and wellbeing of parents during COVID-19 lockdown. *PloS One*, 16(3): e0248008. DOI: 10.1371/journal.pone.0248008.
9. Eime R., Harvey J., Charity M., Pankowiak A., Westerbeek H. (2022) The impact of COVID-19 restrictions on Australians' frequency and duration of participation in different types of sport and physical activity. *BMC Sports Sci. Med. Rehabil.*, 14(1): 42. DOI: 10.1186/s13102-022-00435-z.

10. European Parliament. (2021) Resolution of 10 February 2021 on the impact of COVID-19 on youth and on sport (2020/2864(RSP) https://www.europarl.europa.eu/doceo/document/TA-9-2021-0045_EN.pdf. [date of access 30.03.2022]
11. Grant W.B., Lahore H., Rockwell M.S. (2020) The Benefits of Vitamin D Supplementation for Athletes: Better Performance and Reduced Risk of COVID-19. *Nutrients*, 12(12): 3741. DOI: 10.3390/nu12123741.
12. Graupensperger S., Benson A.J., Kilmer J.R., Evans M.B. (2020) Social (Un)distancing: Teammate Interactions, Athletic Identity, and Mental Health of Student-Athletes During the COVID-19 Pandemic. *J. Adolesc. Health*, 67(5): 662-670. DOI: 10.1016/j.jadohealth.2020.08.001.
13. Grazioli R., Loturco I., Baroni B.M., Oliveira G.S., Saciura V., Vanoni E., Vanoni E., Dias R., Veeck F., Pinto R.S., Cadore E.L. (2020) Coronavirus disease-19 quarantine is more detrimental than traditional off-season on physical conditioning of professional soccer players. *J. Strength Cond. Res.*, 34: 3316-3320. DOI: 10.1519/JSC.0000000000003890.
14. Haan R., Ali Alblooshi M.E., Syed D.H., Dougman K.K., Al Tunaiji H., Campos L.A., Baltatu O.C. (2021) Health and Well-Being of Athletes During the Coronavirus Pandemic: A Scoping Review. *Front. Public Health*, 9: 641392. DOI: 10.3389/fpubh.2021.641392.
15. Haddad M., Abbes Z., Mujika I., Chamari K. (2021) Impact of COVID-19 on Swimming Training: Practical Recommendations during Home Confinement/Isolation. *Int. J. Environ. Res. Public Health*, 18(9): 4767. DOI: 10.3390/ijerph18094767.
16. Hagen J., Stone J.D., Hornsby W.G., Stephenson M., Mangine R., Joseph M., Galster S. (2020) COVID-19 Surveillance and Competition in Sport: Utilizing Sport Science to Protect Athletes and Staff during and after the Pandemic. *J. Funct. Morphol. Kinesiol.*, 5: 69. DOI: 10.3390/jfmk5030069.
17. https://www.polswim.pl/sites/default/files/kalendarz_rok_2020_.pdf. [date of access 18.11.2021]
18. Ilevbare S.I., McPherson G. (2022) Understanding COVID-19: A Hybrid Threat and Its Impact on Sport Mega-Events. A Focus on Japan and the Tokyo 2020 Olympic Games. *Front. Sports Act. Living*, 4: 720591. DOI: 10.3389/fspor.2022.720591.
19. Jagim A.R., Luedke J., Fitzpatrick A., Winkelman G., Erickson J.L., Askow A.T., Camic C.L. (2020) The Impact of COVID-19-Related Shutdown Measures on the Training Habits and Perceptions of Athletes in the United States: A Brief Research Report. *Front. Sports Act. Living*, 2: 623068. DOI: 10.3389/fspor.2020.623068.
20. Kocavska D., Blanken T. F., Van Someren E., Rösler L. (2020) Sleep quality during the COVID-19 pandemic: not one size fits all. *Sleep Med.*, 76: 86-88. DOI: 10.1016/j.sleep.2020.09.029.
21. Marotta N., DE Sire A., Gimigliano A., Demeco A., Moggio L., Vescio A., Iona T., Ammendolia A. (2021) Impact of COVID-19 lockdown on the epidemiology of soccer muscle injuries in Italian Serie A professional football players. *J. Sports Med. Phys. Fitness*, DOI: 10.23736/S0022-4707.21.12903-2.
22. Martinez-Ferran M., de la Guía-Galipienso F., Sanchis-Gomar F., Pareja-Galeano H. (2020) Metabolic Impacts of Confinement during the COVID-19 Pandemic Due to Modified Diet and Physical Activity Habits. *Nutrients*, 12(6): 1549. DOI: 10.3390/nu12061549.
23. Mattioli A.V., Sciomer S., Cocchi C., Maffei S., Gallina S. (2020) Quarantine during COVID-19 outbreak: Changes in diet and physical activity increase the risk of cardiovascular disease. *Nutr. Metab. Cardiovasc. Dis.*, 30(9): 1409-1417. DOI: 10.1016/j.numecd.2020.05.020.
24. Pietrobelli A., Pecoraro L., Ferruzzi A., Heo M., Faith M., Zoller T., Antoniazzi F., Piacentini G., Fearnbach S.N., Heymsfield S.B. (2020) Effects of COVID-19 Lockdown on Lifestyle Behaviors in Children with Obesity Living in Verona, Italy: A Longitudinal Study. *Obesity*, 28(8): 1382-1385. DOI: 10.1002/oby.22861.
25. Pillay L., Janse van Rensburg D., Jansen van Rensburg A., Ramagole D.A., Holtzhausen L., Dijkstra H.P., Cronje T. (2020) Nowhere to hide: The significant impact of coronavirus disease 2019 (COVID-19) measures on elite and semi-elite South African athletes. *J. Sci. Med. Sport*, 23(7): 670-679. DOI: 10.1016/j.jsams.2020.05.016.
26. Pollard C.A., Morran M.P., Nestor-Kalinoski A.L. (2020) The COVID-19 pandemic: a global health crisis. *Physiol. Genomics*, 52(11): 549-557. DOI: 10.1152/physiolgenomics.00089.2020.
27. Ruiz M.C., Devonport T.J., Chen-Wilson C.J., Nicholls W., Cagas J.Y., Fernandez-Montalvo J., Choi Y., Robazza C. (2021) A Cross-Cultural Exploratory Study of Health Behaviors and Wellbeing During COVID-19. *Front. Psychol.*, 11: 608216. DOI: 10.3389/fpsyg.2020.608216.
28. Samuel R.D., Tenenbaum G., Galily Y. (2020) The 2020 Coronavirus Pandemic as a Change-Event in Sport Performers' Careers: Conceptual and Applied Practice Considerations. *Front. Psychol.*, 11: 567966. DOI: 10.3389/fpsyg.2020.567966.
29. Senişik S., Denerel N., Köyagasioglu O., Tunç S. (2020) The effect of isolation on athletes' mental health during the COVID-19 pandemic. *Phys. Sportsmed.*, 1: 1-7. DOI: 10.1080/00913847.2020.1807297.
30. Silva E., Ono B., Souza J.C. (2020) Sleep and immunity in times of COVID-19. *Rev. Assoc. Med. Bras.*, 66(Suppl 2): 143-147. DOI: /10.1590/1806-9282.66.S2.143.
31. Stanton R., To Q.G., Khalesi S., Williams S.L., Alley S.J., Thwaite T.L., Fenning A.S., Vandelanotte C. (2020) Depression, Anxiety and Stress during COVID-19: Associations with Changes in Physical Activity, Sleep, Tobacco

- and Alcohol Use in Australian Adults. *Int. J. Environ. Res. Public Health*, 17(11): 4065. DOI: 10.3390/ijer-ph17114065.
32. Szewczyk P. Poniewierka E. (2015) Kreatyna – zastosowanie w sporcie i medycynie. *Piel. Zdr. Publ.*, 5(4): 409-416. DOI: 10.17219/pzp/60488.
33. Washif J.A., Farooq A., Krug I., Pyne D.B., Verhagen E., Taylor L., Wong D.P., Mujika I., Cortis C., Haddad M., et al. (2021) Training During the COVID-19 Lockdown: Knowledge, Beliefs, and Practices of 12,526 Athletes from 142 Countries and Six Continents. *Sports Med.*, 23: 1-16. DOI: 10.1007/s40279-021-01573-z.
34. Wong A.Y., Ling S.K., Louie L.H., Law G.Y., So R.C., Lee D.C., Yau F.C., Yung P.S. (2020) Impact of the COVID-19 pandemic on sports and exercise. *Asia Pac. J. Sports Med. Arthrosc. Rehabil. Technol.*, 22: 39-44. DOI: 10.1016/j.asmart.2020.07.006.

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