**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

# IMPACT OF SOCIAL ISOLATION ON THE LEVEL OF SPORTS TRAINING OF YOUNG ATHLETES, CAUSED BY COVID19

Luíz Felipe da Silva†[1], Paulo Francisco de Almeida-Neto†[1], Alexandre Bulhões-Correia†[1]
Victor Sabino de Queiros†[1], Dihogo Gama Matos†[2,3], Daniel Dalmau†[4], Paulo Moreira Silva Santas‡[1]
Breno Guilherme de Araújo Tinoco Cabral‡[1]

## ABSTRACT

Social distancing towards prevention of the outspread of COVID-19 pandemics in the year of 2020 may significantly contribute towards physical inactivity of citizens worldwide. The objective of the current study was to quantify the impact of such preventive measure over the physical activity level of young Brazilian athletes across several sporting areas. Sixty-eight (68) Brazilian athletes (14.7 ± 1.68 years) answered to adapted version of the International Physical Activity Questionnaire (I-PAQ) through an online platform. It was requested that participants reported on their level of physical activity before and during the social distancing period. 67.7% of interviewed athletes stated being able to adapt their sports training to their isolation environment under a physical education professional`s distance guidance. Only 4.38% of the sample were not training under such a supervision and therefore inactive. Therefore, despite social distancing, the sampled athletes seem to remain physically active.

**Key words:** COVID-19. Sedentary Behavior. Athletes. Physical exercise.

## RESUMO

Impacto do isolamento social causado por COVID19 no nível de treinamento esportivo de jovens atletas

O distanciamento social para a prevenção da disseminação das pandemias de COVID-19 no ano de 2020 pode contribuir significativamente para a inatividade física dos cidadãos em todo o mundo. O objetivo do presente estudo foi quantificar o impacto dessa medida preventiva sobre o nível de atividade física de jovens atletas brasileiros em diversas áreas esportivas. Sessenta e oito (68) atletas brasileiros (14,7 ± 1,68 anos) responderam à versão adaptada do Questionário Internacional de Atividade Física (I-PAQ) por meio de uma plataforma online. Foi solicitado que os participantes relatassem seu nível de atividade física antes e durante o período de distanciamento social. 67,7% dos atletas entrevistados afirmaram ser capazes de adaptar seu treinamento esportivo ao ambiente de isolamento sob a orientação de um profissional de educação física a distância. Apenas 4,38% da amostra não estava treinando sob tal supervisão e, portanto, inativos. Portanto, apesar do distanciamento social, os atletas amostrados parecem permanecer fisicamente ativos.

**Palavras-chave:** COVID-19. Comportamento Sedentário. Atletas. Exercício físico.

1 - Health Sciences Center, Department of Physical Education, Federal University of Rio Grande do Norte-UFRN, Natal-RN, Brazil.
2 - Research Center in Sports Sciences, Health Sciences and Human Development, CIDESD, Trás os Montes and Alto Douro University, Vila Real, Portugal.
3 - Group of Studies and Research of Performance, Sport, Health and Paralympic Sports-GEPEPS, Federal University of Sergipe-UFS, São Cristovão, Sergipe, Brazil.
4 - MSc Maritime Engineering, Naval Architecture, University of Southampton, Southampton, UK.

†Denotes graduate student author, ‡Denotes professional author

*Corresponding Author:
Luíz Felipe da Silva.
feliperowing@ufrn.edu.br
Avenue Senador Salgado Filho, 3000.
Campus Central, Lagoa Nova, Natal-RN, Brazil.
Postal Code: 59078-970.
Tel: +55 84 99408-8453.
ORCID: 0000-0002-1825-8443.

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

## INTRODUCTION

The year 2020 will be marked in history by the emergence and rapid spread of COVID-19 across the globe. The disease is caused by the new SARS-Cov-2 coronavirus and is responsible for acute respiratory syndrome (Huang, collaborators' 2020; Zhu, Zhang, Wang, 2020; Li, collaborators', 2020).

The virus belongs to the taxonomic subfamily Orthocoronavirinae of the family Coronaviridae, of the order Nidovirales and is characterized by genetic structures that have a simple positive sense RNA-based genome (Payne, 2017; Duarte, 2020; Li, collaborators' 2020).

Despite discovery of a possible treatment based on anti-coagulant substance that aid the recovery of infected patients, there is still no verified cure method. For this reason, the World Health Organization (WHO) has declared global health emergency (World Health Organization, 2020).

Faced with this epidemic, several countries have started to adopt preventive measures recommended by the World Health Organization (WHO) (Sohrabi, collaborators' 2020; World Health Organization, 2020; Negri collaborators' 2020; Zhang, Liu, 2020; Russell, collaborators' 2020).

Amongst these measures is social isolation, a measure that aims at mitigating the infection rates of COVID- (Parnell, collaborators', 2020)

On March, 2020, Ordinance No. 454, Law No. 11979/2020 was published in Brazil, which reinforces WHO recommendations and determines the protective measures to be adopted by Brazilian citizens (Uchôa, 2020), highlighting the importance of social participation in isolation measures.

In Brazil and in the world, schools, convention centers, sports clubs, large social events, sporting events, etc. have been closed indefinitely (Parnell, collaborators', 2020).

Although the measure of social isolation is effective as a protection to contain the rapid spread of COVID-19, it ends up contributing to the increase in sedentary behavior, which can be harmful for subjects suffering from anxiety, depression, psychological stress, high blood pressure, diabetes mellitus, fibromyalgia (González, Fuentes, Márquez, 2017; Toresdahl, Asif, 2020).

For this reason, attention should be paid to the level of physical activity of the adult and pediatric population during the isolation period, as well as sedentary behavior, when people spend most of their time sitting and watching television or seeking virtual entertainment (Ferreira, collaborators', 2020; Oliveira Neto, collaborators', 2020; Hall, collaborators', 2020; Jordan, Adab, Cheng, 2020).

In addition, social isolation has had a negative impact on sport around the world, causing young athletes across various sports to have their activities suspended and subject to suffering frustrations and sadness, due to being forced to change their goals through the COVID-19 pandemic. Such changes can cause emotional and psychological imbalance (Toresdahl, Asif, 2020).

In addition, the difficulties of implementing sport-specific training methods during confinement are likely to make young athletes exposed to significant level of detraining (i.e., partial or complete loss of adaptations induced by sports training). As a result of insufficient or inadequate stimulation the risk of injury is increased (Sarto, collaborators', 2020).

In order to minimize such health impacts, the American College of Sports Medicine (ACSM) has recommended the practice of exercises in the isolation environment.

However, the ACSM did not specify, within these recommendations, materials for the adaptation of sports practice and therefore many clubs and sports professionals seek improvised ways to meet the needs of their athletes, encouraging them to remain active to maintain physical health during the pandemic. (Rodríguez, Crespo, Olmedillas, 2020; ACSM, 2020).

The present research hypothesizes that social isolation due to COVID-19 can negatively affect the level of physical activity of the subjects.

Therefore, the objective of this study is to quantify the impact of social distancing on the level of physical activity of young Brazilian athletes.

## MATERIALS AND METHODS

### Participants

This is a cross-sectional descriptive study. The calculation of the total sample for this research was carried out a priori, considering the significance of $\alpha < 0.05$ and $\beta =$

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

0.80. Thus, an effect size estimated at 0.80 indicated the minimum sample size of 16 subjects (With power estimated of 0.80) (Espirito-Santo, Daniel, 2017).

Thus, the present study added 34 subjects of each sex (male and female) to its sample, totaling 68 young Brazilian athletes of both sexes (14.7 ± 1.68 years), recruited through social networks (In the period from 10 to 12 April 2020). It is noteworthy that there were no sample losses.

As eligibility criteria, participants should be affiliated with a sports federation and be aged 8 to 17 years. Athletes who failed to answer any question in the questionnaire were excluded from the study. In relation to the Brazilian regions, 67.7% of the sample lived in the Northeast Region; 1.48% in the North Region, 1.48% in the Centre-west Region; 2.74% in the Southeast Region and 26.6% in the South Region.

A virtual questionnaire was sent to young people, so the inclusion criteria were: (i) Being an athlete affiliated to a federation related to their sport; (ii) be between 8 and 17 years old. The exclusion criteria adopted were: (i) Not having prior authorization from those responsible; (ii) Not answering all questions in the questionnaire.

This research was carried out fully in accordance to the ethical standards of the International Journal of Exercise Science (Navalta, Stone, Lyons,2019).

The athletes and their respective guardians were informed of the objectives of the research and the adopted methodological procedures via video conference.

All volunteers received the terms of consent and free and informed consent.

Participants were required to send such terms as digitized files with their respective signatures.

The study was analyzed and approved by the Ethics and Research Committee - CEP of the Federal University of Rio Grande do Norte (Opinion: 3.996.317), according to Resolution 466/12 of the National Health Council, strictly respecting the ethical principles contained in the declaration of Helsinki.

In addition, the present study complies with all Strobe items for observational studies (i.e., checklist to strengthen the reporting of observational studies in epidemiology).

**Protocol**

This survey was divided into 3 moments: (i) Preparation of the questionnaire using the free and open access platform Google Forms; (ii) Recruitment of the sample through social networks and meeting with young people and their responsible for video conferencing; (iii) After the sample sent the terms of consent and free and informed consent, they received the virtual questionnaire by text message application on their respective cell phones (Figure 1).


**Figure 1 -** Study design.

The tool used in this research was composed of sociodemographic information and an adapted version of the international physical activity questionnaire - IPAQ (Ipaq, 2020).

The sociodemographic questions asked for information about which region of Brazil the athlete lived in, date of birth, body weight, height, which sport he practiced, length of experience in the sport, whether they were managing to adapt to the sport's training in the isolation location and whether they were receiving professional support at a distance.

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

The questions asked for information about the weekly load of training days, the workload of training, the intensity of training (where mild = 0.5; moderate = 1.0; intense = 2.0 and very intense = 3.0) and whether the subject was performing activities different from his sport and what activity this would be.

Participants were instructed to answer the questionnaire with the recall of their exercise routine in the situation before social isolation due to COVID-19 and to answer the same questions based on the exercise routine experienced during the social isolation of the COVID-19 pandemic.

**The questions related to the level of physical activity were:**

**What sport do you practice?**
How long have you been practicing this sport?
Before the quarantine due to COVID-19, how many days per week did you train?
Before the quarantine resulting from COVID-19, how long did your training hours last in relation to minutes / hours?
Before the quarantine resulting from COVID-19, how did you perceive the intensity of the training in which you participated?
Slight "I couldn't even sweat "
Moderate "I could sweat cool"
Intense "heavy"
Very intense "Extremely heavy"
During the quarantine were you able to adapt the training of your sports practice so that you can perform it in an isolated environment?
During the quarantine, did you have a physical education professional accompanying you on how to carry out your sports training or did you have distance monitoring to practice your sport?
During the quarantine did you perform other exercises that are not related to your sports practice?
During quarantine, how many days a week did you exercise in the isolation environment?
During quarantine, how long did your training last on each day of isolation? Please respond in terms of minutes / hours.
In quarantine, how do you perceive the intensity of the training you have been doing in the isolation environment?
Slight "I couldn't even sweat"
Moderate "I could sweat cool"
Intense "heavy"
Very intense "Extremely heavy"
I am not practicing any type of exercise in the isolation environment.
In quarantine, how have you been exercising?
Calisthenics, using only with body weight (squats, push-ups, jumping jacks, etc).
I have adequate sports equipment to train my sport at home.
I have weight training equipment at home and use it.
Others? If so, please describe (space reserved for writing).

**Statistical Analysis**

The normality of the data was tested by the Kolmogorov-Smirnov test and z-score of asymmetry and kurtosis (-1.96 to 1.96). The assumption of normality was not met, so the Mann-Whitney U test was to compare the level of physical activity before and during the period of social isolation.

The effect size was verified using the Cohen's U3 index technique, after identifying the percentile of the effect size, the values were converted to a scale of magnitude corresponding to: (Espirito-Santo, Daniel, 2017): insignificant: <0.19; small: 0.20-0.49; average: 0.50-0.79; large: 0.80-1.29; very large: <1.30.

All analyzes were performed using open-source software R (version 4.0.1; R Foundation for Statistical Computing®, Vienna, Austria) considering the significance of $p < 0.05$.

**RESULTS**

Table 1 shows the characteristics of the sample. A predominance of rowing and swimming athletes is observed in the present sample.

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

**Table 1 -** Sample characterization.

| Variables | Values |
|---|---|
| n (%) | 68 (100%) |
| Age | 14.7 ± 1.68 |
| Height (m) | 1.66 ± 21.6 |
| Weight (kg) | 59.6 ± 12.4 |
| Body mass index ($m^2$) | 21.0 ± 4.23 |
| Athletics (%) | 1.48% |
| Basketball (%) | 7.40% |
| Handball (%) | 2.19% |
| Volleyball (%) | 5.92% |
| Jiu Jitsu (%) | 5.92% |
| Karate (%) | 2.19% |
| Taekwondo (%) | 1.48% |
| Artistic swimming (%) | 2.19% |
| Swimming (%) | 28.1% |
| Rowing (%) | 48.3% |

Table 2 reports that training days per week and training hours were reduced during the social isolation of the COVID-19 pandemic. In addition, the intensity of exercises amongst young athletes went from intense to moderate.

**Table 2 -** Comparisons between the levels of physical activity pre-COVID-19 and during COVID-19.

| Variable | Pre-COVID-19 | | During COVID-19 | | Cohen's U[3] | | p - value |
|---|---|---|---|---|---|---|---|
| | MD | IIQ | MD | IIQ | Effect size | IC 95% | |
| Weekly training days | 6.0 | 2.0 | 5.0 | 4.0 | 0.40 | [0.05; 0.73] | 0.03 |
| Daily training hours | 2.0 | 0.3 | 1.0 | 0.77 | 1.74 | [1.35; 2.14] | <0.0001 |
| Training intensity | 2.0 | 1.0 | 1.0 | 0.0 | 1.38 | [1.00; 1.76] | <0.0001 |

**Legend:** MD = Median; IIQ = Inter Quartile Interval; 95% CI = 95% confidence interval for estimating the effect size; * Significant statistical difference <0.05. Effect Size / Cohen's U³ Magnitude: insignificant: <0.19; small: 0.20-0.49; average: 0.50-0.79; large: 0.80-1.29; very large: <1.30.

The results indicated that 95.62% of the athletes were physically active. Despite the predominance of athletes from aquatic sports, 67.7% reported that they were managing to adapt their sport's training to the environment of social isolation (Figure 2).

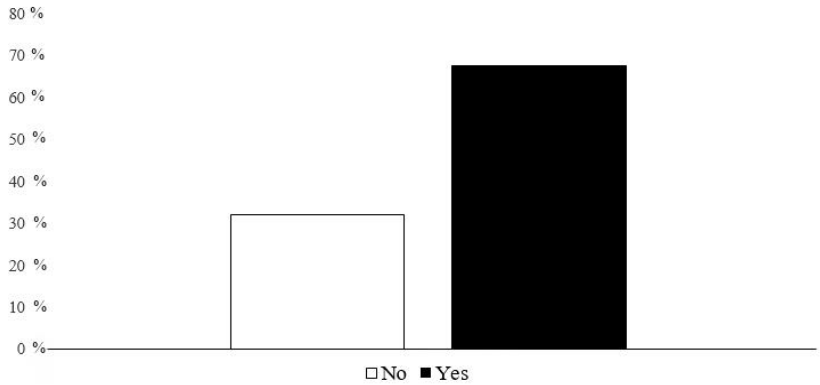


**Figure 2 -** Adaptation of training in the place of social isolation.

According to the data reported in Figure 3, only 4.38% of the sample was not training on distance from professional guidance. It is worth mentioning that the same individuals stated that they were not practicing any physical activity in the isolation environment.

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

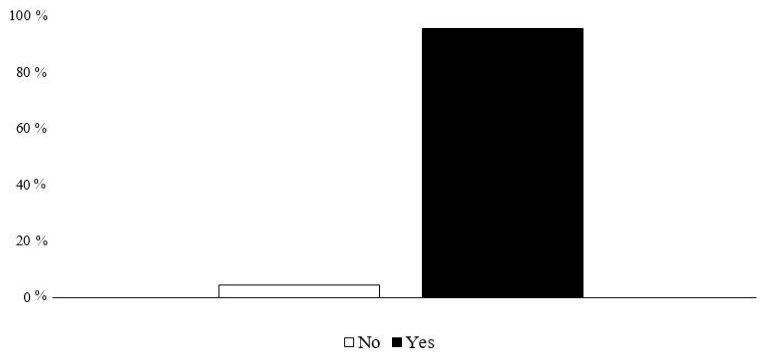


**Figure 3 -** Training with virtual guidance from a physical education professional.

Table 3 reports that 68.9% of the sample claimed to be performing calisthenics exercises in the isolation environment, 23.7% claimed to have sport-specific equipment to practice their sport in the isolation environment, while 1.48% said they practiced dance, 1.48% stretching and 4.38% were inactive.

**Table 3 -** Exercises performed during quarantine.

| Type of exercise | Percentage of supporters |
|---|---|
| No exercise | 4.38% |
| Dance | 1.48% |
| Stretching | 1.48% |
| Calisthenics | 68.9% |
| Sport at home with appropriate material | 23.7% |

## DISCUSSION

The aim of the present study was to quantify the impact of social isolation caused by the pandemic of COVID-19 on the level of physical activity of young Brazilian athletes.

The results showed: i) 95.62% were physically active and 67.70% of the evaluated athletes reported that they were managing to adapt their training to the social isolation environment under professional guidance; ii) Only 4.38% of the sample was not training under distance guidance of a physical education professional; iii) Training days per week and training hours were reduced during social isolation; iv) The intensity of the young athletes' exercises went from intense to moderate; v) Calisthenics was the most cited way by athletes to exercise in the isolation environment.

According to the findings of the present study, most athletes stated that they were receiving distance guidance and that they were able to adapt their training to the isolation environment. Despite this fact, the results also point out that there was a decrease in the weekly and daily training volume during the COVID-19 pandemic (table 2).

Theorists point out in their research that, from the perspective of sports performance, the reduction in the volume and intensity of training during this period can lead to a decrease in physical performance (Toresdahl, Asif, 2020).

Sarto, collaborators's, (2020) reports on the decrease in performance due to the social isolation caused by the pandemic of COVID-19 as well as the necessary care to be taken regarding the risks of injuries in the athletes' return to routine training activities.

It should be noted that in a recent study, researchers (Gavanda, collaborators's 2020), identified that three weeks of detraining were not enough to cause any change in the morphological characteristics of musculoskeletal tissue, the same occurred with strength and sports performance in adolescent athletes.

However, the results of the present study also indicated that 4.38% of the athletes were physically inactive. In this sense, in such a delicate moment for the world, researchers

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

emphasize that it is essential to pay attention not only to sports performance, but also to their health in function of physical inactivity (Lippi, Henry, Sanchis-Gomar, 2020).

It should be noted that the athletes who were physically inactive were the same ones who reported that they were not receiving distance guidance from a physical education professional.

This corroborates the previous study in which the authors highlight the importance of physical exercise under the accompaniment of an appropriate professional (Rodríguez, Crespo, Olmedillas, 2020).

In this sense, the findings of the present study indicate that 95.62% of the sample was physically active, in which 68.9% were practicing calisthenics in the isolation environment, 1.48% were practicing dance, 1.48% claimed to practice stretching and 23.7% said they were using specific material for the practice of their sport (i.e., private pool, mat, punching bag, etc.).

In a previous study, the authors suggested methods of physical training to remain physically active during the period of confinement, highlighting aerobic exercises using stationary bikes, treadmills or ergometer paddles, calisthenics (ie, strength training using only body weight), exercises based on dance and active games that require bodily movement (Hammami, collaborators', 2020), thus corroborating the findings of the present study.

Thus, the prospects for using the findings of the present study are that the class of physical education professionals is valued during isolation due to the pandemic of COVID-19.

Such a class is indispensable for encouraging and guiding the practice of physical activity in an environment of social isolation. In addition, government officials should promote public policies to make the population aware of the importance of staying physically active.

However, the present research brings with it the following limitations: (ACSM, 2020) The design of the study has weaknesses because it used a recall method in the questions relative to the moment before social isolation, therefore reducing the reliability of the answers.

Cortegiani, collaborators', (2020) Only young athletes were evaluated, so the results can be different in other populations.

Oliveira Neto, collaborators', (2020) The sample is not large enough to represent the entire Brazilian population of athletes.

Duarte, (2020) Athletes were isolated for approximately three weeks, an assessment at a longer time of isolation could provide more concrete evidence.

## CONCLUSION

It is concluded that, despite the social isolation, the athletes analyzed managed to remain physically active during the COVID-19 pandemic period.

In addition, the physical education professional demonstrated relevant participation in the monitoring of distance training during the pandemic period, as 67.7% of the evaluated said they were receiving the monitoring of such a professional and only 4.38% were physically inactive.

## REFERENCES

1-ACSM. American College of Sport Medicine. Staying Physically Active During the COVID-19 Pandemic, 2020. Retrieved from: https://www.acsm.org/read-research/newsroom/news-releases/news-detail/2020/03/16/staying-physically-active-during-covid-19-pandemic. 2020.

2-Cortegiani, A.; Ingoglia, G.; Ippolito, M.; Giarratano, A.; Einav, S. A systematic review on the efficacy and safety of chloroquine for the treatment of COVID-19. J Crit Care. Vol. 57. p. 279-283. 2020.

3-Duarte, P.M. COVID-19: Origin of the new coronavirus. Braz J Hea Rev. Vol 3. p. 3585-3590. 2020.

4-Espirito-Santo, H.; Daniel, F. Calculating and reporting effect sizes on scientific papers (1): p<0.05 limitations in the analysis of mean differences of two groups. Rev Port Invest Comp Soc. Vol.1. p. 3-16. 2017.

5-Ferreira, M.J.; Irigoyen, M.C.; Consolim-Colombo, F.; Saraiva, J.F.K.; Angelis, K. Physically Active Lifestyle as an Approach to Confronting COVID-19. Arq Bras Cardiol. Vol. 114. p. 601-602. 2020.

6-Gavanda, S.; Geisler, S.; Quittmann, O.J.; Bauhaus, H.; Schiffer, T. Three weeks of detraining does not decrease muscle

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

thickness, strength or sport performance in adolescent athletes. Int J Exerc Sci. Vol. 13. p. 633-644. 2020.

7-González, K.; Fuentes, J.; Márquez, JL. Physical inactivity, sedentary behavior and chronic diseases. Korean J Fam Med. Vol. 38. p. 111-115. 2017.

8-Hall, G.; Laddu, D.R.; Phillips, S.A.; Lavie, C.J.; Arena, R. A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? Prog Cardiovasc Dis. 2020. Epub ahead of print.

9-Hammami, A.; Harrabi, B.; Mohr, M.; Krustrup, P. Physical activity and corona virus disease 2019 (COVID-19): specific recommendations for home-based physical training. Manag. Sport Leis. 2020.

10-Huang, C.; Wang, Y.; Li, X.; Ren, L.; Zhao, J.; Hu, Y.; Cheng, Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. Vol. 395. p. 497-506. 2020.

11-IPAQ. International Physical Activity Questionnaire. Retrieved from: https://sites.google.com/site/theipaq/. 2020.

12-Jordan, R.E.; Adab, P.; Cheng, K.K. Covid-19: risk factors for severe disease and death. BMJ. Vol. 368. p. 1198. 2020.

13-Li, G.; Fan, Y.; Lai, Y.; Han, T.; Li, Z.; Zhou, P.; Zhang, Q. Coronavirus infections and immune responses. J Med Virol. Vol. 92. p. 424-432. 2020.

14-Li, Q.; Guan, X.; Wu, P. Early transmission dynamics in wuhan, china, of novel coronavirus-infected pneumonia. N Engl J Med. Vol. 382. p. 1199-1207. 2020.

15-Lippi, G.; Henry, B.M.; Sanchis-Gomar, F. Physical inactivity and cardiovascular disease at the time of coronavirus disease 2019 (COVID-19). Eur J Prev Cardiol. Vol. 27. p. 906-908. 2020.

16-Navalta, J.W.; Stone, W.J.; Lyons, T.S. Ethical issues related to scientific discovery in exercise science. Int J Exerc Sci. Vol. 12. p.1-8. 2019.

17-Negri, E.M.; Piloto, B.; Morinaga, L.K.; Jardim, C.V.P.; Lamy, S.A.E.D.; Ferreira, M.A.; Deheinzelin, D. Heparin therapy improving hypoxia in COVID-19 patients - a case series. MedRxiv. 2020.

18-Oliveira Neto, L.; Elsangedy, H.M.; Oliveira Tavares, V.D.; Teixeira, C.V.L.S.; Behm, D.G.; Silva-Grigoletto, M.E. #Traininginhome - Home-based training during COVID-19 (SARS-COV2) pandemic: physical exercise and behavior-based approach. Rev Bras Fisiol Exerc. Vol. 19. p. 9-19. 2020.

19-Parnell, D.; Widdop, P.; Bond, A.; Wilson, R. COVID-19, networks and sport. Manag. Sport Leis. 2020. Epub.

20-Payne, S. Family Coronaviridae. Viruses. p.149-158. 2017.

21-Rodríguez, M.Á.; Crespo, I.; Olmedillas, H. Exercising in times of COVID-19: what do experts recommend doing within four walls? Rev Esp Cardiol (Engl Ed). 2020. Epub.

22-Russell, B.; Moss, C.; George, G.; Santaolalla, A.; Cope, A.; Papa, S.; Van, H.M. Associations between immune-suppressive and stimulating drugs and novel COVID-19-a systematic review of current evidence. Ecancermedicalscience. Vol.14. p.1022. 2020.

23-Sarto, F.; Impellizzeri, F.M.; Spörri, J.; Porcelli, S.; Olmo, J.; Requena, B.; Franchi, M.V. Impact of potential physiological changes due to COVID-19 home confinement on athlete health protection in elite sports: a call for awareness in sports programming. Sports Med. 2020. Epub ahead of print.

24-Sohrabi, C.; Alsafi, Z.; O'Neill, N.; Mehdi, K.; Ahmed, K.; Ahmed, A.J.; Christos, I.; Riaz, A. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). Int J Surg. Vol.76. p. 71-76. 2020.

25-Strobe. Checklist Strengthening the Reporting of Observational Studies in Epidemiology. Retrieved from: https://www.strobe-statement.org/index.php?id=strobe-home. 2020.

26-Toresdahl, B.G.; Asif, I.M. Coronavirus disease 2019 (COVID-19): considerations for

**Revista Brasileira de Prescrição e Fisiologia do Exercício**
**ISSN 1981-9900** ***versão eletrônica***

Periódico do Instituto Brasileiro de Pesquisa e Ensino em Fisiologia do Exercício

**w w w . i b p e f e x . c o m . b r / w w w . r b p f e x . c o m . b r**

the competitive Athlete. Sports Health. Vol. 12. p. 221-224. 2020.

27-Uchôa, S.B.B.; Uchoa, B.B. Coronavírus (COVID-19) - Um exame constitucional e ético das medidas previstas na lei n. 13.979, de 6 de fevereiro de 2020. Cad Prospec. Vol. 13. p. 441-459. 2020.

28-World Health Organization. Coronavirus disease 2019 (COVID-19) situation report – 51. Retrieved from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200311-sitrep-51-covid-19.pdf?sfvrsn=1ba62e57_10. 2020.

29-Zhang, L.; Liu, Y. Potential interventions for novel coronavirus in China: A systematic review. J Med Virol. Vol. 92. p. 479-490. 2020.

30-Zhu, N.; Zhang, D.; Wang, W. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med. Vol. 382. p. 727-733. 2020.

Recebido para publicação em 26/09/2020
Aceito em 15/03/2021