

Covid-19 and the Implications in the Practice of Aerobic Endurance Running: A Narrative Review

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Abstract:

The year 2020 was marked by the pandemic caused by the SARS-CoV-2 coronavirus, the transmitter of the COVID-19 disease that was responsible for numerous cases and deaths, of international interest to public health. In this work, we report how the events, the practice of training distance runners was affected by the COVID-19 pandemic. This review aimed to map the publications on the implications for the practice of aerobic endurance running, associated with the difficulties of performing training and social isolation during the COVID-19 pandemic. This is a narrative review of 20 studies from five databases, which contained express recommendations on activity practice and running training and running events by various populations during the COVID-19 pandemic. To this end, bibliographic research was carried out through a literary review of national and international journals consulted in the following databases: Scopus, Web of Science, PubMed, Scientific Electronic Library Online (SciELO), Google Scholar that contained express recommendations on the implications in the practice of aerobic endurance running during the COVID-19 pandemic. The initial search totaled 43 records. After exclusion by title, abstract, duplicates and reading in full, 20 publications remained, in addition to 10 more manually selected studies, totaling 53 publications. After analyzing the results, the textual corpus revealed the postponement or cancellation of mass meetings, global sporting events, as well as a decrease in regular practice linked to the long-distance running training routine. The number of practitioners was affected, which caused, as a consequence, an increase in physical inactivity and sedentary behavior.

Keywords: Street running, COVID-19, Training of recreational runners.

1 INTRODUCTION

The first events with street racing first appeared in England in the 17th century, later being practiced in the rest of Europe, and also in the Americas, where it spread in the late 19th century (SALGADO; CHACON-MIKAHIL, 2006). Popular endurance races around the world include Ultra Trail du Mont Blanc, Marathon de Sables, Comrades Marathon and Western States Endurance Run, recreational running, off-road running, marathon and ultramarathon, trail running, mountain running, skyrunning and hill running, orienteering, steeplechase and cross country running (SCHEER et al., 2020).

In recent years the phenomenon of recreational racing or street racing has become one of the most popular sporting events in Brazil and worldwide. It is estimated that street or long-distance running is the fourth most practiced physical activity by Brazilians and one of the most popular forms of physical activity worldwide, second only to walking, weight training and soccer, due to the minimum requirements for equipment and sports structure, in addition, have attracted more and more fans in Brazil, with 38.8 million Brazilians of both sexes practicing or practicing some sport (IBGE, 2015).

According to data from SEBRAE (2022), the street racing boom attracted more than 107.9 million runners in 70,000 events in 2019. Particularly in Brazil, racing in general influenced tourism in all regions of the world. country, in addition to moving 3.1 billion reais with 4 million participants.

The motivations that lead people to the practice of street running are diverse: the search for health benefits, the prevention of osteoporosis, reduction of the risks of cardiovascular diseases, improvement of physical fitness, increase of sports performance, feeling of pleasure and feeling of well-being etc. In this context, converting this form of sports practice into an attractive health behavior for the general population, that is, street running provides mental, physical, social interaction and to the tourist economy of the country's cities. Despite this, mass agglomeration events are associated with major public health challenges (MEMISH et al., 2019).

Considering the aforementioned arguments, in 2019, in Wuhan, China, SARS-CoV-2 imposed a major economic and social problem for public health systems worldwide, with unprecedented potential for dissemination, making it impossible to hold events sports, as they are environments of interpersonal exposure, to mitigate the spread of this deadly virus (HARAKI, 2021).

COVID-19 impacted the lives of many people in 2020 as it was classified as a global pandemic on March 11, 2020, and as of March 2021, approximately 120 million cases of the disease have been confirmed and 2.6 million deaths attributed to it. to it (WHO, 2020).

Several studies point out as potential risk groups: the elderly, young adults, obese, individuals with comorbidities, chronic diseases with hemodynamic and immunological repercussions (JIMÉNEZ-PAVÓN; CARBONELL-BAEZA; LAVIE, 2020; RODRÍGUEZ; CRESPO; OLMEDILLAS, 2020; SONG et al., 2020).

Faced with this scenario, restrictive measures were taken to adopt social distance, perform physical exercises at home or in outdoor places, avoid agglomerations at sporting events to reduce and control the spread of the virus, especially in large-scale sporting events that present unique challenges for public health authorities and governments (JOY, 2020).

In several countries, athletes were strictly prohibited from performing outdoor physical activities (CLOOSTERMAN et al., 2021). Such changes led to the closure of gyms, clubs, arenas, championships and competitions, physical training facilities, closure of formal and informal group activities, and restrictions on trails that disrupted long-distance running community norms (DEJONG et al., 2021).

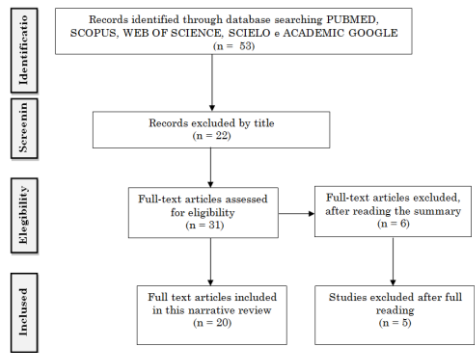
Physical and psychological benefits were cited by Nogueira et al. (2020), when he verified that the practice of physical exercises acts to improve immunity in the prevention and treatment of COVID-19, chronic diseases and viral infections. In this sense, generalized strategies were needed to prevent infection by COVID-19, including resistance training, strength, balance, coordination and flexibility, at least 2-3 days a week, and moderate intensity aerobic training in order to maximize the results. positive effects on the immune system (JOY, 2020).

With the absence of specific and effective treatment, multiple public health measures were implemented in the affected countries, to contain and mitigate the spread of the COVID-19 disease, which also led to the suspension of resistance and ultra resistance races, inevitably resulting in an impact highly significant negative causing training changes, both at the sport level and

2 METHODOLOGY

To achieve the objectives proposed in this study, a narrative literature review was carried out, with a qualitative approach (Figure 1). A bibliographic search was carried out in the following databases: Scopus, Web of Science, PubMed, Scientific Electronic Library Online (SciELO), Google Scholar. We selected 53 articles published between the years 2020 to 2021, which presented studies about the outbreak of the new coronavirus (COVID-19) related to health systems. The following search terms were used: STREET RUN, ENDURANCE RUN, CORONAVIRUS, PANDEMIA and COVID-19. Studies that were not freely available, repeated and those unrelated to the subject or that covered only one of the topics (“COVID-19” or “RESISTANCE RACE” or “CORONA VIRUS” or “PANDEMIC”) were excluded.

Figure 1 – Inclusion and exclusion analysis flowchart of selected articles according to the PRISMA protocol guidelines.



3 RESULTS

In this narrative review, 53 articles published between the years 2020 and 2021, in English foreign language journals, were selected, since they were identified: 2 articles in Scopus (10%), 2 in Pubmed (10%), 3 in the Web of Science (15%), 6 on SciELO (30%), 7 on Google Scholar (35%). Regarding the type of study performed, the articles presented different types of design, being presented in the form of a table, also explaining the main information contained in each article, such as study title, author/year, language, journal, type of publication and outcomes associated with COVID-19 (Table 1).

In view of the studies discussed in Table 1, 11 studies were obtained in total with an approach to the postponement or cancellation of mass meetings, global sporting events, as well as the decrease in regular practice linked to the long-distance running training routine, and 4 studies addressing the number of runners, with decreased motivation, physical fitness, increased physical inactivity and sedentary behavior.

Table 1 - Characterization of the Scope Review studies

Title	Author	Language	Journal	Publication type	Main results
Running behaviors, motivations, and injury risk during the COVID-19 pandemic: A survey of 1147 international runners.	Dejong, A. F.; Fish, P. N.; Hertel, J. 2020.	English / Portuguese	Plos One	Rehearsal	It influences runners' behavior change with increased training volume, decreased intensity and motivation, risk of running-related injuries during the pandemic.
COVID-19 and the cancellation of the 2020 Two Oceans Marathon, Cape Town, South Africa.	Swart, K.; Maralack, D. 2020.	English	Sport in Society	Revision	Cancellation of all sporting (and other) events with adverse effect on the economy and health due to the high risk to the congregation of people.
An Ounce of Prevention: Coronavirus (COVID-19) and Mass Gatherings.	Escher J.R. Allan R. 2020.	English / Portuguese	Cureus	Editorial	Postponement or cancellation of prominent mass gatherings of a religious nature, global sporting events; universal adoption of best physical exercise practices; Use the family environment for practice; avoid sedentary behavior.
Associated effects of the COVID-19 pandemic: a worldwide comparison of distance runner training in 2019 and 2020	Afonseca, L. A.; Duarte, M.; Watanabe, R. N. 2020.	Portuguese	Proceedings of the VIII Regional School of Computing Applied to Health	Revision	Decrease in long-distance running practice, the number of practitioners were greatly affected by the COVID-19.
Perceptual changes in endurance athletes during social isolation due to covid-19.	Guilherme et al. 2020.	Portuguese	Brazilian Society of Exercise and Sport Medicine	Rehearsal	Significant changes in the perception of stress, decreased motivation and physical fitness, in the group of endurance runners athletes.
Physical activity and reducing sedentary behavior during the corona virus pandemic.	Ferreira, M. J. et al. 2020.	English / Portuguese	Brazilian cardiology archives	Point of view	Increase in physical inactivity and sedentary behavior with damage to mental health.
Physical activity during the COVID-19 pandemic: a survey with adults in Northern Brazil / physical activity	Marques, Marcelo et al. 2020.	English / Portuguese	Brazil Magazine active physical health	Rehearsal	Decrease in walking and running activities of recreational practitioners Due to the COVID-19 pandemic, the number of practitioners was very high in the State of Amazonas and specifically physically active and very active individuals before the pandemic.

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during the COVID-19 pandemic: a survey with adults in northern Brazil.					
The impact of COVID-19 on the training routine of recreational runners.	Galvão, F. M. N.; Cezar, M. D. M. 2020.	Portuguese	Fait Electronic Scientific Journal of Applied Sciences	Rehearsal	Decreased training routine for recreational runners and running distance, starting to train at home or other outdoor places, unaccompanied.
Análise da qualidade de vida dos corredores de rua de Boa Vista no período da pandemia do covid-19	Viana et al. 2021	Portuguese	Journal of the Federal Institute of Roraima	Rehearsal	Partial training stop per week, with a decrease in race motives, in the responses to competition/race and physical exercises.
Pandemia COVID-19 e impacto no desporto.	Moura, D. L. et al. 2020.	Portuguese	Sports Medicine Magazine	Rehearsal	Development of an acute respiratory condition of cough (persistent or worsening of usual cough), fever (temperature $\geq 38^{\circ}\text{C}$) or dyspnea. Postponement or cancellation of competitions, championships, global sporting events, marathons, sporting events on a world scale.
Practice of Physical Activity during Social Distancing.	Sociedade Brasileira de Diabetes. 2020.	Portuguese	Brazilian Society of Diabetes	inform	Recommend the practice of aerobic physical exercise (walking, running, jumping rope, climbing stairs, dancing) for muscle strengthening and stretching.
Physical Activity And Reducing Sedentary Behavior During The Coronavirus Pandemic.	Pitanga, F. J. G.; Beck, C. C.; Pitanga, C. P. S. 2020.	English	Brazilian cardiology archives	Point of view	Sedentary behavior and depression on people's immune systems.
Outdoor Activity: Benefits and Risks to Recreational Runners during the COVID-19 Pandemic.	Makruf, A; Ramdhan, D. H. 2021.	English	Kesmas: Journal Kesehatan Masyarakat Nasional	Revision	Take seriously the potential risks of COVID-19 virus infection when running outdoors.
The Impact of the COVID-19 Pandemic on Endurance and Ultra-Endurance Running.	Scheer,V.et al. 2021.	English / Portuguese	Medicine	Rehearsal	Significant decrease in the number of submissions and endurance and ultra-endurance events during the COVID-19 pandemic, with a devastating effect on the sports industry.
The practice of street running in Santarém, Pará, Brazil: quality of life and effects of the COVID-19 pandemic.	Lima, J.G. F. et al. 2021.	Portuguese	SIBI/UFOPA	Dissertação	Modifications to the characteristics of running practice during the pandemic, such as the place of practice and the decrease in the frequency and duration of training.
Running behavior and symptoms of respiratory tract infection during the COVID-19 pandemic: a large prospective Dutch cohort study.	Cloosterman, Kyra LA et al. 2021.	English / Portuguese	Journal of science and medicine in sport.	Rehearsal	Dutch runners managed to maintain average weekly running frequency, duration, distance and speed habits during the COVID-19 period
Running races during the COVID-19 pandemic: a 2020	Robinson et al. 2021.	English / Portuguese	BMJ Open Sport & Exercise Medicine	Rehearsal	Decrease the overall size of the race, the numbers of participants in the starting pens, as well as using more staggered departure times to contain the spread of

survey of the running community.					COVID-19
A worldwide comparison of long-distance running training in 2019 and 2020: associated effects of the COVID-19 pandemic.	Afonseca, L. A.; Watanabe, R.N.; Duarte, M. 2022.	English / Portuguese	PeerJ	Point of view	Decreased level of training and running distance to contain the spread of COVID-19
Influence of the COVID-19 pandemic on running behaviors, motives, and running-related injury: A one-year follow-up survey.	Dejong Lempke, A.F.; Hertel, J. 2022.	English / Portuguese	Plos One	Rehearsal	Higher running-related injuries during the first year of COVID-19, and were substantially greater in runners with little experience as well as those who lost access to preferred training venues.
Recreational runners who recovered from COVID-19 show different running kinetics and muscle activities compared with healthy controls.	Jafarnezhadger o, A. A. et al. 2022.	English	Gait & Posture	Rehearsal	Significant decrease in running practices, muscle activities and running kinetics.

4 DISCUSSION

Endurance running is one of the most popular and practiced athletics events around the world, showing significant increases in participation by different categories and events such as trail running, recreational running, mountain running, skyrunning, road running, orienteering, running. hurdles, cross-country running, marathon and ultramarathon in recent decades (SCHEER, 2019; SCHEER et al., 2020). Since the beginning of the COVID-19 pandemic, many endurance running events have been canceled or postponed, a significant adversely affected amount of resources has been spent or compromised due to the high risk to the congregation of people, but such impacts on endurance capacity of runners has not been examined to date (SWART and MARALACK, 2020).

As with sports and sporting events, during the COVID-19 pandemic crisis, the postponement and/or cancellation of prominent mass gatherings of a religious nature, global sporting events, has therefore occurred due to the continued uncertainty of the spread of the virus. virus and the potential risk of spreading the virus through the congregation of runners. In this context, there was the universal adoption of the best physical exercise practices using the family environment to perform, in order to avoid sedentary behavior (ESCHER; ALLAN, 2020).

For Dejong, Fish and Hertel (2020), the COVID-19 pandemic has imposed a unique stress on daily functioning around the world, and the results of their research indicate that there has been a reactionary response in the running community, regarding the number training per week, the reasons for running decreased significantly, as well as the responses to competition/race and socialization that were determining factors for participation in the race, while there were more responses that participants were motivated to run to occupy their free time. . However, the authors

still found, overall, that the total number of sustained runs, mileage, and race day times increased significantly during compared to before the pandemic.

Data from the study by Guilherme et al. (2020) showed that in a period longer than 10 days of isolation, there were significant changes in the perception of stress, motivation and physical fitness in the group of athletes, endurance runners, cyclists and triathletes. Where endurance runners have been most affected by the effects of the COVID-19 pandemic since it was first declared on March 11, 2020. It is worth noting that during the period of social isolation, the COVID-19 pandemic has imposed a sedentary behavior and depression on the immune system of people (PITANGA; BECK; PITANGA, 2020). Similar observations were made in the study by Galvão and Cézar (2020) who verified the training routine of recreational runners greatly affected by the effects of the COVID-19 pandemic. Millions of people stopped exercising or reduced the weekly frequency and intensity of training (RAIOL, 2020). Among those who remained active, they began to train at home or other outdoor places, unaccompanied, performing training with moderate intensity and volumes (JIMÉNEZ-PAVÓN; CARBONELL-BAEZA; LAVIE, 2020).

The walking and running activities of recreational practitioners were greatly affected during social distancing. Due to the COVID-19 pandemic, social distancing recommendations caused a decrease in the general levels of physical activity in adults residing in the State of Amazonas and specifically in the practice of individuals who were physically active and very active before the pandemic (MARQUES et al. 2020).

Ferreira et al. (2020) confirmed that, when avoiding the practice of team sports, aerobic activities were performed individually, in small groups or in crowds. Most of the population did not reach the minimum recommended time for physical activity and exercise during the pandemic, on the contrary, the scientific findings of this study show an increase in physical inactivity and sedentary behavior with damage to mental health.

At the athletics level (Moura et al., 2020) observed that many athletes developed an acute respiratory condition of cough (persistent or worsening of habitual cough), fever (temperature $\geq 38^{\circ}\text{C}$) or dyspnea. Alternatively, the indoor world championship was postponed. The marathons, sporting events with thousands of participants worldwide, were also affected with preventive measures, seeking to minimize contact between athletes, technical teams, fans and respecting the quarantine, in order to minimize the spread of COVID-19 within the scope of sports, whether in training or competitions, as everyone is afraid of being infected, of putting their sports career at risk, loss of income and economic problems. This was also confirmed in the first

5 FUTURE CONSIDERATIONS

While the health benefits and motives of aerobic running as exercise and the deleterious effects of the COVID-19 pandemic are well established, more study is needed on the potential implications for the practice of aerobic endurance running. Likewise, figures for participation in large events and low- and medium-intensity resistance training for populations impacted by the COVID-19 pandemic may also need further investigation. Efforts have recently been made to characterize the effects of the SARS-CoV-2 coronavirus on motivations for training and participation in aerobic

endurance running events, however, no studies have examined the cellular responses and the occurrence of injuries in the different populations affected by the disease COVID-19.

6 CONCLUSIONS

In this review, we see a significant decrease in the numbers of submissions and endurance running events during the pandemic with the devastating effects of COVID-19. The analyzed data revealed the postponement or cancellation of mass meetings, global sporting events, as well as the decrease in regular practice linked to the long-distance running training routine. In addition, a large number of amateur runners were impacted, which resulted in an increase in physical inactivity and sedentary behavior. A return to pre-pandemic levels soon remains unlikely so far.

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