COVID-19 AND ITS EFFECT ON OLYMPIC SPORT: THE IMPORTANCE OF STUDYING SOCIAL ISOLATION AND THE HARM IT CAUSES, IN ORDER TO MINIMIZE IT

COVID-19 E SEU EFEITO NO ESPORTE OLÍMPICO: A IMPORTÂNCIA DE ESTUDAR O ISOLAMENTO SOCIAL E SEUS DANOS A FIM DE MINIMIZÁ-LOS

COVID-19 Y SU EFECTO EN EL DEPORTE OLÍMPICO: LA IMPORTANCIA DE ESTUDIAR EL AISLAMIENTO SOCIAL Y SUS DAÑOS A FIN DE MINIMIZARLOS

SPECIAL ARTICLE
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ARTICULO ESPECIAL

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ABSTRACT

In March 2020, the World Health Organization (WHO) declared the disease caused by the SARS-CoV2 virus, known as COVID-19, to be a pandemic. The sporting world, too, is suffering from the global effects of this disease, with the postponement or cancellation of competitions, including the 2020 Tokyo Olympic Games. As a proposal for containing the disease, social isolation was declared. Despite the importance of this measure, it was harmful for Olympic athletes, as they had to stay away from their training site and trainers, as well as their interdisciplinary teams. It is therefore important to study this harm caused, in order to minimize it. In general, it is believed that regular physical activity is associated with improved immune system functioning. The lack of training can therefore have significant consequences for the performance and health of the Olympic athlete. From the athlete's point of view, the impaired immune system, due to the reduced frequency of physical exercise, leaves them more vulnerable to contracting or developing infections or other diseases. The risk of harm due to the decreased performance of preventive works is also evident in this population. The reductions in training load and intensity can cause changes in the athlete's body composition and affect various aspects of cardiorespiratory fitness, as well as reducing strength levels and muscle potency. In relation to the athlete's mental health, two aspects are particularly challenging: isolation and uncertainty. Based on the possible harm caused by social isolation, the need is seen for a specific and joint work, in an attempt to minimize it. This work addresses the following topics: (I) context: transmission, symptoms, diagnosis, treatment, discharge criteria, isolation and post-pandemic consequences; (II) harm and proposals: nutritional, physiological, biomechanical and psychological. ***Level of evidence II; Review Article.***

Keywords: SARS-CoV-2; Physical activity; Sports.

RESUMO

Em março de 2020, a Organização Mundial da Saúde (OMS) declarou como pandemia a doença causada pelo vírus SARS-CoV2, conhecida como COVID-19. O mundo do esporte acompanha e sofre os efeitos globais dessa enfermidade, com o adiamento ou cancelamento de competições, inclusive os Jogos Olímpicos de Tóquio 2020. Como proposta para contenção da doença, foi determinado o isolamento social. Apesar de importante, esta medida traz danos aos atletas olímpicos pelo afastamento do local de treinamento e de treinadores, assim como de sua equipe interdisciplinar. Portanto, entende-se a importância de estudar esses danos a fim de minimizá-los. De forma geral, acredita-se que a atividade física regular esteja associada à melhora do funcionamento do sistema imunológico. Assim, a falta de treinamento pode levar a consequências importantes para o desempenho e a saúde do atleta olímpico. Do ponto de vista da saúde do atleta, o comprometimento do sistema imunológico pela redução da regularidade do exercício físico deixa o atleta mais vulnerável a contrair e desenvolver infecções ou outras patologias. Além disso, o risco de lesões considerando a diminuição da realização dos trabalhos preventivos é evidente nessa população. As reduções da carga e da intensidade de treino podem provocar mudanças na composição corporal do atleta e afetar diversos componentes da aptidão cardiorrespiratória, assim como reduzir níveis de força e potência muscular. Com relação à saúde mental do atleta, dois aspectos são os mais desafiadores: o isolamento e a incerteza. A partir dos possíveis danos causados pelo isolamento social, entende-se a necessidade de um trabalho específico e em conjunto, na tentativa de minimizá-los. Neste trabalho serão abordados os seguintes tópicos: (I) contexto: transmissão, sintomas, diagnóstico, tratamento, critérios de alta, isolamento e consequências pós-pandemia; (II) danos e propostas: nutricionais, fisiológicas, biomecânicas, bioquímicas e psicológicas. ***Nível de evidência II; Artigo de Revisão.***

Descritores: *SARS-CoV-2; Atividade física; Esportes.*

RESUMEN

En marzo de 2020, la Organización Mundial de la Salud (OMS) declaró como pandemia a la enfermedad causada por el virus SARS-CoV2, conocida como COVID-19. El mundo del deporte acompaña y sufre los efectos

globales de esa enfermedad, con la postergación o cancelación de competiciones, inclusive los Juegos Olímpicos de Tokio 2020. Como propuesta para contención de la enfermedad, se determinó el aislamiento social. A pesar de importante, esta medida trae daños a los atletas olímpicos por el alejamiento del local de entrenamiento y de entrenadores, así como de su equipo interdisciplinario. Por lo tanto, se entiende la importancia de estudiar esos daños a fin de minimizarlos. De forma general, se cree que la actividad física regular esté asociada a la mejora del funcionamiento del sistema inmunológico. Así, la falta de entrenamiento puede llevar a consecuencias importantes para el desempeño y la salud del atleta olímpico. Desde el punto de vista de la salud del atleta, el compromiso del sistema inmunológico por la reducción de la regularidad del ejercicio físico deja al atleta más vulnerable a contraer y desarrollar infecciones u otras patologías. Además, el riesgo de lesiones considerando la disminución de la realización de los trabajos preventivos es evidente en esa población. Las reducciones de la carga y de la intensidad de entrenamiento pueden provocar cambios en la composición corporal del atleta y afectar diversos componentes de la aptitud cardiorrespiratoria, así como reducir niveles de fuerza y potencia muscular. Con relación a la salud mental del atleta, dos aspectos son los más desafiantes: el aislamiento y la incertidumbre. A partir de los posibles daños causados por el aislamiento social, se entiende la necesidad de un trabajo específico y en conjunto, en la tentativa de minimizarlos. En este trabajo serán abordados los siguientes tópicos: (I) contexto: transmisión, síntomas, diagnóstico, tratamiento, criterios de alta, aislamiento y consecuencias postpandemia; (II) daños y propuestas: nutricionales, fisiológicas, biomecánicas, bioquímicas y psicológicas.
Nivel de evidencia II; Artículo de Revisión.

Descriptores: *SRAG-CoV-2, Actividad física; Deportes.*

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INTRODUCTION

On March 2020, the World Health Organization (WHO) declared a pandemic state by the disease caused by the SARS-CoV2 known as COVID-19. The sports community take part in the global effects from this disease. Many competitions were postponed or cancelled, including the Olympic Games from Tokyo. Besides that, training facilities were closed and the athletes had to adapt their training schedules.

TRANSMISSION

The disease is transmitted from person to person mainly by respiratory droplets. When an infected individual coughs, sneezes or speaks he releases the virus and can contaminate other one when the droplets get in touch to mucous membranes. The transmission can also occurs in case someone touches a contaminated surface and then moves his hands to eyes, nose or mouth, since there is evidence that the virus stays viable in many surfaces for hours to days[1].

SYMPTOMS

COVID-19 has a widely clinical presentation varying from asymptomatic to severe infection. According to World Health Organization (WHO), most patients (almost 80%) will be asymptomatic or will present mild symptoms. Approximately 20% will need hospital attendance due to breath shortness and from those ones 5% could need ventilatory support. Some risk factor have been identified in the development of severe disease, as age > 60 years, heart disease, decompensated or severe pneumopathy, immunosuppression, diabetes, kidney diseases, obesity and risky pregnancy[1].

The virus incubation period varies from 2 up to 14 days. The symptoms mostly appears after 5 days from the exposition. Studies shows that an infected person could transmit the virus during the asymptomatic period. This suggests the transmission can occur even without the emergence from any symptom. The most common symptoms are fever (83-99%), cough (59-82%), fatigue (44-70%), anorexia (40-84%), dyspnea (31-40%) and myalgia (11-35%). Other symptoms like sore throat, headache, rhinorrhea, diarrhea, anosmia and ageusia were also reported. The main complication is the acute respiratory distress syndrome[1].

DIAGNOSE

A diagnostic suspicion arises from a clinical-epidemiological investigation and physical exam. It is important to question about travelling and close contact to sick people. The etiological diagnose to identify the SARS-CoV2 virus is made using techniques such as RT-PCR point of care or sorologic rapid test either validated for reference institutions[1].

The most frequent laboratorial finding is lymphopenia. Elevated levels of lattice dehydrogenase (LDH) and ferritin are common and variation in hepatic enzymes are observed as well. High levels of D-dimer and severe lymphopenia seems to be related to an increase in mortality risk[1].

In radiology, bilateral infiltration and ground-glass opacities, mainly basal, peripheral and posterior, are the most described findings in thoracic X-ray and tomography, respectively[1].

TREATMENT AND VACCINE

The treatment of COVID-19 depends from patient's clinical presentation and risk factors. Patients without viral pneumonia or hypoxia could be treated in a home based care, focusing in prevention measures and monitoring the symptoms. The clinical support is directed to hydration and use of antithermic medication and analgesics, if necessary[1,2].

Some patients could develop more severe disease and will have to take hospital attendance with oxygen therapy. Until now there is no specific treatment approved. WHO and the Centre of Disease Control (CDC) do not recommend the use of glucocorticoids unless there is another specific recommendation for its use. A large number of ongoing studies are exploring the antiviral treatment, but the drug's efficacy is still lacking. The hydroxichloriquine and chloroquine have been reported as potentially in vitro inhibitors of SARS-CoV2. Other drugs as remdesivir, lopinavir-ritonavir, IL-6 inhibitors and convalescent plasma are also being tested[1].

Vaccines are still in a development phase and should not be available until 2021.

DISCHARGE CRITERIA

The CDC strategy for end of isolation is based on availability of tests.

Test based strategy:

- Absence of fever without any medication; and

- Improvement of respiratory symptoms; and
- Two negative consecutive COVID-19 tests in 24h intervals.

Strategy when tests aren't available:

- At least seven days of isolation after symptoms onset; and
- Absence of symptoms for at least three days without using any antipyretic medication[1,2].

Ways to contain dissemination: isolation and prevention

COVID-19 is thought to disseminate by respiratory droplets and because people get close to an infected person. Usually the symptoms are present, although the asymptomatic ones are capable to spread the virus. Therefore, the best measure to prevent the disease is to avoid exposition to the virus. The following measures are recommended to shorten the transmission:

- Wash your hand using soap and water for 20 seconds, or use disinfectants or alcohol 60% as an alternative. Do this after touching objects and surfaces;
- Cover your nose or mouth when you sneeze or cough;
- Avoid touching your face, specially nose, eyes and mouth;
- Don't share personal objects;
- Don't get close to sick people;
- Keep the environment well ventilated;
- Avoid crowded spaces and keep 2 meters distance from other people;
- After new data about transmission, is recommended the use of cloth masks that can be made at home with low cost materials.

Most countries are adopting social distance as a public health measure. This and other measures when properly taken show a positive association in reducing the spread of virus transmission and allow the government entities to expand the structure and capacity of the health system[1].

POST-COVID-19 CONSEQUENCES FOR SPORT COMMUNITY

As the whole world get affected, also the sport community feel the effects of the COVID-19 pandemic. The health management team has the responsibility to guide and to take care of athletes and staff members promoting prevention from getting ill and keeping them safe when returning to train after the isolation period. If any athlete got the COVID-19 it is expected to have a mild clinical presentation, since they are mostly young and without previous diseases. However, chronic complications as post infection myocarditis are possible. Therefore the sport physician is challenged to define how long an athlete that had COVID-19 should be removed from training and when to allow the full participation. As SARS-CoV2 is a new virus this answers are lacking and more studies are needed.

Damages provoked by social isolation and proposals to minimize it

Exercise and Immunity

There is a belief that regular physical activity is associated with a boost in the immune system. Studies have shown that moderate exercise relates to an increase in the vaccinal response, lower levels of senescent T cells, increase in T cells proliferation, inflamatory citokynes reduction, increase in fagocyte activity from neutrophils, greater cytotoxic activity from NK cells and an increase in IL-2 production[3]. On the other hand some papers claim that a bout of high intensity or prolonged (> 1,5h) exercise induces a transitory immunossupression that lasts approximately 72h, which increases the risk of infection[4]. Indeed it is reported an increase up to 500% in the risk of infection after an ultra-endurance event[3]. The respiratory system leads the list of illness complaints among athletes during competition. In the Olympic Games from Rio 2016, it has been responsible for 47% of the reported illness[5]. Besides that, it is not possible to blame exercise as the only responsible for this immunossupressive state. Other factors such as sleep, nutrition, emotional stress and environmental exposition could be as relevant as physical activity.

Nieman proposes a relationship between exercise intensity and the infection risk in a way that it presents itself as a J shaped curve, with the extremities representing the higher risk of illness[3]. Considering the confinement context, we should look after the immunological effects of lowering the intensity of physical activity or the physical inactivity. Posteriorly, Gleeson[6] proposed that the curve should be flattened, arguing there is some difference in clinical evidence between sedentary and physical active (moderate) people. Than in moderate intensity and volume of exercise, the curve is flatten (Figure 1). On the other hand, Malm considered that athletes are capable of increasing exercise intensity and volume without increasing infection risk. By this thought, we got an S shaped curve, including athletes as a group in which the immunological system can tolerate extreme exercise conditions without increasing the risk of infection. Therefore, the elite athletic population is less susceptible to illness than general population[7].

An International Olympic Committee Consensus suggests that either high or low exercise intensity could be associated with increased risk of illness[5]. A study with elite cyclists in Denmark shown less NK cells activity during winter, when there is lower training volume[8]. We still can find reports of reduction in NK cells levels[8], lower levels and proliferation of lymphocytes, increase in granulocytes levels, reduction in monocytes levels and an increase in T senescent levels[9]. By the same way, there are reports that physical inactivity is associated with an accumulation of visceral adipose tissue followed by a persistent inflammatory state[9]. This chronic inflammation is involved with insulinic resistance, atherosclerosis, neurodegeneration and tumor growth[10].

The stress related to social isolation and confinement could dysregulate the hippotalamus-pitutary-adrenal axis (HPA) producing increase in cortisol levels[11]. When chronically elevated this hormone has negative effects on the immunity and the immune cells activity. Studies evidence that high cortisol levels are related to reduction in NK cells activity, impaired response from T lymphocytes[12] and altered levels of pro-inflammatory citokynes, as TNF-α, IL-1 e IFN-γ[13].

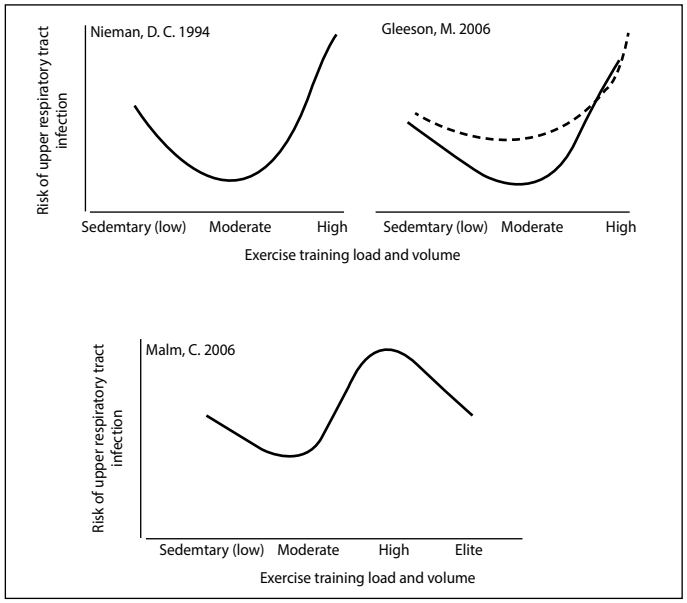

Figure 1. Risk of upper respiratory tract infection. The J-shape model proposed by Nieman (1994) followed by the flattened curve proposed by Gleeson (2006) and Malm's S-shape curve (2006).

ENERGETICS AND NUTRIENTS READJUSTMENT

Total energy expenditure is defined by the sum of basal metabolic rate (BMR), the thermal effect of food, the energy expenditure of physical activity, associated with the thermal effect, and in some cases of growth[14]. High-performance athletes have specific energy needs in order to satisfy the demands of training sessions, the daily macro and micronutrient levels for their metabolic functions (mainly in the hormonal and immune systems), assist in the modulations of the body composition compatible with sports practices and an adequate recovery[14].

The change in habits, as a consequence from social isolation and the prolonged stay at home, favor a certain degree of inactivity. There is a reduction in energy expenditure and, so, the need to readjust the distribution of macro and micronutrients in the usual diet[14]. These readjustments must be made individually.

An imbalance between energy intake and expenditure can result in changes in body composition, increased risk of muscle injury, fatigue, increased recovery time, menstrual cycle disorders, immune changes, fostering anxiety, and even Relative Energy Deficiency in Sport (RED-S). Therefore, the management of energy and nutrient requirements in athletes is an important component of the development of nutritional plans and recommendations for sports performance in the pandemic period of COVID-19[14].

A balanced feeding is essential to maintain adequate health, including the functioning of the immune system[15]. The nutrients are essential for the development, maintenance, and control of immune responses and a deficient or inadequate food intake is often associated with an increased risk of infectious, allergic, and inflammatory diseases[16].

Carbohydrate intake is a fundamental part of an athlete's diet, whether for performance optimization or recovery, especially during exercise. However, a restriction of carbohydrate intake can compromise immune functions[14]. Carbohydrates affects the immunity in a direct or indirectly pathway, respectively, serving as an energetic substrate for cells of the immune system or limiting the response of hormones, such as glucocorticoids and catecholamines, hypoglycemia during and after exercise[16]. Bishop et al found an association between high pre-exercise carbohydrate levels and an attenuation of the inflammatory cytokine response (IL-6, IL-10, and IL-1ra)[17]. Despite this, carbohydrate supplementation during exercise seems to have little effect on salivary IgA and the activity of NK cells[16]. According to this context, it is recommended that the diet of elite athletes should be composed of at least 50% of carbohydrates[18] and the higher consumption of carbohydrates does not seem to have more benefits.

Although most athletes consume adequate amounts of protein, some individuals may restrict this macronutrient below their daily recommendations, such as when trying to control weight. This behavior can favor the compromise of the immune system and susceptibility to opportunistic infections[16]. Amino acids are involved in a wide variety of actions in the human organism, for example serving as a substrate in protein synthesis and neurotransmitters. Regarding the immune system, the most studied amino acid is glutamine, which is an energetic substrate for immune cells such as lymphocytes, macrophages, and neutrophils[14]. Besides that, adequate-protein consumption helps to reduce the loss of lean mass in a period with less volume and intensity of training.

Lipids from the diet can also modulate the immune system through several mechanisms, including the reduction of lymphocyte proliferation, reduction of cytokine synthesis, increased phagocytic activity, and modification of NK cells activity. In this scenario, we highlight the essential fatty acids: the n-3 series, derived from linolenic acid; the n-6 series derived from linoleic acid; as well as the n-9 series, derived from oleic acid and the family of non-essential fatty acids[19].

Adequate hydration helps in the homeostasis of body fluids and maintains constant saliva production. Salivary secretion has in its composition several antimicrobial and antiviral proteins, standing out immunoglobulin A, lysozyme, β-amylase, lactoferrin, and defensins. Also, alcohol consumption depresses the immune function for several hours and should be discouraged during this period of social isolation[19].

About micronutrients, vitamin B1 performs an important role in several places in the intestine, favoring the metabolism of fatty acids in the modulation of the immune system[20]. Vitamin D has a fundamental role in bone health, muscle function, and immunological aspects, mainly in reducing the risk of respiratory infections[16]. Vitamin C is a potential antioxidant and an important component to support immune health, especially in athletes. Vitamins A, E, and B12, folic acid, iron, selenium, and zinc also perform a fundamental role in the development of immunocompetence[20]. The polyphenols and carotenoids compounds, widely present in fruits and vegetables, are antioxidants and beneficial for immune function[16].

The intestinal microbiota has an important function in the immune system and can be modulated by dietary changes. Probiotic and prebiotic actions can beneficially alters the intestinal environment, favoring interaction with the intestinal lymphoid tissues, contributing to gastrointestinal health, and reducing the incidence of infections. The β-glucans present mainly in whole foods, also have this modulating role[16].

The choice of fresh or minimally processed foods should be the basis of feeding, limiting the consumption of processed foods, and avoiding ultra-processed foods. Eating accompanied by another person, with attention, in quiet and clean places is encouraged. Avoid the consumption of fast food, minimize the trip to the supply centers during a pandemic, sanitize food inputs before consumption or storage, prioritizing the full use of food, observing the validity on product packaging, and performing a dimensioning of the menu of meals to be prepared, are also key points of food during the COVID-19 pandemic[15].

DETRAINING

Cardiorespiratory Detraining

Detraining can affect several components of cardiorespiratory fitness. Mujika and Padilla presented the effects of short (up to 4 weeks) and long (over 4 weeks) detraining in an extensive review organized in two manuscripts[21]. Among the studies cited, we highlight the essential experiments carried out in the 80s and 90s, which describes in a comprehensive and sophisticated approach the physiological repercussions of detraining in small samples composed mainly of endurance athletes, such as long-distance runners and cyclists. Regarding cardiorespiratory fitness, maximal oxygen consumption (VO_{2MAX}) can be reduced by up to ~ 7% in the first three weeks[22], reduced by ~ 3 to 14% in 8 weeks[22] and up to ~ 18% after 12 weeks[22]. The reduction in VO_{2MAX} seems to be related to a decrease in blood volume. Coyle et al[22] found a ~ 9% reduction in blood volume, mainly attributed to a ~ 12% reduction in plasma volume, in 2 to 4 weeks of detraining, in addition to increases in heart rate and total peripheral resistance. The authors also demonstrated that the expansion of blood volume to absolute values before detraining reversed the effects on cardiovascular responses. The reduction in VO_{2MAX} seems to occur in parallel with a decrease in maximal ventilatory volume[22].

The interruption of training can increase the maximal heart rate from 3 to 5%[22] in two weeks and seems to stabilize since then[22]. Other cardiovascular repercussions can occur, such as a reduction in the stroke volume in the submaximal exercise of ~ 10 to 14%[22], a reduction in the maximal

cardiac output of ~ 7 to 10% and the estimated left ventricular mass[23]. Concerning the peripheral component of cardiovascular fitness, detraining seems to yield small changes in the capillarization of athletes, which even after this period remains superior to sedentary individuals. However, a ~ 7% reduction in arteriovenous difference was observed after 12 weeks of detraining from the same group of athletes[22]. Regarding the types of muscle fibers, detraining seems to reduce oxidative enzyme activity[22], in addition to a decrease in the proportion of type 2a fast fibers accompanied by an increase in the proportion of type 2x fibers[24]. Detraining can still increase the respiratory exchange ratio (RER) by ~ 3% at maximal intensities and between ~ 2 and 8% at submaximal intensities[22], suggesting an alternation of lipid to glycemic metabolism during exercise.

Consequently, the performance also decreases with detraining. In exercise tests, a reduction of ~ 7 to 21% in time to exhaustion was observed after two to four weeks without training[24]. Regarding the cardiorespiratory and performance parameters, a decrease of ~ 11% was found for VO_{2MAX}, in addition to ~ 8, 15 and 13% reductions in maximal power outputs and in the 1 and 2 ventilatory thresholds, respectively.

Autonomic activity is also affected by detraining. This parameter is monitored through heart rate variability (HRV), a non-invasive technique that has been used as a supporting tool in monitoring training load[25]. Morning and post-training HRV records can give indications of the training status, especially for endurance athletes, since an association between HRV and performance has been observed. Pereira et al[26] found that after 4 weeks of training interruption, the reduction in resting HRV was accompanied by a decrease in performance in a 3000m time trial in long-distance runners. Despite this, the heart rate of recovery and HRV post-training were not different from the values before detraining.

Detraining strength and muscle control

The production of muscle strength depends, among other factors, on the cross-sectional area of the fiber, on the cross-sectional of the muscle, the number of motor units recruited, the firing frequency and the temporal synchronization of these neural impulses. Increasing any of these properties raises strength levels during muscle contraction. These studies have highlighted the effect of the detraining on some of these factors and, then, in the muscle strength and power[21,27,28,29].

In a review study, Mujika et al[21] highlighted that athletes showed slight reductions in concentric, isometric and isokinetic strength of the knee and vertical jump after 2 weeks without training, but not significant. However, a significative decrease (8-13%) was observed in the myoelectric activity of the vastus lateralis and isokinetic eccentric extension force. Trained swimmers maintained muscle strength after 4 weeks of inactivity, but their ability to apply force in the water was markedly reduced (-13.6%). The newly acquired isometric strength gains were lost at a slow rate. On the other hand, after 4 weeks without training, the isokinetic strength decreased at a much higher rate, despite remaining above pre-training values, both in adults and in children.

Also according to Mujika et al[27], in up to 4 weeks of detraining, the cross-sectional area decreases rapidly, especially in strength athletes. However, these athletes still have muscle characteristics above sedentary ones, with a quick recovery to the base levels as they return to training. After 4 to 8 weeks, the high performance athletes may experience significant loss of eccentric strength, specific power to the sport and isokinetic strength. And after over 8 weeks, the number of oxidative fibers may suffer a decrease in endurance athletes and an increase in strength athletes.

For Tran et al[30], the effect of detraining for 4 weeks caused a considerable drop in the height of the vertical jump (-5.3%), in the peak vertical velocity (-3.7%) and in the isometric strength (-5.5%). In addition, the sensorimotor capacity decreased, indicating that the athletes took longer (61.4%) to reach stability in a landing task.

Vassilis et al[29] observed no significant effect on isokinectic strength results among young soccer players after 4 weeks of detraining. According to the authors, the athletes in this age range can hold the benefits of conditioning (neuromuscular adaptations) for a longer time compared to adults.

In a recent review study, Sousa et al[28] reported that most of the gains induced by simultaneous strength and resistance training were reversed after 2 to 4 weeks of detraining. In addition, although intense training promotes greater aerobic and neuromuscular adaptations, it seems that higher loads of resistance training combined with low intensities of aerobic training allow an increase of strength and reduce the loss after the detraining.

According to the data presented, the main effects in athletes have been reported in the first four weeks of detraining. Significant reductions in eccentric strength and in the muscle power, especially for athletes with high sports dependence and/or recent gains in these physical capacities are worth noticing. Moreover, loss of muscle control in landing tasks were observed. Thus, it is recommended that the maintenance program in this phase of social isolation, with lower intensity and sport specificity, must include eccentric force and sensorimotor stimulus to minimize the deleterious effects of the detraining and promote a return to baseline levels of physical fitness in a shorter period of time.

PHYSIOTHERAPY

As we work with elite athletes, there is always a concern about injuries, not only by the athlete itself, but also in the multidisciplinary team. To understand the risk factors associated to injuries is essential to elaborate preventive interventions. The theoretical model of complexity regarding these injuries constitutes a non-linear relationship between the risk factors and the presence of injuries, which can also be justified by the relationship between capacity and demand[31]. This model also illustrates the multifactorial characteristics of the sports injuries, which has intrinsic and extrinsic aspects that relates to the determination of risk.

The intrinsic factors are divided in changeable and non-changeable and both are relevant either in protection or in risk of getting injured. One of the most important risk factor is the presence of a previous injury, which predisposes a new injury independently of any other. On the other hand, the extrinsic risk factors relate to exposition, such as environmental conditions, types of sport ground, sport equipment, rivals and many others. It is important to observe that both intrinsic and extrinsic factors are dynamic and could change even during a single training session[31].

During this pandemic period, most athletes reduced their training loads. Such decrease in training have a negative impact on muscles, mostly because there is a reduction from stress related physiological indicators as described before. Load determination is extremely important in regards to sport performance and injuries[31]. Some papers associate the increase in injury risks to training loads[31]. Therefore, in a social isolation context and consequently detraining, the athletes are probably more susceptible to injuries. The main characteristic of this moment is an excessive increase in internal load and a heavy decrease in external load.

Studies demonstrates that load monitoring and management should be fundamental to all injury prevention programs in athletes. In that way, the workload seems to be the most important in primary, secondary and tertiary injury prevention programs[31]. There will be no effect at all in monitoring the load if there is no changes in training loads. Therefore, the training type also has influence in injury occurrence. Monotony

training sessions with high volume as well as movement repetitions are related to overuse injuries.

Considering the actual pandemic and social isolation state, it is necessary to plan a training program in order to maintain the athletes active and minimize the decreases in sports performance as much as possible. The training prescription should respect individuality from each athlete and take into account previous or actual injuries. Risk factors related to this moment, as changes in body composition, detraining and anxiety are important. Besides that, the exercises must be simple, as they are going to be done at home, with or without any equipment. Pictures or videos can be used to explain the exercises and technology plays a key role in the follow-up.

MENTAL HEALTH

In relation to the athlete's mental health, two main aspects are more challenging, as Huremović[32] says: isolation and uncertainty. The effects of social interaction in mental health promotion and prevention are well known. The affection bond and social support are considered the most important. In a context of social isolation, it is natural that the interactions keep another way, if they don't cease completely. This could promote feelings of solitude and changes in mood. Athletes and physical active people have their relationship connections facilitated by the sports activity and ending it can cause prejudice and effects in the subjective well-being. The social isolation is a measure of public health to help the battle against SARS-CoV2 and should not be avoided. Nevertheless, preventive strategies are important to minimize the damages caused by social isolation in the athlete's mental health[32].

The uncertainty related to a pandemic situation is almost solid. There are no answers, deadlines and definitions, which ceases planning and increases the fear of future scenarios. Such reality affects directly the athlete's daily life and training programs. Symptoms of depression and anxiety are common as well as expected[32], since the athletes doesn't have the governance and this could lead to a sensation of hopelessness and helplessness. Than it is important to reduce those potential damages. To achieve this, it is important to involve the athletes in the decision making process of their careers. They should be stimulated to adopt a routine that respects the limitations of the moment and the available resources. And they must accept there is no way to control everything and head their efforts to things they could do[32].

In a recent review about psychological effects of quarantine, most studies reported negative results related to post traumatic stress symptoms, confusion and anger. The stressors included long period of quarantine, fear of infections, frustration, insufficient supplies, insufficient information, monetary losses and stigmatization[33]. Although, some individuals have a greater risk of developing more severe psychopathological complaints, which makes the presence of a mental health professional indispensable at this moment.

Besides all the issues related to the pandemic and it's effects, inside the sports community there is a concern about the schedule from competitions, especially the Olympic Games from Tokyo. This unleashes a new perspective in career management and new decision have to be taken. It is important to offer support and emotional validation in a moment of uncertainty. Even more, it is relevant to help the athletes to be mora compassionate and less critic, as greater objectives can not be achieved and there is a natural decrease in motivation[33].

CONCLUSION

Although inevitable as an alternative to contain COVID-19 contamination, social withdrawal can damage the immune system, compromise sports performance by altering body composition, impairing cardiorespiratory fitness, muscle strength and control, and mental and physical health. Therefore, understanding these damages is essential to adopt a strategy to minimize these losses.

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