Journal of Orthopaedics Study and Sports Medicine

Genesis-JOSSM-1(1)-04
Volume 1 | Issue 1 | 2023
Open Access
ISSN: 3139-5635

Psychosocial, Physical and Physiological Impact of COVID-19 Lockdown on Athletes: A Case Study of Bulawayo Athletics Clubs

Bhekuzulu Khumalo[1*] and Letwin Kudakwashe[2]

[1]Sports Science Department, Academy of Medical Sciences, Malawi University of Science and technology (MUST), Blantyre, Malawi

[2]Sports Science and Coaching Department, Faculty of Applied Sciences, National University of Science and Technology (NUST), Bulawayo, Zimbabwe

[*]**Corresponding author**: Bhekuzulu Khumalo, Sports Science Department, Academy of Medical Sciences, Malawi University of Science and technology (MUST), Blantyre, Malawi

Citation: Khumalo B, Kudakwashe L. Psychosocial, Physical and Physiological Impact of COVID-19 Lockdown on Athletes: A Case Study of Bulawayo Athletics Clubs. J Orthop Study Sports Med.1(1):1-12.

Received: June 9, 2023 | **Published:** June 22, 2023

Copyright© 2023 Genesis Pub by Khumalo B, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0). This license permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are properly credited.

Abstract

The 2019 corona virus (COVID-19) was a public health emergency of international concern and posed a challenge to psychosocial resilience. Government of Zimbabwe imposed nationwide lockdown. A development that disturbed athletes on their normal training programs. This case study was meant to survey the impact of the lockdowns on track and field athletes during the first COVID-19 wave. As athletics competitions continued to be postponed, athletes training programs were disturbed, accessing training facilities affected and with some athletes living in isolation. A descriptive approach was adopted to assess the state of about 200 athletes affiliated to seven clubs which are affiliates to Bulawayo Athletics Board (BAB). After the first two weeks, from the start of the first COVID-19 lockdown, a questionnaire was sent out to athletes and 33 participated in this study. The majority (65.51%) of the athletes did not feel lonely or left out of activities. Most of the athletes (79.31%) did not feel nervous or stressed, 65.51% felt too anxious as they avoided situations and objects. A majority (79.31%) trained with friends or relatives, while 65.51% trained with age mates, 72.41% with other athletes, 20.69% trained with non-athletes. 51.72% were athletes training once, 44.83% training twice and 3.45% training 4 times a day.

Some athletes missed training days or trained without a program, others failing to give feedback to their coaches. Lack of knowledge on resumption of competitions brought uncertainty, to athletes, coaches, parents and the rest of the significant others.

Keywords
Anxiety; Nervousness; Stress; Sports.

Introduction

Background to the study

The 2019 corona virus (COVID-19) epidemic is a public health emergency of international concern and poses a challenge to psychosocial resilience. The International Journal of Environmental Research and Public Health (IJERPH) (2020) states that the 2019 corona virus (COVID-19) epidemic is a global health threat and is by far the largest outbreak of a typical pneumonia since the severe acute respiratory syndrome (SARS) outbreak in 2003. The total number of cases and deaths exceeded those of SARS, within weeks of the initial outbreak.

According to IJERPH (2020), the outbreak was first revealed in late December 2019 when clusters of pneumonia cases of unknown aetiology were found to be associated with epidemiologically linked exposure to a seafood market and untraced exposures in the city of Wuhan of Hubei Province, of China. The IJERPH (2020) say that COVID-19, similarly to SARS, is a beta corona virus that can be spread to humans through intermediate hosts such as bats, though the actual route of transmission is still debatable. The transmission from human-to-human has been observed via virus-laden respiratory droplets, as a growing number of patients reportedly did not have animal market exposure, and cases have also occurred in healthcare workers (IJERPH, 2020). By December 2019, transmissibility of COVID-19 as indicated by its reproductive number was estimated at 4.08, suggesting that on average, every case of COVID-19 will create up to 4 new cases.

By 30 January 2020 the World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency of international concern. The ongoing COVID-19 epidemic had induced fear, and a timely understanding of mental health status was urgently needed for the general population. Since the outbreak, response efforts by the Zimbabwean government were swift, in an unprecedented move to retard the spread of the virus and declared COVID-19 a national disaster on 27th of March 2020. The Zimbabwean government began nationwide lockdown, with travel restrictions, on 30 March 2020 for three weeks. The lockdown was eased and later extended indefinitely on 16th of May 2020 with two-week reviews. For the first three weeks of lockdown as the numbers of COVID-19 were escalating athletics competitions continued to be postponed till further notice and this development disturbed athletes on their training programs. “Use it or lose it", may well be something you have heard of a million times before, but when it comes to your fitness, it is well worth remembering, "You are only as good as your last training session," said sports scientist [1]. In 2017, researchers analysed the performance levels of soccer referees in the period between the end of the competitive season and the preseason (Two to four weeks). They noted a significant decrease in sprinting ability, cardiovascular fitness, and distance covered. Muscle strength fades after just two weeks of inactivity and fitness takes hard work to gain, [2].

[3] research reveals that it only takes two weeks of not using their legs for young people to lose a third of their muscular strength, leaving them at the same level with a person who is 40-50 years older. According to [4] positive energy balance during physical inactivity is associated with fat deposition, associated with systemic inflammation and activation of antioxidant defences, exacerbating muscle loss. These harmful effects of inactivity can be reduced by routine exercise practice, but the exercise dose–response relationship is currently unknown. Nevertheless, low to medium-intensity high volume resistive exercise, easily implementable in home-settings, will have positive effects, particularly if combined with a 15–25% reduction in daily energy intake.

Since COVID-19 started to take its way across the globe it has affected athletes and sport organizations in a number of ways, says [5].In the COVID-19 lockdowns era athletes were facing restrictions of training and congregating anytime they want with closed borders, closed training centers and millions of people living in isolation. There were uncertainties and anxieties about when qualifiers will be held, how to maintain physical and psychosocial fitness and training, and whether the Athletics Competitions will occur in the "Olympic" year, 2020. There were numerous champions who believed the competitions should go ahead as planned while others supported them being postponed or cancelled.

Athletes would find themselves feeling alone and isolated as those around them would not understand their experiences and would not be able to provide the comfort they need [5]. There were feelings of helplessness and fear as either athlete, their teammates are tested for COVID-19 and await the results. Their support structures were physically disbanded. Some athletes were trapped in foreign countries unable to return to their home countries. The threat of severe illness worldwide can also create fear of never making it home. Athletes were under pressure to reschedule their training program if they had any, while trying to stay physically fit at home. United Nations (UN), 2019 in www.un.org, added on to say that some athletes were at risk of losing their professional sponsors who may not continue as agreed.

UN, [6] of the view that cancellation of competitions impacts on social benefits which cement social cohesion, identification of fans with athletes leading to greater physical activity of athletes. Sports have been considered a valuable tool in fostering effective communication, building bridges between communities and generations. Major sporting organisations have shown efforts to reduce the spread of the novel Corona virus for the safety of athletes. COVID-19 outbreak has resulted in the closure of gyms, stadia, pools and all physical activity centers, only essential services, travel and shopping were allowed and exercise outside individual property boundaries was not allowed, likely having a psychological impact on all, including athletes (www.elsevier.com/locate/jsams) however, many athletes are not able to actively participate in their regular activities other than their usual training facilities (UN, 2019 in www.un.org). Lack of access to exercise and athletic training can increase the chances of stress, anxiety, depression. Training comfortably and effectively at home with limited space depends with the family set up, it can be possible for some athletes and impossible for some. Most trainings were not supervised by the coach for the few athletes who manage to train at home.

[7] continued to say that the sudden halt in sports has thrown some athletes off their lane into a wave of emotions which include frustration, stress, anxiety, anger, fear and disappointment. The emphasis of

mental health in athletes must be addressed and cannot be accomplished without providing adequate psychological support to the athletes. Assuming a reduction in bio-motor abilities, athletes are at high risk of getting injuries when transitioning from an unprecedented COVID-19 lockdown to high level sport specific practice. According to link.springer.com these injuries likely represent career changing and career ending moments for professional athletes. With this massive disruption inflicted on sports community athletes have to cope as effectively as possible with the crisis and respond to it in the most positive and constructive way.

As humans we like to feel safe, secure, and comfortable. Unfortunately, crises cause reactions that are decidedly uncomfortable, not to mention a threat to our survival. Crises create unfamiliarity, unpredictability, uncertainty, discomfort and loss of control. The COVID-19 was one of those crises. The cancellation and or postponement of the rest of the competitive season in every sport in all levels was one of the biggest impacts COVID-19 had on sports. Changes to the sports world left everyone in a state of shock, disbelief and distress. Human kind had more questions than answers. For parents, friends, relatives, spouses and other important people around athletes may experience suffering having to see their loved ones' hopes and dreams of finishing the competitive season dashed, having to deal with their own grief from having invested considerable money, countless hours, and undeterminable emotions supporting their athletic aspirations. For coaches, the costs are similar to those of parents with the added pain of not being able to ply the trade that is their professional identity, career, livelihood, and passion.

Researched data was needed to develop evidence-driven strategies to reduce adverse psychosocial physical and physiological impacts during the COVID-19 lockdown. The aim of case study was to survey the psychosocial, physical and physiological impact of COVID-19 lockdown on athletes of Bulawayo based athletics clubs to understand better their levels of psychological impact, anxiety and stress during the initial stage of the COVID-19 outbreak.

Methods

A case study design was followed focusing on psychosocial, physical and physiological impact of COVID-19 lockdown, using a conveniently accessible sample of athletes. It was import to find out how COVID-19 brought adjustments, as athletes had to adapt to the new developments hence modifying their training whilst keeping an eye to the uncertainty and unknown new dates of meeting. The study confined itself to track and field athletes in Bulawayo, Zimbabwe. The researchers did seek permission largely from the coaches, parents or managers to have athletes completing the questionnaire.

Participants

Bulawayo based track and field athletes, were the targeted participants in this study. The eligibility criteria for this study were based on belonging to any of the seven Bulawayo athletics club affiliated to the_Bulawayo Athletics Board (BAB). These clubs had about 200 athletes who were active before lockdown. A convenience sample was obtained from the seven clubs and recruited through BAB offices, these were elite, semi-elite and amateur athletes who were more than 10 years of age. All athletes had equal chance of being part of the study, however only those who had access of completing online and those who managed to visit the BAB offices participated.

Aim

The aim of this study was to assess the psychosocial, physical, and physiological impact of the first COVID-19 lockdown of March † on track and field athletes.

Objectives

1. To assess the psychosocial, physical and physiological, state of track and field athletes during the first COVID-19 lockdown of 2020.
2. To compare the impact, of the COVID-19 lockdown of 2020, on athletes' psychosocial, physical and physiological, wellbeing, by age and event.

Questions

1. How were the psychosocial, physical and physiological, state of track and field athletes during the first COVID-19 lockdown of 2020?
2. What was the impact, by age and event, of the COVID-19 lockdown of 2020, in Bulawayo, Zimbabwe, on athletes' psychosocial, physical and physiological, wellbeing?

Data collection process

In May 2020, within a lockdown imposed in Zimbabwe a questionnaire was sent out to athletes affiliated to Bulawayo based clubs, either distributed via Whatsapp or dropped at the BAB offices where athletes could drop in to complete the forms at their convenient times. Precautionary measures against COVID-19 were taken to avoid face to face interaction with the respondents, hand sanitising, always wearing masks and social distancing during their visit to the BAB offices for completion of questionnaires. The questionnaire looked at the challenges the athletes experienced during the lockdown period. The questionnaires were distributed after the first two weeks, from the start of the lockdown. The only questionnaires considered, were those completed from day 15 to day 21 of the first lockdown, as exercise physiology says "match fitness" is lost within the first two weeks of inactivity. The questionnaire, developed to capture athlete's bio-data, social, physiological, psychological aspects, how an athlete adjusted to the new era of COVID-19, was designed using questions from previously used questionnaires such as the sport anxiety scale- 2, and the researchers also added own questions, before it was further tested through piloting with a small sample. Bio data such as athletic event, age, marital status, relationship, education, monthly income, drinker, smoker, were captured. Frequency of training and exercise in a day or weekly, duration of training sessions, training program if any, how effective was training during the first twenty-one days of lockdown. For physiological responses, there are questions on missed training days, weight changes and maintenance, difficulty or changes in sleeping patterns. Questions about the concentration, nervous, anxious, stress, worried, feedback to the coach or trainer, belief of readiness if competitions would resume, were meant to assess the psychological state of the athlete. Information about where and with who the athlete lived, any friends, siblings, training partners, changes and safety at home, support from friends and family on training during lockdown, was also required.

A total of 50 questionnaires were distributed, 33 were returned, of the 33 four (4) had missing information hence only 29 were used in data analysis. Epidata 3.1 was used for data entry and SPSS 16.0

was used for descriptive statistics for deriving the percentages and cross tabulations comparing responses either by age and event group.

Results

This section presents the demographic data, comparison of athletes' response by event group specialization and by age. Most of these athletes were still school going hence living under the guidance of family, they were not breadwinners, they earned less than one hundred United States dollars a month this indicated that for the first 21 days of lockdown they had ample time to do a lot but the restrictions did not allow which then led to less of inactivity deteriorating of physical fitness. Within the age group 10 – 15 years, there are 2 (6.90%) sprinters, 1 (3.45%) middle distance and 2 (6.90%) jumpers. For the 16 – 20 years group it is 2 (6.90%) sprinters, 2 (6.90%) middle distance, 1 (3.45%) thrower and 1 (3.45%) jumper, while within the 21 – 30 years age group 2 (6.90%) are sprinters, 1 (3.45%) middle distance, 1 (3.45%) long distance, 2 (6.90%) throwers and 2 (6.90%) jumpers. For the 31- 40 years group 2 (6.90%) sprinters, 1 (3.45%) long distance and 1 (3.45%) thrower responded. Ages 41 -50 years and 61_{+} years had one 1 (3.45%) long distance responded each, with 3 (10.34%) within the 41 – 5- years group being middle distance athletes. This is illustrated graphically in (Figure 1) below.

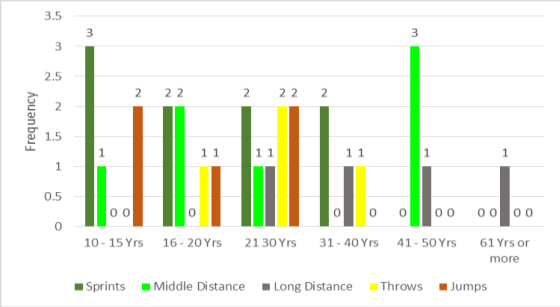

Figure 1: Which is your event and age range? (N = 29).

The majority of athletes, sixteen, (55.17%) attained high school education, followed by tertiary education, nine (31.03%) with primary school and those no level of education attained, both with 2 (6.90%). A majority of the athletes, 27 (93.10%) earn less that USD 100 per month, with only 2 (6.90*%)* earning between USD101 and 150 per month, while 15 (51.72%) of the 29 athletes are bread winners.

To the question, "Do you ever feel lonely or left out of activities?" the majority 19 (65.51%) of the athletes responded "NO", 7 (24.41%) said yes and 3 (10.34%) said sometimes. The athletes were generally not feeling nervous or stressed over the prevailing situation, as 23 (79.31%) answered "NO" to the question. "Are there times you feel nervous or stressed over the current situation?" only 3 (10.34%) responded "YES" and another 3 (10.34%) said sometimes. Asked if there were situations or objects that they avoided because they felt too anxious, 19 (65.51%) responded "YES", 2 (6.90%) said "NO" and 8 (27.59%) were not sure. The two that responded yes were, one (21- 30) years old and one (31 – 40) years old. All the athletes objected to using drugs or alcohol to help you relax or feel better, never wished they were dead, with 25 (86.21%) reporting that they have never gone for days without sleeping. Only 1 (3.45), sprinter, within the 31 – 40 years age group saying yes they did go days without sleep,

who also responds that it sometimes happens.

The majority 16 (55.17%) are not worried about losing fitness, yet 11 (37.93%) are worried, two 2 (6.90%) 10 – 15-year-olds, 1(3.45%) middle distance and 1 (3.4%) jumper are not, they said says maybe they do worry. A large number 23 (79.21%), believed that were improving their fitness, whereas 1 (3.45%) 21 – 30-year-old sprinter did not. On how likely you one gave their coach or trainer feedback about the training, 11 (37.93%) pointed that they always, 16 (55.17%) said they are most likely to and 2 (6.90%) said never. Only 1 (3.45%) a 16 -20-year-old middle distance athlete did not believe if the competitions or games would start within the week, they would be ready, while 20 (68.97%) indicated they would be ready and 8 (27.59%) were not sure.

Of the 29 respondents 18 (62.07%) are single while the rest are single, 16 (55.17%) reported that they are in relationships, 9 (31.03%) are not and 2 (6.90%) were not sure. Of the 29, 11(37.93%) athletes were with their partners during lockdown, 15(51.72%) reported that their partners do not affect their concentration on training. A few athletes within the age group 21 – 30 years 2 (6.90%) and 31 – 40 year 1 (3.45%) who said their partners do affect their concentration on training. A large number 26 (89.66%) are non-smokers with 22 (75.86%) reporting that they are non-takers of alcohol, 3 (10.34%) do smoke and 7(24.14%) called themselves moderate drinkers. In terms of places of residence, 17(58.62%) lives in high density areas, 10 (34.48%) in low density areas and only 2(6.90%) lives in middles density areas. Most 12 (41.38%) of the athlete, living with family members, are in the 10 – 20 years age group, out the 25(86.21%). In response to the question, “Who do you live with?” 3(10.34%) lived alone, 25(86. 21%) lived with family members and only 1 (3.45%) athlete, a middle-distance runner, lived with friends. The majority of athletes living with family members are either sprinters 9 (31.03%) or middle distance 5(17.24%). The majority of the athletes had, had a long stay at their place of residence as evidenced by 10 (34.48%) for all their lives and 6 (20.69%), meaning 16 (65.51%) lived at places where they had lived for at least 10 years or more.

Most athletes 23 (79.31%) felt ok and safe at home which could be the reason why 27 (93.55%) having remained home since that start of the COVID 19 lockdown. To the question, “Any changes in your home recently (someone left/arrived)?” 27 (93.10%) responded “NO”. Almost all the athletes 23 (79.31%) have siblings, with the majority 12 (41.38%) having two siblings and 5 (17.24%) having one and six- ten each. Almost all 28 (96.55%) have friends who they would hang out with during the lockdown period, only 1 (3.45%) middle distance athlete, in the 16 – 20 years age group did not have.

Of all the athletes, 17 (58.62%) friends are from athletics and 11 (37.93%) are not. A total of 17 (93.10%) say they do have support for sporting activities from their families, 1 (3.45%) in the 10 – 15 years age group and 1 (3.45%) 21 – 30 years group, said they were not getting the support. These were one sprinter and one thrower.

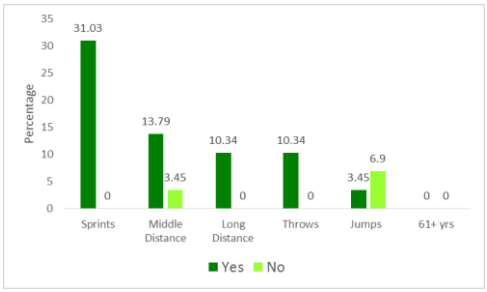

Figure 2(a): Training with athletes of the same event. (N = 23).

All the athletes were able to spend time training at home. Most the athletes 23 (79.31%) had either friends or relatives to train with, and 19 (65.51%) trained with people who were of their age, 21 (72.41%) were training with other athletes, but 6 (20.69%) trained with none athletes. Figure 2 a), shows whether or not the respondents trained with athletes of the same event or not and (Figure 2b) looks at the same age.

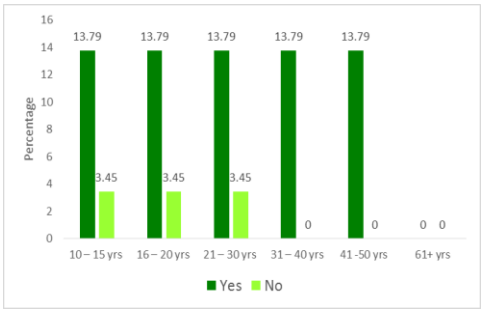

Figure 2 (b): Training with athletes of the same age. (N = 23).

Responding to the "If your answer is No, to the question is your training program the same, with those training with you? (N = 13)", 5 (17.24%) said yes and 8 (27.59) said "NO", the majority 7 (24.14%) of those responding "NO" are below 30 years of age, and were 2 (6.90%) middle distance, 1 (3.45%) long distance, 2 (6.90%) throwers and 3 (10.34%) jumpers. Figure 3 shows the negative effect of the coaches, family and friends, on the athletes' training during the lockdown. (Figure 4) compares the number of training days missed within the first 14 days of lockdown.

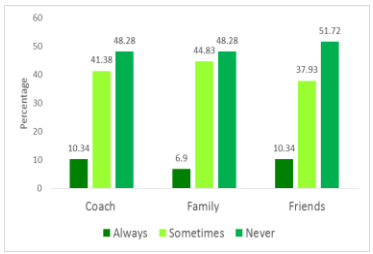

Figure 3: How did these people negatively affect your training? (N = 29).

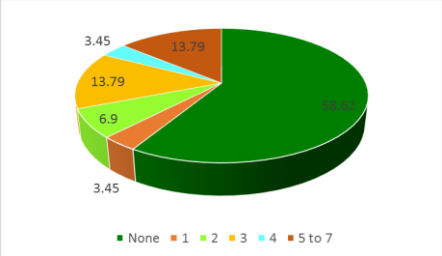

Figure 4: How many days of training have you missed for the past 14 days? (N =29).

Almost all 28 (96.55%) reported no changes in their weight, only 1 (3.45%) 21 – 30-year-old thrower said they had gained weight. In line with the above 23 (79.31%) said "YES" they are able to manage their weight, 4 (13.79%) said they were not sure with 2 (6.90%) saying they were not able**.** A majority 23 (79.31%) responded that they always exercise, with 6 (20.69%) were not always exercising, all the long-distance runners said they always exercise. Figure 5, shows the frequency of training per week.

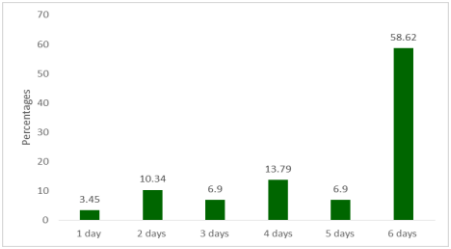

Figure 5: How many times a week do you train? (N = 29).

There are 15 (51.72%) athletes training once a day, 13 (44.83%) training twice a day, none three times a day and 1 (3.45%) 10 – 15-year-old jumper training 4 times a day. There are 14 (48.28%) athletes who say their training sessions are two hours long, 8 (27.59%) training for 1 hour 30 mins and 7 (24.14%) for an hour. Figures 6 (a,b), shows a comparison of responses to the question "Do you follow a training program?" by age group and by event group.

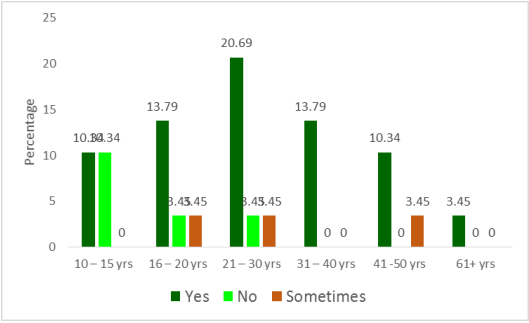

Figure 6 (a): Do you follow a training program? By Age (N = 29).

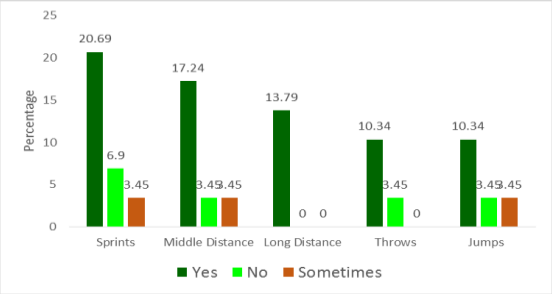

Figure 6 (b): Do you follow a training program? By Event (N = 29)

"If you have training program, are you religiously following it?" Most of the athletes 18 (62.07%) said they sometimes do, 10 (34.48%) said they do and 1 (3.45%) 21 – 30-year-old jumper said “NO”. About having recent changes in training program, 20 (68.97%) of the athletes said they no changes and 9 (31.03%) said they did have changes. Most of the athletes 24 (82.76%) said “YES” it was possible for to train effectively during the first 21 days of lockdown, 3 (10.34%) said sometimes it was and 2 (6.90%) 10 – 15-year-olds, a sprinter and a jumper said “NO” it was not.

Some athletes said that family and friends gave psychosocial and physiological support which helped athletes to maintain physical fitness, however, some felt lonely and not sure about their safety at home. During the first 21 days of COVID-19 lockdown some athletes missed training days due to various reasons which could be nervousness or stress, lack of communication with the coach or manager and adjustments to programs. During the study it also came out that most of the respondents had neither direct nor indirect contact with individuals with confirmed or suspected COVID-19 cases though there were no changes at home with no persons who left or arrived at home during the lockdown.

Discussion

Regarding concerns about COVID-19 respondents were worried or somewhat worried about themselves returning to normal life of athletics they are used to. As the pandemic was ongoing it was important to prepare psychosocial, physical and physiological aspects of athletes to be ready if the widespread transmission occurs as they learn, adjust and adopt to the new normalcy in the athletics world. The situation of COVID-19 pandemic had physical, psychological, and behavioural consequences to all individuals, including elite and recreational athletes.

According to life in lockdown has been difficult because everyone has to stay safe and healthy, while at the same time abiding by new norms. However, athletes were grossly affected by the COVID-19 lockdown. So many changes took place which were new to everyone including coaches, managers, administrators, athletes and all involved. Coaches had to change the way they operate incorporating the restrictions that came with the pandemic. The period was basically trial and error because coaches were not sure whether the training programs, they provided to the athletes was conducive.

The research showed that there was communication breakdown between some coaches and their athletes which led to some athletes missing training days, some athletes training without the program, athletes failing to give feedback to their coaches and not knowing when they will resume competitions

brought uncertainty. In turn some athletes developed anxiety, stress, depression and confusion. www.psychologytoday.com adds that on to say the emotions felt by athletes are the most powerful and immediate discomfort felt in reaction to the loss experienced. Sadness, disappointment, grief, devastation, despair, stress, anxiety, helplessness, hopelessness, frustration, and anger are just a few of the emotions felt in response to this abrupt end to the training and competitive season.

Recommendations

Parents, guardians, family members, friends and coaches should work together supporting in the development and nurturing of athletes. Athletes should not miss their training sessions, improve communication and always give feedback when necessary. All parties involved should adjust, adopt and normalize the new developments brought by the COVID-19 pandemic for better performance in athletics. Adhere to the COVID-19 rules and regulations as set forth by the government and health departments regarding the return of sports for the safety of everyone. As with most crises, COVID-19 will pass the life in the sports fraternity will return to normal. The off-season prep period of conditioning, sports training and mental training will occupy the minds and spirits of athletes as well as parents, coaches and managers. The new season will arrive, the traditional way of training will resume and competitions will be held. Life in the sports world will once again return to its usual intense, frenetic and fun pace. For now, we must learn to live with COVID-19 as we do not know when we are going to get over it and return to our “normal” lives.

Limitations

Since covid-19 was new phenomena there were no studies previous carried out to compare with. Some coaches, parents or managers did not grant permission to have athletes completing the questionnaire. Other athletes did not complete the questionnaire due to limited access to internet data or not having compatible devices or due to travel restrictions it was not easy to reach the Bulawayo Athletics Board (BAB) offices and the Athletes were still adjusting to live according COVID-19 lockdown regulations, this led to the small sample size.

Acknowledgements

Our gratitude to Sports Science Department, Academy of Medical Sciences, Malawi University of Science and technology (MUST), Malawi and Sports Science and Coaching Department, Faculty of Applied Sciences, National University of Science and Technology (NUST), Bulawayo, Zimbabwe. Special thank you too Mr. Manuel Mpofu the then BAB chairperson, for allowing us to use the office for the distribution and collection questionnaires.

Funding source

This research was self-funded by the researchers.

References

1. Boutagy B. (2004). The Formula for Success: Knowledge x Experience.
2. Dallas M. E. (2015) Physiologic Responses and Long-term Adaptations to Exercise.
3. Vigelsø A, Gram M, Wiuff C, Andersen JL, Helge WJ. (2015) Six weeks aerobic retraining after two weeks

immobilization restores leg lean mass and aerobic capacity but does not fully rehabilitate leg strength in young and older men. J Rehabil Med. 47(6):552-60.

4. Narici M, Giuseppe De Vito, Franchi M, Paoli A, Moro T, et al. (2020) Impact of sedentarism due to the COVID-19 home confinement on neuromuscular, cardiovascular and metabolic health -Physiological and pathophysiological implications and recommendations for physical and nutritional countermeasures: Eur J Sport Sci.
5. Edwards, Thornton (2020) Athlete Mental Health and Mental Illness in the era of COVID-19: shifting focus with new reality.
6. Smith RE, Smoll FL, Cumming SP, Grossbard JR. (2006) Measurement of Multidimensional Sports Performance Anxiety in Children and Adults: The sport anxiety scale-2. J Sports Psychol. 28:479-501.
7. Lim MA, Pranata R. (2020) Sports activities during any pandemic lockdown. Royal Academy of Medicine in Ireland.