

## Impact of the COVID-19 Pandemic on Physical, Psychological and Nutritional Characteristics of Elite Athletes: a Cross-Sectional Web Survey

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### ABSTRACT

COVID-19 has upended sports and sporting calendars worldwide; causing postponement or cancellations of sports events globally. Amid the lockdown, most of the athletes are left on their own at their homes. This study investigates the impact of the ongoing Pandemic on physical, psychological and nutritional characteristics of elite athletes amid COVID-19 spread. A cross sectional web survey was carried out using a validated questionnaire comprising of total 19 questions regarding the demographic details, physical, psychological and nutritional characteristics of elite athletes before and after COVID-19 Spread. The normality of data was established using Kolmogorov-Smirnov test. The frequency and percentage n (%) of ordinal data of participant responses were calculated. A total of ninety four elite athletes voluntarily participated, out of which 73 (78%) were male athletes. 40% were professional cricketers followed by 10% badminton and 10% table tennis players and rest 40% belong to various other sports. 76% of total athletes played their sport at the national level The vigorous intensity training schedules were routinely adapted by 39 (42%) of total athletes before the lockdown phase amid COVID-19 spread which reduced to 9(10%) afterwards. 59(63%) of total athletes self reported being in relaxed mood. 37 (39%) felt disturbed about the cancellation of tournaments and their inability to practice. Daily calorie intake was increased among 26 (28%) of athletes. Covid-19 spread has significantly impacted training regimes, eating habits, and state of mind of elite athletes. Although majority of athletes reported being in a relaxed and happy state of mind, however long periods of re-training and psychological counseling would be required to reverse the effects of detraining caused due to the ongoing Pandemic crisis.

**KEY WORDS:** SPORTSPERSON; PSYCHIATRY; TRAINING; RECONDITIONING.

### INTRODUCTION

The coronavirus disease 2019 (COVID-19) has upended sports and sporting calendars worldwide causing

postponement or cancellations of sports events globally. On March 24, 2020 The Guardian reported that the 2020 Summer Olympics have been rescheduled to a date beyond 2020. Restriction on sporting events has put a hold on all sports and recreational activities which affect the rigorous training regimen of elite athletes, to enhance and maintain their peak sports performance. Amid the lockdown, most of the athletes are left on their own at their homes. Prolonged stay at home may lead to an increase in sedentary behavior of the athletes. Certain health problems can also occur due to the lack of strength and endurance training. The irregularity or cessation of high intensity aerobic or endurance training for more than 2 weeks can significantly affect the cardiovascular

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endurance and, in turn, the immunity of athletes as reported by Pedlar et al. (2018, 2020).

According to the Law of Reversibility Principle, a detraining phase extending till 2 weeks post a high intensity training regime triggers a vicious cycle of reduced lean mass and an increase in body fat, leading to a significant decrease in muscle strength and power (Lee et al., 2017). A similar or longer period of retraining is required to regain the earlier physical fitness levels. The continuation of same intensity and timely progression of training sessions is essential to maintain peak performance of athletes. Post lockdown, incomplete training regimens can make it difficult for athletes to reach their peak performance levels. Mental health is directly proportional to physical health; and any disproportion can affect an athlete's performance in sports to a great extent. Till date, to the best of our knowledge, there is no literature available on the lockdown phase impact on elite athletes. In view of the same, the present survey has been taken to find out the impact of COVID-19 Pandemic on elite athlete's physical health, nutrition and mental wellbeing (Lee et al., 2017).

## MATERIAL AND METHODS

Institutional Ethics Committee (IEC) of Maharishi Markandeshwar Deemed to be University (IEC-114F) approved the study Protocol. This study protocol is in accordance with the National ethical guidelines for Biomedical and Health Research involving human subjects-ICMR guidelines (Revised 2017) and guidelines of Helsinki declaration 2013. The individual data was collected in the month of April and May 2020 from national and international level elite athletes. The e-survey was sent to 110 elite athletes from different zones of the country using chain-referral sampling. 100 elite athletes voluntarily participated in the study (responses of 6 athletes were rejected later on due to incomplete form submission). To analyze the impact of COVID-19 Pandemic on physical, nutritional and psychological characteristics of elite Indian athletes, a self structured and validated questionnaire for a comprehensive survey was prepared. The questionnaire was validated using face validity and pilot testing of Questionnaire on 12 Participants.

Table 1. Structured Questionnaire

1.	Name:
2.	Which Sport are you playing?
3.	Age: (i) Less than 18 years (ii) 18-35 years (iii) Above 35 years
4.	Gender: (i) Male (ii) Female
5.	Which level of tournament did you play? (i) National (ii) International
6.	Before lockdown, the intensity of your daily workout/practice/ training was (i) Light (ii) Moderate (iii) Heavy Please specify your Daily Practice/Training:
7.	During lockdown, the intensity of your daily workout/practice/ training was (i) Light (ii) Moderate (iii) Heavy Please specify your Daily Practice/Training:
8.	Before lockdown, how much time you spend on your workout in a day? (i) Less than 2 hour (ii) 2-4 hours (iii) More than 4 hours
9.	During the lockdown, how much time you spend on your workout in a day? Less than 2 hour (ii) 2-4 hours (iii) More than 4 hours
10.	What is the impact of lockdown on your daily food intake? (i) Increased (ii) Decreased (iii) Unchanged
11.	Do you feel lockdown will affect your sports performance in future? (i) Yes (ii) No
12.	Do you feel Happy/Relaxed/Motivated that you can improve your game for future competitions (i) Yes (ii) No
13.	Do you feel Worry/ Tension /Anxiety/Stress about your performance in future competitions? (i) Yes (ii) No
14.	Are you suffering from any financial problem? (i) Yes (ii) No
15.	'You are not able to play your sport' what are you feeling? (i) Aggressive (ii) Irritated (iii) Depressed (iv) None of the above
16.	How is your mood now days? (i) Relaxed (ii) Stressed
17.	Do you have any thought that you might quit your game? (i) Yes (ii) No
18.	Are you practicing Yoga/Meditation/Breathing exercise/or other relaxation techniques daily? (i) Yes (ii) No
19.	Are you enjoying your increased family time at home? (i) Yes (ii) No

It consisted of a total of 19 questions, which included description of the survey, their consent to participate, demographic data of the athletes, details about their training regimes, changes in physical activity, diet and weight modifications, mental well-being, performance issues, and social and family interactions (Table 1). The structured questionnaire had been copyrighted

under all the author names with registration number L-96011/2020. Open and close- ended questions were formulated to access all the items in the questionnaire. The questionnaire was included in the Google® form link and sent by various social media applications (Facebook, Whatsapp and Messenger). Participants were asked to answer the question by themselves.

S. No.	VARIABLE		Frequency (Percentage)
1.	Type of sport	Cricket	38 (40.4)
		Badminton	10 (10.6)
		Table tennis	10 (10.6)
		Football	5 (5.3)
		Volleyball	5 (5.3)
		Basketball	07 (7.4)
		Other	19 (20.2)
2.	Gender	Female	21 (22.3)
		Male	73 (77.7)
3.	Age (In years)	Less than 18 years	26 (27.7)
		Between 18-35 years	65 (69.1)
		More than 35 years	3 (3.2)
4.	Level of Tournament	National	76 (80.9)
		International	18 (19.1)
5.	Intensity of Workout before Lockdown	Light	10 (10.6)
		Moderate	45 (47.9)
		Vigorous	39 (41.5)
6.	Intensity of Workout during Lockdown	Light	47 (50.0)
		Moderate	38 (40.4)
		Vigorous	9 (9.6)
7.	Total Time duration of Workout before Lockdown	Less than 2 hour	39 (41.5)
		Between 2-4 hours	39 (41.5)
		More than 4 hours	16 (17)
8.	Total Time duration of Workout during Lockdown	Less than 2 hour	84 (89.4)
		Between 2-4 hours	07 (7.4)
		More than 4 hours	03 (3.2)
9.	Daily food intake	Decreased	33 (35.1)
		Increased	26 (27.7)
		Unchanged	35 (37.2)
10.	Will lockdown have impact on your future sports performance?	Yes	56 (59.6)
		No	38 (40.4)
11.	Do you feel motivated to improve your game?	Yes	71 (75.5)
		No	23 (24.5)
12.	Do you feel Anxiety/Tension/ Stress about your future sports performance?	Yes	42 (44.7)
		No	52 (55.3)
13.	Are you suffering from any financial loss?	Yes	26 (27.7)
		No	68 (72.3)
14.	How you are feeling about not being able to play?	Irritated	37 (39.4)
		Aggressive	9 (9.6)
		Depressed	20 (21.3)
		None of the above	28 (29.8)

Continue Table

15.	How is your Mood nowadays?	Relaxed Stressed	59 (62.8) 35 (37.2)
16.	Do you have any thoughts about quitting your game?	Yes No	10 (10.6) 84 (89.4)
17.	Are you practicing Meditation/ yoga or other relaxation techniques daily?	Yes No	51 (54.3) 43 (45.7)
18.	Are you enjoying this time?	Yes No	81 (86.2) 13 (13.8)

**Table 3. Influence of the Lockdown measures on athlete training by demographic variables (n=94)**

Training Parameters	Gender		Characteristics n (%)			Level of Participation	
	Male 73(78)	Female 21(22)	<18 y 26(28)	18-35 y 65(69)	>35 y 3(3)	National 76(81)	Inter-national 18(19)
Training Intensity							
Mild							
Before lockdown	7(10)	3(14)	2 (8)	8(12)	0(0)	10(13)	0(0)
During lockdown	40 (55)	7(33)*	13(50)	34(52)	0(0)	42(55)	5(28)
Moderate							
before lockdown	36(49)	9(43)	12(46)	31(48)	2(67)	39(51)	6(33)
During lockdown	27 (37)	11(52)*	8 (31)	27(42)	3(100)	28(37)	10(56)
Vigorous							
before lockdown	30(41)	9 (43)	12(46)	26(40)	1(33)	27(36)	12(67)
During lockdown	6 (8)**	3 (14)*	5(19)	4(6)	0(0)	6(8)	3(17)
Training duration each day							
<less than 2 h							
before lockdown	32(44)	7 (33)	8 (31)	29 (45)	1(33)	33 (43)	6 (33)
during lockdown	66 (90)*	18 (86)*	23 (88)	58 (89)	1(33)	69(91)**	15(83)
2-4 hours							
before lockdown	28 (38)	11 (52)	13 (50)	25 (38)	1(33)	30 (39)	9 (50)
during lockdown	5 (7)*	2 (10)*	2 (8)	5 (8)	1(33)	5 (7)**	2 (11)
More than 4 h before							
lockdown	13 (18)	3 (14)	5 (19)	11 (17)	1(33)	13 (17)	3 (17)
during lockdown	2 (3)*	1 (5)*	1 (4)	2 (3)	1(33)	2 (3)**	1(6)

\* p value<0.05, \*\* p value <0.01

Most of the participants reverted within 10 minutes to one day with their completed forms. In case of non-response, reminders through the same social media platform were sent every 48 hours. Online surveying was preferred as it is easily accessible, less expensive and time saving. Google® form automatically analyzed the data. Responses of each participant were entered in excel sheets and the data was analyzed. For the data analysis, the statistical software, IBM® SPSS version 20.0 was used. At a confidence interval of 95%, data analysis was represented with a descriptive statistics at 0.05 levels of significance. Due to submission of incomplete forms, 6 responses were excluded, with the data analyzed for 94 participants. The response rate to survey was 100 (91%) and completion rate was 94(94%). The normality of data was established using Kolmogorov-Smirnov

test. The frequency and percentage n (%) of ordinal data of participant responses were calculated. Independent t-test was used to compare participant responses by demographic variables.

## RESULTS AND DISCUSSION

The lockdown due to the ongoing pandemic is thought to have major consequences on the sports fraternity. Sudden cessation of all sports activities, lost opportunities as well as uncertain financial and sporting futures could have their significant impact on general well being of athletes and their safe return to sport. Although the process of unlocking has started in many parts of the world, but an athlete's return to sports as well as regular practice sessions have not been resumed in most of

them. The present study was conducted to observe the impact of COVID-19 Pandemic in India on the physical, nutritional and psychological aspects of elite athletes. The lockdown has caused an unexpected stop not only to various sporting events and competitions, but the routine practice sessions of elite athletes have also hampered to a great extent. In the present study, out of a total of 94 athletes, 40% were professional cricketers followed by 10% badminton and 10% table tennis players and rest 40% belong to various other sports. 76% of total athletes played their sport at the national level (Table 2) (Chang et al., 2009).

**Physical Health and Nutrition:** It is a well-known fact that detraining leads to reduced maximal oxygen consumption (VO<sub>2</sub>max), decline in endurance capacity and a marked reduction in flexibility, muscle strength, power and volume (Madsen et al, 1993). Normally, the average time span of athletes ceasing or reducing their training parameters should last only up to two weeks, to a maximum of four weeks. As the duration of lockdown in India, at the time of sample collection, had extended to nearly 3 months, athletes were asked about modifications in their daily training regimens. Before the COVID-19 Pandemic induced lockdown began in India, a total of 10% male athletes were practicing with mild, 49% with moderate and 42% with vigorous intensity.

With the implementation of lockdown, these numbers changed, with now 55% practicing with mild, 37% with moderate and just 10% practicing with vigorous intensity (Table 3). The lubrication and nutrition (hyaluronic acid and lubricin) of joint cartilage is compromised due to inactivity, resulting in a possible degeneration and imbalance of the maintenance and preservation of cartilages, ligaments and the synovium. The reduced activity was observed among female athletes as well, although a higher number of them, i.e., 14% were still maintaining a vigorous intensity of training (Chang et al., 2009).

The shift of training intensity from vigorous to mild was more apparent among male national players belonging to the age group of 18 -35 years. Similarly, total duration of training sessions per day significantly reduced from 17 % to 3% among national players during the lockdown (Table 3). Hence the training routines of elite athletes have abruptly been interrupted. Retraining phase to gain similar levels of physical fitness requires a time twice of what the player spent in detraining (Paoli, 2020). 26 (28% of the total) athletes reported an increase in their daily food intake despite a reduction in the intensity of their training (Table 2). A similar study showed an unprecedented number of Achilles tendon ruptures at the beginning of pre-season of the National Football League (NFL) following a lockdown period (Myer et al., 2011; Frizziero et al., 2016).

Unfortunately, such injuries can be career-altering or even career-ending. Elite athletes require a high level of regular physical training, balanced nutrition as well as mental wellbeing to maintain their peak physical fitness

levels, irrespective of their specific sport (Lorenz, 2013). Detraining also shows its effects on tendon structure and properties causing an alteration in structural organization and mechanical properties of the tissues which, in turn, impair normal tendon reaction to load application (Frizziero et al., 2016). An increased caloric intake, coupled with a phase of inactivity, induces an alteration in body composition, which includes, but is not limited to, an addition in body fat levels, which has been associated negatively with physical performance. Some drastic measures need to be taken by the athlete to improve body composition before competition, which could increase the risk of injury once a player return to sport (Mcmanus, Murray and Parry, 2017). Training regime schedules of elite athletes generally follow periodization patterns, where long periods of passive rest are avoided. A sudden phase of detraining among elite athletes would impact their future sports performance, as well as increase their chances of injuries (Haugen et al, 2019).

**Mental Health:** Along with physical, the impact of COVID-19 lockdown on psychological aspects of athletes is bound to be inevitable. Surprisingly, a majority of athletes were relatively stress-free, with 86% reportedly enjoying this increased time of stay at home with family. However, 60% of the athletes did believe that the lockdown could have an impact on their future sports performances, with 48% feeling anxious about the same. 76% of total athletes were self motivated to improve their performance (Table 2), and 11% thinking about quitting their game. A positive attitude, self-motivation, mental imagery, self-talk are some of the key mental skills all athletes should practice during these testing times (Peluso et al., 2005).

Psychological factors significantly impact an athlete's focus and preparation of game, with a negative thought or foul mood profoundly influencing his performance (Serrano et al., 2013). At the same time, to avoid any physical, technical, and psychological damage, players can also use this time to invigorate and improve their fitness with basic exercise regimens like core exercises, aerobics, resistance exercises, yoga, and meditation etc. A cross sectional study has also been conducted in South Africa to analyze impact of coronavirus crisis on elite and semi elite athletes (Pedlar et al., 2020), showing similar results. Efforts should be put to maintain both physical health and mental wellbeing at home, and the players needing to maintain a conditioning routine during the lockdown. The limitations of this study include that the sample size was not estimated since there are few previous studies done on similar aspects.

## CONCLUSION

A well-planned restart of the training phase and "return to play" strategy is the need of the hour, all around the world, to overcome the risks involved for athletes. Too rapid resumption of events by sports federations need to be avoided at every cost. The results of this study could

help the government sporting federations and sports science professionals to formulate strategies to support athletes develop and implement guidelines to minimize the potential risk to a sportsperson's career caused by this global pandemic.

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