

The padel phenomenon after the COVID-19: an Italian cross-sectional survey of post-lockdown injuries

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Abstract

The impact of COVID-19 on sport and physical activity has been a subject of considerable interest and concern. Padel satisfies the desire for social interaction and a return to sport after a period of inactivity. The aim of this study is to show a correlation between return to sport and related injuries in a population of padel players. The study was carried out in a survey mode, consisting of a questionnaire with four sections and fifty questions on the biographical data of the individual, lifestyle before and after the pandemic, knowledge and playing level of padel and injuries. The self-administered online questionnaire was developed and validated by a panel of physiotherapists, orthopaedic surgeons, and physiatrists with experience in clinical practice and/or musculoskeletal research. The study was conducted in a survey mode from a smartphone or computer via a link to a multiple-choice document. The link to the questionnaire was distributed via mailing lists, social media, and chat applications. A previous history of injury prior to the Covid pandemic, a higher body mass index, and increased sporting activity were all linked to a higher number of injuries. Daily steps, age, experience, and the average number of games per week were all found to have no significant effect. The enforced rest during the lockdown period highlighted the importance of comprehensive injury prevention strategies in sports, as well as understanding the impact of de-training and periods of inactivity on risk of injury.

Key Words: musculoskeletal injury, padel, post-COVID-19, post-lockdown trends, return to sport.

Eur J Transl Myol 34 (2) 12331, 2024 doi: 10.4081/ejtm.2024.12331

Coronavirus disease 2019 (COVID-19) was recognized as a pandemic by the World Health Organization (WHO) on 11 March 2020.¹ The Covid-19 virus spreads by direct (*i.e.*, droplets, aerosols, airborne) and contact transmission.² Thus, to stop the infection, world governments adopted extraordinary measures.³ Even in Italy, on the 9th of March 2020, the government declared a state of lockdown, in which people were not allowed to leave their homes, apart from few exceptions.^{3,4} Consequently, all sporting activities were banned, and sports

centers were closed.⁵ The lockdown has profoundly changed lifestyles, with people spending more time at home and becoming more sedentary.⁵ On the other hand, some people continued to look for home-training solutions.⁷ On 4 May, the lockdown ended, and the population's daily life almost returned to normal, with the possibility of practicing sports, even though only the individual ones, performed outdoor.³ The impact of COVID-19 on sport and physical activity has been a topic of considerable interest and concern.^{8,9} Understanding the

relative impact of these restrictions on different sports will provide important insights into readaptations to different sporting practices from a sport management and public health perspective.¹⁰ In fact, prolonged periods of reduced or no physical activity led to a progressive loss of exercise-induced physiological adaptations, resulting in cardiovascular, metabolic, and muscular changes that required a gradual resumption of physical activity.¹¹ To counteract the sedentary and restricted lifestyle, many people have chosen to practice various sports within the permitted sports (e.g., padel, jogging, tennis, other individual sports), even without proper training or in a state of physical deconditioning.⁴

Padel is a racquet sport played in pairs on a rectangular court (20x10m) surrounded by synthetic glass/mesh walls and divided lengthways by a tennis net.¹² Padel does not require a high level of technical skill to start playing, the equipment is cheap, and it can be played outdoors.¹³ The rules and the scoring system are similar to tennis, except that the ball can bounce off glass walls,¹² making it a fast-paced sport with an intermittent high-intensity activity.¹⁴ The enjoyment of the game, especially when players are at the same level, increases people's satisfaction.¹⁵ All these characteristics have been the key to the success of this sport, satisfying the desire for social interaction and a return to sport after the lockdown.¹³ However, the repetitive, fast, specific unilateral gestures lead players to overuse their limbs, contributing to musculoskeletal injuries and asymmetric adaptations associated with poor technique and biomechanical patterns.^{16,17} This growing interest in padel has also been reflected in an increase in scientific research focusing on aspects of the game, injuries, and player characteristics.¹³ Specifically, during COVID-19 lockdown, about 40% of padel players had an injury within 12 months, either in the lower limbs, such as ankle/knee sprains, or in the upper limbs, such as cuff rotator and elbow tendinopathy, with varying degrees of severity.¹⁸⁻²⁰

Therefore, there are not enough studies to describe the incidence of injuries in padel players after the COVID-19 lockdown. The aim of this study was to describe injuries and associated risk factors in a cohort of Italian padel players of all levels returning to the sport after the COVID-19 lockdown.

Materials and Methods

Study design

This study is cross-sectional epidemiological research investigating the prevalence rates and characteristics of padel practice and related injury frequency during the COVID-19 pandemic period in Messina (Italy). This was conducted according to the guidelines Strengthening the reporting of observational studies in Epidemiology (STROBE).²¹ Data were collected and analysed by the authors, with full confidentiality and anonymity guaranteed. This study was approved by the Chief of the Department of Physical and Medical Rehabilitation Unit. It was performed in accordance with the Declaration of Helsinki,²² and pertinent National and International regulatory requirements. All the participants were asked to carefully

read and confirm an informed consent before collecting the data. The study was conducted in a survey mode from a smartphone or computer via a link to a multiple-choice document. The survey was completely anonymous and there was no way to trace the identity of the respondents.

Participants

Inclusion criteria were padel players of all levels during the pandemic. There were no restrictions on the eligibility of players other than adult age. Data were collected using online questionnaires between 01/06/2021 and 31/08/2021.

Procedures

The self-administered online questionnaire was developed and validated by a panel of physiotherapists, orthopaedic surgeons, and physiatrists with experience in clinical practice and/or musculoskeletal research. The study was conducted in a survey mode from a smartphone or computer via a link to a multiple-choice document. According to the epidemiological method used in an online survey research,²³ the authors presented an introductory page explaining research aims, identity and affiliations of the investigators, and details of what it would mean to be involved. It was made clear that by entering information in response to survey questions and submitting their response, respondents gave consent for their data to be used by the researchers. The survey was completely anonymous and there was no way to trace the identity of the respondents. The link to the questionnaire was distributed via mailing lists, social media, and chat applications. The questionnaire consisted of four sections and fifty questions regarding the individual's biographical data (*i.e.*, sex, age, height, weight), lifestyle before and after the pandemic, pre-existing chronic diseases, covid infection and its consequences on health, knowledge and playing level of padel, and injuries. The test took about 5 minutes to complete. All these data were collected into an electronic database. The full questionnaire is provided in the supplementary material.

Statistical analysis

The relation between the mean number of injuries that occurred during one year after the Covid pandemic and various variables was investigated using linear regression model analysis. The linear regression model is a statistical approach that provides a measure of the linear relation between a scalar outcome, *i.e.* the mean number of injuries, and one or more explanatory variables by estimating the unknown model parameters from the experimental data and using them as linear predictor functions.²⁴ The linear regression model was implemented by the Matlab[®] function *fitlm*, which provides a fit to the variables and the p-values for the t-statistic of the two-sided hypothesis test for each variable. Data were separated according to the variation of the activity level with respect to the pre-COVID period into three groups: participants who increased the activity level (G1), participants who did not modify the activity level (G2), and participants who de-

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creased the activity level (G3). The linear model was built to test the effect of the following factors: age, body mass index (BMI), mean number of injuries during the year before the COVID pandemic, mean number of steps per day, changes in sporting activity before and after the COVID pandemic, weight gain, participant's expertise in playing the game, mean number of games played per week on the mean number of injuries during the year after the COVID pandemic. The same model was built on data collected on all the participants and on the only G1, G2, or G3 groups, separately. A significant effect was assessed with a *p*-value of less than 0.05.

Results

The expected results were in terms of i) statistical analysis of the number of practitioners; ii) injuries occurring during sports practice; iii) a possible correlation between prolonged inactivity or physical inactivity, weight gain and the number of injuries. A stratification of injury risk by age and level of physical fitness was outlined, providing a wealth of early data on the physical condition of the sample. A comprehensive overview of demographic data and main findings of the survey is presented in Table 1. The proper use of the linear regression model was verified

by an F-test, which showed that the regression model fit significantly better than a degenerate model with only one constant term ($p < 0.001$). The model showed that participants who were more likely to be injured before the COVID pandemic were also more likely to be injured after ($p < 0.001$), that males were more likely to be injured than females ($p = 0.005$), and that a higher BMI was associated with a higher number of injuries ($p = 0.033$). In contrast, daily steps ($p = 0.448$), age ($p = 0.515$), weight gain ($p = 0.061$), variation in activity level ($p = 0.535$), experience ($p = 0.671$), and average number of games played ($p = 0.469$) were not identified as significant effects. A total of 41 participants reported an increase in activity level after COVID (G1), 71 reported no change in activity level (G2), while 120 participants reported a decrease in activity level (G3). All models based on separate groups of participants fit significantly better than a degenerate model with only one constant term ($p < 0.002$ in all datasets) and showed that while participants who were more likely to be injured before the COVID pandemic were also more likely to be injured after ($p < 0.001$ for all G1, G2 and G3), only G1 participants showed an effect of BMI ($p = 0.044$ for G1, versus $p = 0.104$ for G2 and $p = 0.708$ for G3) and weight gain ($p = 0.012$ for G1, versus $p = 0.774$ for G2 and

Table 1. Demographic features of participants and main finding of survey

Participants	n=233
Male	153
Female	80
Age (y)	27 ± 9
Height (cm)	173 ± 8
BMI	24 ± 3
Reduction in physical activity (%)	120 (51.5)
Weight gain (%)	89 (38.2)
Worsening mood (%)	140 (60.1)
Injuries after lockdown	
Total (%)	47 (21.2)
Muscle injuries	27
Joint sprain	11
Field collision	7
Spine	13
Upper Limb	23
Lower limb	11

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$p=0.554$ for G3). The G2 group showed no effect of sex ($p=0.900$), whereas males in G1 and G2 were more likely to be injured than females ($p=0.0489$ and $p=0.009$ for G1 and G3 respectively). Daily steps ($p=0.771$, $p=0.318$, $p=0.564$ for G1, G2 and G3 respectively), age ($p=0.180$, $p=0.748$, $p=0.920$), experience ($p=0.120$, $p=0.774$, $p=0.791$) and average number of games ($p=0.115$, $p=0.819$, $p=0.924$) were not identified as significant effects in any of the three groups (Table 2).

Discussion

The aim of this study was to demonstrate an association between return to sport after a period of suspension and the risk of related injuries in padel players. The public health emergency associated with COVID-19 infection has imposed a series of restrictions, leading to a global reduction in physical activity and an increase in sedentary behaviour.^{3,25} People who have lost fitness or have been inactive for a long time may have tried to return to basic physical activity and found that they were unable to do basic exercises.²⁶ Moreover, people felt uncertain about how to safely return to physical activity without risk of infection and injury, driven by a desire to return to normal life but held back by fear of infection.²⁷ However, the overall benefits of physical activity, from cardiovascular to mental health, are well known, even after the long period of inactivity during the pandemic.^{26,28,29} Restarting physical exercise after a period of inactivity requires to alternate training and rest days, gradually increasing aerobic and muscle-strengthening activities by a few minutes a day until reaching the recommended 150-300 minutes a week.³⁰ This training usually results in physical reconditioning with positive effects on the cardiovascular and respiratory systems.³¹ In fact, according to the World Health Organization (WHO),³¹ and to the Italian Sports Medicine Federation (ISMF) guidelines,³⁰ after a period of detraining, a gradual return to physical activity is essential, also in terms of quantity, intensity, and frequency.³⁰

Since countries re-opened and amateurs and professionals returned to sport, reducing, and limiting the risk of virus spread became a priority. However, each sport practised after the pandemic closure had specific risks of virus spread, some more than others. Golf and time trial cycling are realistically able to maintain a social distance for the duration of the competition.³² Other sports, such as football and futsal, were less able to maintain social distance.³³ Among the various sports available, racquet sports, particularly padel, were an emerging fun activity for both young people and adults, improving fitness and potentially developing motor and cognitive skills.³⁴

Nowadays, padel could be considered an important health promoter with significant implications in terms of active lifestyle and psychological benefits.^{13,34}

Given its recent widespread popularity, authors decided to focus on this sport, considering padel injuries and all the involved risk factors. Data showed that people who were more likely to be injured before the pandemic were also more likely to be injured after the pandemic. This could be explained by inadequate physical preparation, technical errors in athletic gestures, inadequate equipment or playing fields.^{16,35,36} In a recent review, Bernardino *et al.* studied padel injuries in both professional and amateur players and found an injury rate of 40-70% for players who suffered at least one injury in a year of practice.¹⁵ Interestingly, the same authors showed a general predominance of muscle injuries in the lower limbs, particularly in male players, with a higher number of upper limb injuries in female players.¹⁵ These results are inconsistent with those published by Tagliafico *et al.*, who recorded a total of 85 injuries in 800 Italian padel players (mean age: 49 ± 22 years), suggesting that padel is a sport with a high incidence of lower limb injuries.³⁷ Furthermore, these data contrast also with our findings that players were more likely to be injured and that the upper limb, particularly the elbow, was the most common site of injury. On the other hand, Munoz's study is in line with our results,

Table 2. Statistical results of the linear model

Effects on injuries	All patients (n=233)	G1 (n=41)	G2 (n=71)	G3 (n=120)
BMI	p=0.033*	p=0.044*	p=0.104	p=0.708
Injuries before COVID-19	p<0.001*	p<0.001*	p<0.001*	p<0.001*
Male gender	p=0.005*	p=0.0489	p=0.900	p=0.009*
Variation in activity level	p=0.535			
Age	p=0.515	p=0.180	p=0.748	p=0.920
Daily steps	p=0.448	p=0.771	p=0.318	p=0.564
Padel experience	p=0.671	p=0.120	p=0.774	p=0.791
Average game per week	p=0.469	p=0.115	p=0.819	p=0.924

showing an increased frequency of injury to the upper limbs (*i.e.*, shoulder and elbow), with no gender differences between amateur padel players.³⁸

However, in terms of age, we found that the over-30s had more lower limb injuries, particularly to the knee, whereas the under-30s had fewer injuries, mainly to the upper limb (particularly epicondylitis).

Moreover, the results showed that a higher BMI is associated with a higher number of injuries in return to sport after the pandemic, as already shown by other authors.³⁹⁻⁴¹ Thus, the daily steps, the age, the expertise, and the average number of matches were not identified as significant effects. Furthermore, in our cohort of players, although not statistically significant, expertise may influence the incidence of injury, as professionals are more prone to joint and/or muscle overuse injuries, whereas amateurs suffer more acute muscle and tendon injuries due to differences in playing technique. These data are supported by the findings of Demeco *et al.*, who suggest that untrained players may be at increased risk of injury due to the high speed of action and sudden changes of direction.¹³

In addition, increased expertise in the game may be reflected in increased intensity, frequency, skill, and competitive level during training sessions or matches, thereby raising the risk of injury.¹³ This risk may also be increased by a change in sporting activity and may be related to new equipment, changes in the playing surface and sport-specific adaptations and movements.⁴²

The main limitation of our study is that the data are limited to a small population, which introduces a selection bias for certain lesions. Moreover, there is not a control group (who did not practice any sport or practising a different sport to compare the injuries). Furthermore, the literature is limited, and the few available studies show conflicting results regarding the correlation between risk, type, and mechanism of injury in padel.¹³ However, considering the attractiveness of this sport, future research should address the lack of knowledge on the mechanisms and type of injuries for a better management of padel players.

Conclusions

This study examines the effect of COVID-19 on sports injuries, focusing on padel due to its recent popularity.

However, to date there has been a high level of heterogeneity in studies and results, making it difficult to draw firm conclusions, despite the popularity of this sport in recent years.

The prevalence of injuries in padel, as in other sports, is more localized to the elbow and knee, as in other sports, and there seems to be a predisposition to injury, even before and after the pandemic period. This could be explained by inadequate physical preparation, higher BMI, technical errors in athletic gestures and inadequate equipment or playing fields. This highlights the importance of understanding the impact of training and periods of inactivity on injury risk.

In contrast, daily steps, age, experience, and average games played were independent risk factors with no significant effect on padel injuries. Furthermore, given its popularity and known cardiovascular and neuromuscular

benefits, padel has important implications for active living and the implementation of global health. Future studies are needed to develop prevention strategies, once the mechanisms of injury associated with padel have been clarified.

List of abbreviations

BMI, body mass index

COVID-19, coronavirus disease 2019

ISMF, Italian Sports Medicine Federation

STROBE, strengthening the reporting of observational studies in epidemiology

WHO, World Health Organization

Contributions

AA, SP, DF, and AT, conceptualization; AA, AB, and GL, methodology, data curation; AA, AB, FB, VF and GL: writing—original draft; CS, and DB, analysis of data; VF, DF, SP, and AT, writing—review and editing; AB, AT, GL and SP, supervision. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Conflicts of interest

The authors declare no conflict of interest.

Ethics approval

This study was approved by the Chief of the Department of Physical and Medical Rehabilitation Unit. The study is conformed with the Helsinki Declaration of 1964, as revised in 2013, concerning human and animal rights.

Informed consent

All patients participating in this study signed a written informed consent form for participating in this study.

Patient consent for publication

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

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Submitted: 1 February 2024.

Accepted: 9 April 2024.

Early access: 24 April 2024.