

# MEDICAL SCREENING IN PADEL PLAYERS

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## INTRODUCTION

Padel is an emerging racket sport, with Mexican origin, played in a grass court of 20 × 10 m, divided by a central net, and delimited by glass and gratings<sup>1,2</sup>. The key of its success is that high levels of technical skills are not required to start practicing, equipment is not expensive, and it is usually played outdoors<sup>3</sup>. Nevertheless, padel is considered a high-intensity intermittent sport, combining high-frequency and low-intensity athletic gestures<sup>4</sup>. Besides game dynamics and the technical-tactical requirements, padel performances are influenced by the physical fitness and kinematic patterns of the athletes, that can underestimate the risk of injury, microtrauma and overload disorders<sup>5</sup>.

During the game, similarly to other sports, players continuously collaborate in individual and cooperative activities contrasting the opponents and protect their side.<sup>6</sup> Therefore, the performance is the result of concentration and mental skills.

The growth of this sport has also been reflected in an increase in scientific literature, considering the number of articles has been published in recent years. In this scenario, existing literature addressed several research topics, such as athletes' actions and strategy during a game, match dynamics, the injury risk, and physical fitness<sup>3</sup>.

It is mandatory to perform an adequate medical screening in padel players to prevent potential musculoskeletal injuries.

## MATCH ANALYSIS OF PADEL

The region of the court (net, middle, and baseline) has a great influence on match dynamics<sup>6</sup>. Herein, 46.6% of the activity occurs in the baseline area, while the 27.7% takes place in the middle area and 25.6% near the net. At the baseline, side corners gain great importance, whereas the centre is significant in the middle and net part of the court<sup>6</sup>.

In padel, strategy has a key role since most of the winning points are scored from the middle and net region of the court. Players have to “conquer” the net, which is considered to be more advantageous, whilst the defensive pair attempt to recuperate it<sup>7,8</sup>. The net site significantly improves the efficiency of winner points thanks to the advantageous position of the attackers with low error rates, and a lower time to react for the defenders<sup>7</sup>.

One of the possible solutions to gain the net is to use lobs sending the ball to the side-corners, at the baseline near the walls keeping the opponents away from the offensive zones<sup>9</sup>. In fact, lob is the most frequent (85.4%) and efficient stroke in a defensive position to overcome the opponent position at the net. Generally,

lob it is not a closing shot, but it allows the continuity of the game, increasing the length of the rally<sup>10</sup>.

In term of attacking shots, the most successful are the overhead strokes, considering that 8.6–7.2% of trays and 33.3–51.8% of flat smashes are winning strokes<sup>7</sup>. In this context, smashing near the net is a winning choice during a game and its success is related to the court area, direction, speed and precision with which it is performed<sup>7</sup>. Opting for cross-court shots bounces the ball on the railing or wall, increasing opponent's uncertainty and the possibility of making an error, especially when executed in flat hits and topspin<sup>2</sup>.

Overall, most points are scored between the 5th and 11th second of the rally. The highest probability of making an error following an unforced hit is in the first four seconds of the rally. Consequently, the ability of an elite player lies in avoiding unforced errors in the first seconds after serve and the capacity of volleying in the central region spending more time near the net, increasing the probability to score<sup>9</sup>.

In this scenario, experience plays a key role during a match, due to the focus of a professional athlete on court position, the net approach, the net time frame, and “right and left” players synergy. In this regard, the player on the left side takes more shots than the right player, and plays more offensively,



**Figure 1:** Best strategies according to position in the court. The Figure is adapted from Demeco A, et al. *Int. J. Environ. Res. Public Health* 2022; doi: 10.3390/ijerph19074153<sup>6</sup>.

because in right-hand-dominant couples, the left-side player performs the powerful smash, with the dominant arm in the center of the field. However, a left-hander player on the right side of the court defends the center line more effectively (see Figure 1 for further details)<sup>11</sup>.

#### THE ROLE OF MOVEMENT ANALYSIS IN THE MEDICAL SCREENING

The technologic development of the last years has provided a great contribution to injury management of elite players. In particular, pre-season screening has gained a crucial role during the sport season, through preventive players assessments, integrating clinical and instrumental analysis to identify athletes' deficits (e.g., neuromuscular or movement deficit). In this context, kinematic analysis of the athletic gesture can potentially identify, at an early stage, neuromuscular or articular deficits, that represent a risk factor for injuries<sup>12</sup>. To date, Kinematic analysis represent the gold standard in movement analysis, based on optoelectronic system, often integrated with surface electromyography (sEMG) and force platforms. Through the detection of

reflective markers, is possible to analyze the athletic gesture required, integrating the articular range of motion and the muscular activity<sup>13</sup>. However, the clinical applicability is still limited, due to the necessity of expensive equipment and expert personnel<sup>14</sup>. Recently, the improvement of camera capture has increased the validity of 2D motion capture system on articular range of motion analysis; 2D tools are usually easy to use and can be utilized in both the diagnostic and therapeutic phase, thanks to serious games, that objectivate the outcomes of the rehabilitation plan<sup>15</sup>.

In addition, inertial measurement units (IMU), that include gyroscopes and accelerometers, provide a detailed gait or articular assessment. They gained popularity in clinical and sport setting, mainly when integrated with sEMG, to study the risk factors for injuries or overuse pathologies (e.g., ACL injury risk)<sup>16,17</sup>.

During training or competition, GPS is widely utilized by athletic trainer to monitor the external training load. These systems are commonly utilized in agonistic competition, and give an approximation of the distance covered by the athlete during training or

match, deriving, with the use of customized software, speed and acceleration, that should be interpreted with caution<sup>18</sup>.

The important aim of these tools is to support the clinician or the athletic trainer in the development of a tailored approach targeting the athlete needs with a personalized plan of exercise in order to increase the performance<sup>12</sup>.

#### PADEL AND FATIGUE

Intensive padel training can induce neuromuscular fatigue<sup>19</sup>, thus highlighting the importance of an adequate recovery time in high-intensity intermittent sports<sup>20</sup>. During a match, hydration plays a key role. In this scenario, Pradas et al. reported an alteration in urinary values after a padel match with a worsening of the urine-specific gravity<sup>19</sup>. This is evident in men due to a higher predisposition of hypohydration<sup>21</sup> and the tendency of more sweating than female players (due to anthropometric and metabolic characteristics). Furthermore, it is shown an increase in microalbuminuria excretion, a parameter linked to intense physical activity<sup>22</sup>, due to a reduction of kidney arteries lumen, that slows

renal plasma flow<sup>23</sup>. Moreover, recent evidence suggested an improved physical conditioning and body health in middle-aged adult women playing regularly padel compared with sedentary women, with a higher proprioception, strength, and cardiorespiratory capability. Furthermore, it is reported a lower abdomen, hip circumference, and leg skinfold, lowering the risk of cardiac pathologies, osteopenia, and back pain<sup>24</sup>.

Alongside this, it is equally important for elite athletes to deepen mental fatigue. This concept was defined by Van Custer et al<sup>25</sup> as psychobiological damage caused by significant mental strain that requires high cognitive and emotional effort. It is of great importance in padel, accounting the significant amount of cognitive involvement in choosing appropriate solutions in an unpredictable and high-speed environment<sup>9</sup>. Moreover, railings and walls increase the variability of the related technical-strategic response and mental fatigue. It is particularly relevant if there are more consecutive games, highlining the role of adequate recovery time that represents a milestone in preventing both neuromuscular and mental fatigue.

Fatigue is closely correlated with motivation, which during exercise increases the contribution of the facilitation system (improving the athlete's ability to tolerate effort and improving physical performance), and which could decrease after a padel match, with negative emotions caused by dissatisfaction with performance. Moreover, fatigue also increases the reaction time,

which consists of a cognitive part (pay attention to feeling the stimulus) and a neuromuscular part (faster reaction), due to the psychophysical effort required during the game, slowing the response to the opponent's strokes<sup>26</sup>.

Hence, specific sports conditioning regimen might improve mental fatigue endurance of athletes in sports. Furthermore, the intake of caffeine and creatine could have a positive effect<sup>27</sup>, improving the availability of extracellular adenosine in the brain<sup>28</sup>. In this context, the restorative effect of sleep and rest play a key role in improving the mental fatigue of athletes, especially during close-range competitions<sup>28</sup>. This aspect is a of high relevance during international competing and the jet lag that can cause sleep disorders or even insomnia. Therefore, coaches have to focus on programming all the details of the training monitoring the athletes' needs.

#### RISK OF INJURY DURING A PADEL MATCH

There is still little evidence in the current literature on this topic, however, a deep analysis of the current knowledge investigating the injury rates shows that two out of five padel players experienced at least an injury over the last year<sup>6</sup>. Generally, a non-professional player requires more than a month to recover. The majority of padel injuries affect lower limbs, and ankle sprains are the most common lesions, usually due to an abrupt internal inversion and rotation of the player executing a change of direction, that is a very common movement during a game<sup>29</sup>.

In addition, padel players complain a large percentage of upper limb injuries. Since padel players commonly executes overhead strokes (e.g., smashes), frequent sites of padel injuries are shoulder and elbow, e.g., rotator cuff syndrome, Glenohumeral Internal Rotation Deficit, bursitis, and epicondylitis. The higher proportion of upper limb injuries in padel compared with other racquet sports is probably due to the court characteristics (smaller and surrounded by glass) which increases the frequency and the speed of shots taken and game pace itself. Moreover, the high frequency of the abduction-external rotation movements of the shoulder during these shots could represent a possible explanation, mostly in case of shoulder instability<sup>30</sup>. Therefore, it is considered mandatory an early diagnosis of the kinematic alterations to plan a global rehabilitative approach built on the athlete needs<sup>32</sup>.

In addition, the court dimensions, the proximity of the players, the size and speed of the ball, represent a risk factor for eye injuries, and propose the use of protective eyewear to reduce the number of eye injuries<sup>31</sup>.

#### PHYSICAL FITNESS FOR PREVENTION AND REHABILITATION STRATEGIES AFTER INJURIES

In sport, body dynamics and anthropometry of a player are linked with better results, mostly in racket sports<sup>4,32</sup>. The height and arm span of a player are decisive, and fast strength is essential to complete the exchanges, taking advantage of the most

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**Illustration**

powerful overhead shots<sup>33</sup>. Taller players with higher muscle weights have the ability executing powerful strokes, e.g., smash, which can sometimes bounce the ball out of the court, scoring a direct point<sup>4,34</sup>. Moreover, a higher “core” strength is essential to execute stronger shots due to the sudden change of direction of padel athletes shifting their stance quickly and requiring high leg power to move upper body weight more quickly<sup>4</sup>.

Moreover, the presence of walls and gratings surrounding the field extends rally duration, and, consequently, the number of actions and strokes is greater than other racket sports, such as badminton and tennis. While at non-professional levels, physical fitness has low influence on performance of a player, the high intensity of an elite competition makes strength and conditioning training a priority for success, and balance and reaction time represent fundamental characteristics of the elite player<sup>9</sup>.

In this scenario, an appropriate preparation should include a prevention program of exercises to avoid a loss of

performance or microtrauma, mostly when the player is beginning to play padel<sup>33</sup>. Moreover, the fast and intense game pace may increase the injury risk<sup>35</sup>, mostly if fatigue is coupled with improper technique<sup>36</sup>. In addition, the high intensity and brevity of running and jumping may influence the ability to control landings, and may consequently be associated with non-contact injury<sup>37</sup>. This aspect is of high relevance, considering that only strength training is not sufficient, and should be integrated with a neuromuscular training, able to increase the awareness of the body to react to a perturbation<sup>16</sup>.

On the other hand, excessive training and loads might be associated with injury risk, highlighting the need to focus on proper technique, alimentation, and recovery<sup>38,39</sup>.

Complementarily, postural exercises and trunk “core” strength is proven to be essential to avoid lesions with long-term consequences<sup>24</sup>, since the unilateral overhead sport nature of padel and the high specialization of the player in occupying a specific part of the court, which strongly influences on game dynamics<sup>8,24</sup>.

## CONCLUSIONS

Padel has been obtaining a high attraction by young and old people and should be contemplated as a health promoter with positive repercussions in the health status. However, the intermittent high-intensity physical activity might induce musculoskeletal injuries in padel players, making necessary an adequate medical screening with a particular attention to the joints as ankle, shoulder, and elbow. Thus, starting from an adequate knowledge in terms of mechanisms of injuries, specific prevention programs should play a key role in the next future for padel players.

## References

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