

## Top athletes handedness in the major racket sports

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**Abstract:** Previous research showed a higher percentage of left-handed athletes in interactive and fast ball sports than in the general population. The aim of this study was to analyse the patterns of representation of left-handedness in top level competitors of the major racket sports. The hand used to hold the racket by the 100 world best male players (selected from 2012 rankings) in tennis (T), table tennis (TT), squash (S) and badminton (B) was recorded. The proportion of left-handers was calculated for each sport and logistic regression analyses were used to evaluate the probability for a player of holding the racket with the left hand given his position in the ranking. TT showed a higher percentage of left-handers (29%) than T (15%), B (16%) and S (14%). Logistic regressions showed that, when going up in the ranking, the probability of using the left-hand to hold the racket tended to increase in TT, B and S, and to decrease in T. The higher proportion of left-handers observed in TT when compared to the other sports can be attributed to the fact that, among the analysed sports, TT is a sport in which the opponents stand with the shortest distance. Furthermore, the technical and tactical components of performance are more determinant than physical fitness in TT, and these characteristics, taken together, may favor left-handed players. The very low number of left-handers among the very best tennis players may be explained by the fact that the disadvantage of a reduced experience against left-handed opponents is nowadays compensated by the player's professionalism. In conclusion, the present study confirmed that left-handed individuals are more represented in racket sports, and especially in TT, when compared with the general population. Finally, considering the specific position of each player in the ranking as determinant of left-handedness probability seems to be a promising approach to further analyse left-handedness in the best ranked players of different sports.

**Keywords:** handedness, racket sports, interactive sports.

### 1. INTRODUCTION

Handedness is the tendency of humans to use, in various movements or motor tasks, one hand rather than the other. The topic of handedness has received a lot of attention in several research fields. It is well known that left-handers are a minority of the general population: their proportion is normally reported to range, with some cultural variations, between 10 and 13% [1-3]. Interestingly, the proportion of left-handed individuals seems not to have changed since the Paleolithic age [4], although handedness has both a genetic and environmental origin [5], and left-handedness is associated to fitness costs and functional disadvantages [6-9]. Therefore, it can be supposed that left-handers have also some advantages when compared to right-handers. For example, a selection mechanism linked to fighting interactions has been suggested [1]. Although such a mechanism does not completely explain the present proportion of left-handers in the population, it is reasonable to state that left-handed individuals have an advantage in fighting. Indeed, the opponents, more accustomed to fighting against right-handers (representing the majority of people), may face a non-familiar situation when fighting against left-handers [3-4, 8]. It was suggested that the frequency of left-handers is higher in those societies showing frequent physical fights [7].

The advantage of left-handers in fights may be reflected in a sport context, especially in combat sports (boxing, judo, karate and martial arts), interactive team sports (e.g., rugby and handball), and racket sports (tennis, table tennis, badminton, etc.) [1]. Some authors hypothesized a neuropsychological advantage of left-handed sportsmen [10-12]. However, Wood and Aggleton [13], observing in fast ball sports a proportion of left-handed players higher than in the general population, concluded that the advantage of left-handers was due to specific characteristics of the sports disciplines rather than to neuropsychological factors. Grouios et al. [2] noticed a higher percentage of left-handed athletes in interactive than in non-interactive sports, and postulated that their findings were consistent with the "fighting hypothesis" of Raymond et al. [1]. Those authors also observed that, in interactive sports, the percentage of left-handers increased when the physical interaction was closer.

It seems therefore that some features of sports disciplines play a key role in determining a more or less marked advantage for left-handers, and, consequently, a high percentage of left-handed practitioners. In this study, we analyzed the patterns of representation of left-handedness in top level competitors of the major racket sports [14], namely tennis, table tennis, badminton and squash. Previous studies carried out in different periods and on athletes of different levels,

reported percentage of left-handers in the 14.0-22.7% range for tennis [2, 13, 15], in the 18.5-31.0% range for table tennis [1-2], and of 22.7% for badminton [1].

Specifically, the present study aimed to analyze the frequency of left-handers among top-level players in the four aforementioned racket sports. A further purpose was to evaluate the probability of left-handedness as a function of the specific position of a player in the world ranking.

## 2. METHODS

The ranking of the best players in the world were downloaded from the following websites, belonging to international federations or professional circuits:

- Tennis: [www.atpworldtour.com](http://www.atpworldtour.com)
- Table tennis: [www.ittf.com](http://www.ittf.com)
- Squash: [www.worldsquash.org](http://www.worldsquash.org)
- Badminton: [www.bwfbadminton.org](http://www.bwfbadminton.org)

A monthly ranking is usually compiled for table tennis, badminton, and squash by the respective federations/associations. For these sports, the ranking of January 2012 was considered. In contrast, there is a weekly ranking in tennis, and the examined one was the first of January 2012.

For each of the sports, the handedness of the first 100 male players was analyzed. According to Raymond [1], analyzing the hand used in throwing can represent a direct way to measure functional handedness. Therefore, the hand used by a player to hold the racket was considered as an indication of handedness for that player. Handedness of all the top 100 tennis players was indicated in the above website. For the other three sports, handedness of players was determined by asking international-level coaches who knew well the respective athletes, or by examining pictures representing the athlete when hitting the ball with the racket.

The proportion of left-handers was calculated for each sport, and logistic regressions were used to estimate the probability for a player of holding the racket with the left-hand, given his position in the ranking.

## 3. RESULTS

The proportion of left-handed players was 15%, 29%, 14%, and 16% in tennis, table tennis, squash, and badminton, respectively.

Table 1 shows the values of coefficients obtained from the logistic regressions.

To obtain the estimated probability for an individual of being left-handed, the following steps must be followed:

- i) calculate the value of the logit function:
 
$$g(x) = \beta_0 + \beta_1 x,$$
 where  $x$  is the position in the ranking
- ii) calculate the probability of right-handedness
 
$$p_R = e^{g(x)} / [1 + e^{g(x)}]$$

- iii) calculate the probability of being left-handed
 
$$p_L = 1 - p_R$$

Table 1 Summary of the logistic regression analyses.

|                                | Tennis  | Table tennis | Squash | Badminton |
|--------------------------------|---------|--------------|--------|-----------|
| Ranking position ( $\beta_1$ ) | -0.0081 | 0.0006       | 0.0092 | 0.0085    |
| Intercept ( $\beta_0$ )        | 2.1641  | 0.8645       | 1.3767 | 1.2502    |

For example, for the tennis player being number 10 in the world, the probability of left-handedness is:

- i)  $g(10) = 2.1641 - 0.0081 \cdot 10 = 2.0831$
- ii)  $p_R = e^{2.0831} / [1 + e^{2.0831}] = 0.889$
- iii)  $p_L = 1 - p_R = 0.111$

Examining the values of the  $\beta_1$  coefficients allows to understand how the probability of left-handedness  $p_L$  changes according to the ranking position of a player:

- Tennis, there is a trend of  $p_L$  to decrease when going up (i.e. towards better positions) in the ranking. The estimated  $p_L$  is 0.104 and 0.205 for the world's number 1 and the world's number 100, respectively;
- Table tennis: there is a very weak trend of  $p_L$  to increase when going up in the ranking. The estimated  $p_L$  is 0.296 and 0.284 for the world's number 1 and the world's number 100, respectively;
- Squash: there is a trend of  $p_L$  to increase when going up in the ranking. The estimated  $p_L$  is 0.200 and 0.092 for the world's number 1 and the world's number 100, respectively;
- Badminton: there is a trend of  $p_L$  to increase when going up in the ranking. The estimated  $p_L$  is 0.221 and 0.109 for the world's number 1 and the world's number 100, respectively.

## 4. DISCUSSION

The present study aimed to analyze the patterns of representation of left-handedness in top level competitors of the major racket sports. Overall, the results show that table tennis is the sport in which the percentage of left-handers is the highest (29%) and is rather homogeneous among the top 100 players in the world. In contrast, tennis, squash and badminton show an about 15% percentage of left-handers. However, these sports have a different behavior concerning the probability of left-handedness as a function of the ranking position: this probability tends to increase when going up in the ranking for badminton and squash, while

an opposite trend is observed for tennis.

In a recent study, Loffing et al. reported that the proportion of left-handers among top-level tennis players has decreased throughout the last 40 years, whereas there is still an over-representation of left-handers players among amateur players [16]. The authors supposed that the disadvantage of a reduced experience against left-handed opponents is compensated by the player's professionalism, because top players have now sophisticated opportunities to accurately prepare their matches against any opponent. The present results are clearly consistent with Loffing's study, because tennis was the only among the examined sports in which a low proportion of left-handers was observed among the best ranked players. Indeed, only 2 out of the first 20 tennis players were left-handed, as opposed to 6, 5, and 4 players, respectively in table tennis, squash and badminton.

The observed over-representation of left-handed players in table tennis is consistent with previous observations [1]. Since the level of professionalism in table tennis can be considered similar to that of tennis at least among top-level players, the higher proportion of left-handers is probably linked to some peculiar features of this sport. Indeed, when compared to tennis, table tennis is characterized by a shortest distance between the opponents and by faster actions and rallies [17-18]. Furthermore, the technical/tactical components of performance, linked to the capacity of imparting an effect to the ball [19-20], are more determinant than physical fitness. Taken together, these characteristics are likely to favor, in any cases, left-handed players.

Contrary to what happened in tennis, badminton and squash showed a higher number of left-handed players when going towards the best positions of the ranking. Given the paucity of previous studies that analyzed handedness in these sports, the interpretation of the present observations is not straightforward. It is reasonable to hypothesize that, also in these cases, the technical and tactical characteristics of each sport may result in a more or less advantage of left-handed players. Further studies are needed to test this hypothesis.

In conclusion, the present study confirmed that left-handed individuals are more represented in racket sports when compared with the general population. This over-representation was more evident in table tennis and less evident in the other three examined sports. Furthermore, it was shown for the first time that the trend of the probability of left-handedness as a function of ranking position shows some differences in the examined racket sports. Actually, considering the specific position of each player in the ranking as determinant of left-handedness probability, rather than simple proportion of left-handed players, seems to represent a promising approach to analyse the left-handedness in the best ranked players of different sports. Future research is warranted to further investigate the links between handedness and technical/tactical aspects in racket sports.

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