# Grip Pressure Applied by Tennis Players Before, During and After Impact : Relationships With Level of Play and Tennis Elbow Incidence

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## Summary

This study aimed to measure the grip pressure applied by beginner, intermediate and elite tennis players before, during and after impact. Results showed that grip pressure values differ between tennis elbow affected and non-affected players, especially during the impact and follow-through phases.

## Introduction

Lateral epicondylitis, also referred to as tennis elbow (TE) is one of the most common tennis injuries, with a very high prevalence among recreational players [1]. Previous research compared wrist kinematics and wrist extensor activity among experienced and novice players, especially during backhand, which is reported to induce increased pain among players affected by TE [2]. However, these studies did not focus on grip pressure applied by players, especially during the impact and the follow-through phases, which could play a key role in preventing TE injuries. Thus, the aim of this study was to measure grip pressure among different level of players before, during and after impact.

## Methods

Forty three healthy male tennis players (mean ± age : 33.8 ± 17 years old) participated in this study. Players were assigned to three groups according to their level of play (based on the International Tennis Federation ranking system) : 'Beginners' (level 10 to level 8 players, n = 8) , 'Intermediate' (level 7 to level 3 players, n = 28) and 'Elite' (level 2 players or above, including nationally ranked players, n = 8). Subjects were also asked if they previously sustained a TE injury to separate them into two groups ('Yes' or 'No').

Four Wilson Blade tennis rackets (ranging from sized 2 to size 5) were instrumented with pressure sensors around the base of each racket and accelerometer near the racket throat. Each player chose the racket corresponding to their usual racket size. Players were asked to perform 60 forehands, 60 backhands, 60 forehand volleys and 60 backhand volleys. For each type of shot, 30 of them were played cross-court and 30 of them were played down-the-line. A tennis ball machine projected new tennis balls toward the subject at the rate of one ball every 8s. Accelerometer signal was used to detect impact timing as well as pre-impact phase (15ms period prior to impact) and post-impact phase (15ms period after impact). The sampling frequency of the pressure sensors and the accelerometer was 200 Hz. Pressure values were normalized for each subject based on their 'base' pressure, i.e. the pressure value occurring when subjects were holding the racket between shots.

## Results and Discussion

Concerning the backhand, beginner players that previously suffered from TE displayed the same grip pressure during and after impact while beginner players not affected by TE reduced their pressure after impact. More surprisingly, elite players that have not suffered from TE displayed an increase in grip pressure after impact.

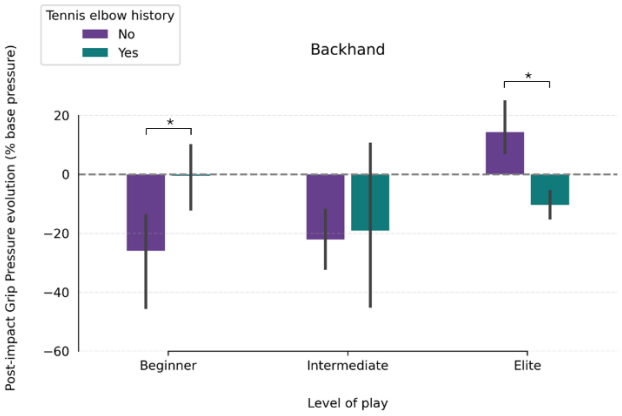


**Figure 1**: Evolution of the grip pressure during the 15ms period following impact during backhand among players. (* = p <0.05)

## Conclusions

The lack of grip pressure decrease during follow-though phase among beginners players that have suffered from TE, in opposition with literature recommendations, might explain the prevalence of this injury among this population.

## References

[1] Rigozzi CJ et al. (2023). *Sensors*. MDPI, **23**: 5146.
[2] Eychenne S. (2022) Pressions et préhension : délivrez votre tennis, Nombre7 Editions.

**Table 1:** Grip pressure before, during and after impact for backhand strokes among all players. Yes/No = TE history

| | Beginner-No | Beginner-Yes | Intermediate - No | Intermediate -Yes | Elite - No | Elite -Yes |
|---|---|---|---|---|---|---|
| Pre-impact pressure (% base) | 188.8 | 171.7 | 212.2 | 203.2 | 139.2 | 221.6 |
| Impact pressure (% base) | 218.4 | 167.9 | 230.1 | 248.3 | 176.8 | 226.1 |
| Follow-through pressure (% base) | 192.5 | 167.5 | 208.3 | 227.5 | 191.4 | 216.2 |