THE EFFECT OF A DAMPING ELEMENT IN TENNIS RACKETS

Wolfgang Potthast, Oliver Bloch, Susanne Ochel, Gert-Peter Brüggemann
Institute for Biomechanics, German Sport University Cologne, Germany

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INTRODUCTION: Lateral epicondylitis or tennis elbow is often associated with external vibrations initiated by the racket (Hach & Renstroem). Therefore a technical attempt to reduce lateral epicondylitis, through the implementation of a damping element (DE) between the grip and the head of a tennis racket, would seem logical. The purpose of this study was to investigate the effect of a damping element on the transition of vibrations from the frame (FR) via the grip (GR) to the wrist (WR).

METHODS: In order to investigate the vibrations at the different locations (FR, GR, WR) and the effect of the DE, two strain gauge based accelerometers (3000 Hz) were glued at FR and GR. One accelerometer (3000 Hz) was taped at the player's wrist and tightened with an eletrocardiogram-rubber band. 6 male and 6 female players had to return a ball-shot from a tennis ball cannon. Two video cameras controlled the speed of the ball and the point of ball-racket contact. The subjects started approximately at the centre of the baseline (Fig. 1). The task was repeated 10 times and was done under four different racket conditions: (1) TR (test racket with DE), (2) R1 and R2 (two different commonly used control rackets without DE) and (3) MR (modified test racket with stiffened DE). The parameters observed were mean power frequency (MPF) and the normalised to the maximum occurring amplitude $a_{maxnorm}$ of the acceleration data. An ANOVA with post hoc test was performed in order to identify differences between the racket conditions.

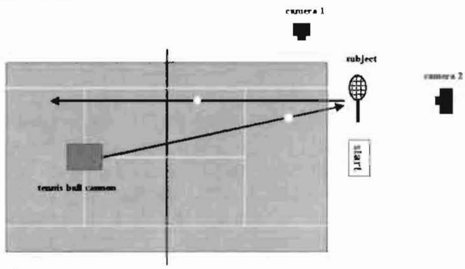

Figure 1. Experimental setup.

RESULTS AND DISCUSSION: Maximum acceleration at FR up to 90g was recorded. The ANOVA shows at GR significant lower MPF and $a_{maxnorm}$ values between TR (79.35 Hz) and the three remaining racket conditions (Table1).

Table 1. ANOVA of $a_{maxnorm}$ and MPF at location GR ($p<0.001$), n=120.

	$a_{maxnorm}$, normalised		MPF [Hz]	
Racket condition	**Group 1**	**Group 2**	**Group 1**	**Group 2**
TR	0.8171		79.35	
R1		0.8797		93.38
R2		0.8822		97.06
MR		0.9203		99.68

Brody determined racket oscillations with frequencies between 120 and 200 Hz. The MPF values determined in the presented study are not inconsistent with Brody's findings. It appears that the DE is effective to dampen the vibrations caused by the ball-racket collision at FR regarding MPF and $a_{maxnorm}$ in their transition to GR.

CONCLUSION: The DE provides an effective pre-requisite for injury prevention because it reduces MPF and $a_{maxnorm}$ at GR. However, the transition of vibrations from GR to WR and along the forearm is not yet well understood.

REFERENCES:

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