

EVALUATION OF VIBRATION DAMPING
PROPERTIES OF THE TENEX ELBOW
SHOCK ABSORBER

BC
RESEARCH

BRITISH COLUMBIA RESEARCH CORPORATION

EVALUATION OF VIBRATION DAMPING PROPERTIES
OF THE TENEX ELBOW SHOCK ABSORBER

Prepared for:

WESTERN ECONOMIC DIVERSIFICATION

P.O. Box 49276 Bentall Tower 4

1200 - 1055 Dunsmuir St.

Vancouver, B.C. V7X 1L3

Prepared by:

Tony Leyland - Ergonomist
Occupational Health Group
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Project No: 4-02-338 April 2005.

SUMMARY

This study was designed to evaluate the effectiveness of the TENEX elbow shock absorber in reducing peak accelerations at the elbow of two professional tennis players during numerous tennis strokes. The TENEX elbow shock absorber, produced by Tenex Corp, is a semi-spherical container of high impact polycarbonate filled with a high-density liquid. It is worn on the wrist and is purported to reduce vibration shock to the elbow during ball and racquet impact. This in turn is supposed to alleviate symptoms of tennis elbow.

Previous studies had evaluated the TENEX shock absorber, and after review by Western Economic Diversification, there was still some additional testing to show the product's effectiveness that could be added for its ability to dampen the vibration transmission from a racquet to the elbow of an individual hitting a tennis ball. British Columbia Research Corporation was requested by Western Economic Diversification to evaluate the previous studies and test the effectiveness of the TENEX elbow shock absorber when worn by a human subject.

After reviewing existing studies it was concluded that the elbow shock absorber would absorb energy over a wide spectrum of frequencies when attached to a steel rod. As the human arm is composed of soft tissue, fluid (blood and lymph) and bone (which is far less rigid than steel) it was impossible to extrapolate these findings to the human situation. The one previous study that did use human subjects did not measure the vibrations at the elbow and dealt with pain control and arm strength of the subjects, and concluded that Tenex worked well on human subjects who displayed symptoms of tennis elbow.

Studies carried out by B.C. Research used two tennis-teaching professionals with an accelerometer attached to

their elbows. Peak accelerations were recorded at the elbow for numerous tennis impacts. The conditions of these impacts included wearing the TENEX elbow shock absorber, not wearing the device, and wearing a dummy wrist weight of the same mass as the TENEX. As many factors as possible were controlled. However, the results support previous findings that vibration shock to the elbow in tennis is highly variable and likely dependent on factors such as racquet head speed, impact point and grip tightness.

A laboratory study was performed to obtain graphs of the impact from the accelerometer on the elbow. The purpose was to highlight the variability in peak accelerations at the elbow.

Vibrations of metal rods are presented by other researchers as one graph which averaged series of tests and showed 50 to 70% reduction in vibration factors.

Use of the TENEX elbow shock absorber in our two field studies resulted in significant lower peak accelerations than when not using the elbow shock absorber.

The differences in peak acceleration were statistically significant for one set of strokes for both subjects. One subject had significantly lower peak accelerations when wearing a TENEX elbow shock absorber during his backhand stroke, the other had a similar result for his forehand stroke.

The TENEX elbow shock absorber has not been proven to reduce the incidence of tennis elbow by the studies evaluated or conducted by B.C. Research. However, responses from tennis players wearing the TENEX elbow shock absorber are positive and no ill effects of using a TENEX elbow shock absorber are expected. In addition, it is likely that a significant reduction in peak accelerations at the elbow (over the course of a tennis game requiring hundreds of

strokes), would reduce the accumulated stress to the muscle tendons in this area.

It is concluded that the TENEX elbow shock absorber is a promising product which ability to reduce vibrations to the arm of a tennis player is significant.

Tony Leyland

Ergonomist
Occupational Health Group

April 15,2005