



Development of a Tennis Specific Speed Test for the Arm Movement and Evaluation of a Tennis Specific Speed Training Method

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Introduction

Although racquet speed has become a performance-limiting factor in elite tennis within the last couple of years, this key element was rarely taken into consideration in performance diagnostics. There are several parameters that contribute to an increase in racquet speed. One of those important elements for hitting fast strokes seems to be the “fast arm phenomenon” (Ferrauti and Weber, 2000). To date this aspect hasn't been tested due to the lack of a suitable test. Based on the hypothesis that players with a faster arm are able to generate higher racquet speed, a tennis specific arm speed test (AST) was developed, quality criteria were examined and observations about its use in performance diagnostics for tennis players were made. Moreover the effects of a tennis specific speed training programme for arm movement (racquet speed) were evaluated after a four-week training study.

Methods

One of the main advantages of a rope (cable) pull machine is its highly variable usage. One can therefore easily replicate tennis specific movements (e.g. a forehand). Based on those criteria, a portable testing device was designed and later used for measuring arm speed when hitting a forehand. In combination with a linear encoder, data was collected with Muscle Lab-Systems (Ergotest Technology, Norway, type ET-Enc-01, resolution < 0.075mm; at 1000 Hz). The maximum ball speed of the subjects' forehand was also measured via radar, on-court, and later correlated with the results of the AST. In a four-week training study with top-ranked Austrian youth tennis players, the effects of a tennis specific arm speed-training programme were evaluated. The training group completed three sessions a week, ~ 30 min, doing various exercises and using different equipment (medicine balls, speed tennis racquets...). Those training sessions were implemented in the regular training process and usually completed on court. After the intervention period, pre and post-test results of the AST and on court forehand speed test were compared and analysed.

Results and Discussion

The validity examination of the AST brought highly significant results ($p=0.007$) when correlating it with a regular on court speed test ($r=0.727^{**}$). This means that the higher the arm speed at the AST the higher the ball speed on court. The training group showed a highly significant improvement not only at the AST (+14.4%) but also on court (+7.3%). In absolute numbers the training group improved its maximum forehand ball speed by 5.5mph within four weeks. The post-test of the control group didn't show any significant improvements. Studies by Elliot (2003) and Bahamonde (1998 and 2003) have shown that various factors are responsible to produce explosive shots, but the importance of a fast arm and its contribution to generate racquet speed, might have been underestimated so far.

Conclusion

The results of the AST and the training study underline the importance of a fast arm, a phenomenon that is very often mentioned among coaches. Moreover one could show promising results with very little changes in practice and more specific training. Since racquet speed is a decisive factor in elite tennis, coaches should put more emphasis on arm speed training. Motto: “more power through more speed”!

References

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