

Abstract

Background: A player's fitness can be a key factor that may make the difference between victory and failure. Because technical and tactical skills are predominant factors in tennis it is of great importance to organize the fitness training as efficient and time saving as possible. The German Tennis Federation (DTB) has established a biannual nationwide physical testing including ~ 400 squad players. The results obtained are used for basic talent identification as well as the development of training guidelines, including individualized training programs. The present article shows the concept for fitness testing and training design of the DTB. Two sample player profiles are presented to show the usefulness of the testing protocols and the individual conclusions obtained in order to design individualized training programs.

Material and Methods: Between the years 2009 and 2013, the sample of the 1052 best male and female junior players in Germany was evaluated using a battery of standard anthropometric and physical performance tests. Players were recruited from their respective regional federations and all the athletes were tested twice a year in a three week period.

Results: The individualized training programs are based on established percentiles considering sex, chronological age and the stage of maturation. Results show individual profiles of two players, including the percentile rank relative to their peers and related to both, their chronological and biological age.

Conclusions: The results enable the identification of weaknesses in different parameters and allow to design efficient physical training programs. Regarding the limited training time and the great amount of time needed to improve tennis specific skills this approach enables a more efficient way to design physical training programs.

Keywords

Talent identification – testing – physical fitness – tennis

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Conception for Fitness Testing and individualized training programs in the German Tennis Federation

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Introduction

In tennis, the sport-specific technical skills are predominant factors (e.g., racket and ball handling skills and stroke techniques) [28]. However, the player's fitness can be a key factor that may make a difference between victory and failure. It is widely accepted that to execute advanced shots and to compete effectively against progressively more elite opponents, players require higher levels of physical fitness [8]. It has been suggested that tennis players require a mixture of speed, agility, and power combined with medium to high aerobic and anaerobic capacity. Thus, successful performance cannot be defined by one predominant physical attribute; tennis requires on a complex interaction of several physical components and metabolic pathways [8,12,18].

It is important that the player and coach obtain objective information about the players' physical performances to clarify the objectives of training, plan short- and long-term training programs, provide objective feedback and motivate the player to train harder [29]. Competition naturally provides the best test for an

athlete, but in an athletic activity as complex as tennis it is difficult to isolate the various components within the sport and get objective measures of performance. Thus, fitness testing can provide relevant information about specific parts of the sport [23]. Moreover, specific training programs can then be designed based on the players' fitness testing results. From a practical point of view, the goals of testing are to enhance a player's performance (i.e., providing individual profiles of their respective strengths and weaknesses), reduce the risk of injury and design an appropriate training program so that the athlete's playing career can be as long as possible [18,27].

During the last few years, tennis players have been observed to devote a great amount of time to improve their tennis skills throughout technical and tactical training, with an average of 15–20 h of technical training per week even at a young age [6]. Because technical and tactical skills are predominant factors in tennis [10], coaches tend to place their training priorities on technical/tactical contents, and therefore, only just a minimum of specific physical training sessions

Zusammenfassung

Hintergrund: Im modernen Leistungstennis gewinnt die Athletik zunehmend an Bedeutung, obwohl Technik und Taktik nach wie vor primär leistungslimitierend sind. Folglich sollte das Konditionstraining möglichst individualisiert und dadurch ressourcensparend sein. Der Deutsche Tennis Bund betreibt seit vier Jahren eine konditionelle Leistungsdiagnostik mit allen Kaderspielern auf dessen Grundlage individuell angepasste Trainingsempfehlungen gegeben werden. Der vorliegende Beitrag beschreibt die Durchführung der Testbatterie und verdeutlicht anhand von zwei Fallbeispielen den Wert von differenzierten leistungsdiagnostischen Befunden für eine individuelle zielgerichtete Ausrichtung des Konditionstrainings.

Methoden: Im Zeitraum von 2009–2013 nahmen 1052 männliche und weibliche C-/D-Kaderspieler im Alter von 10 bis 18 Jahren am „DTB-Konditionstest“ teil. Dieser beinhaltet standardisierte anthropometrische und konditionelle Untersuchungen.

Resultate: Grundlage der individuellen Leistungssteuerung ist der Vergleich der Individualbefunde mit alters-, geschlechts- und entwicklungsrelativierten Normprofilen, deren Anwendung anhand von zwei Beispielen verdeutlicht wird. Die entwickelten Normprofile basieren auf Halbjahresgruppierungen und berücksichtigen sowohl das chronologische als auch das biologische Alter.

Schlussfolgerungen: Die Fallbeispiele verdeutlichen die Notwendigkeit entwicklungsrelativierter Normprofile für eine individuelle, zielgerichtete Ausrichtung des Konditionstrainings. Auf der Grundlage der Ergebnisse werden eindeutige Stärken und Schwächen in den unterschiedlichen motorischen Hauptfaktoren deutlich gemacht, so kann eine klare Schwerpunktsetzung für das Training empfohlen werden.

Schlüsselwörter

Talentforschung – Leistungsdiagnostik – DTB-Konditionstest – Tennis

per week can be programmed. As a consequence, training strategies aiming for fitness improvements (i. e., based on the individual profiles of strengths and weaknesses) are warranted.

Norm values and percentile tables for junior tennis players which have been generated and used to assess a given performance are commonly based on chronological age [3,17,26]. However, since there is a large variation in physical, emotional and cognitive development of athletes in adolescence (i.e., fundamental changes in biological characteristics at the age of 12–15 years) [19], it seems that chronological age is not a good indicator on which to base athletes training programs. A practical approach to design optimal individual training programs which are related to certain periods of trainability during the process of maturation is the use of an athletes' peak height velocity (PHV) as a reference point [13]. The PHV is the fastest rate of growth during the adolescent growth spurt, and can be a useful reference point providing valuable information about an individual's stage of maturation, enhancing the efficiency of development training, competition and recovery programs [1]. Established profiles just based on the chronological age do not consider the individual stage of maturation, thus obviously representing a weakness in the testing procedures.

Thus, the aim of this study is to establish percentiles based on normative data of physical fitness testing for tennis players based on chronological and biological age and to present the concept for fitness testing and training design of the German tennis federation including player profiles which in addition to chronological age consider the stage of maturation and

which can be used as a reference to design individualized training programs.

Methods

Participants

Between the years 2009 and 2013, the sample of the 1052 best male and female junior players in Germany was evaluated using a battery of standard anthropometric and physical performance tests (i.e., The German Physical Condition Tennis Test). Players were recruited from their respective regional federations and all the athletes were tested twice a year in a three week period (March and September). Players were tested at their respective federation base and passed four stations of different testing procedures in a group of three, spending 30 minutes for each station; accordingly an overall time of approximately two hours was required for a players testing. To ensure standardization of test administration across the entire study period, all tests were carried out in the same order and using the same testing devices and supervisors.

Measurements

All fitness tests were performed in an indoor facility (i.e., tennis court (Rebound Ace surface) and physiotherapy room) (Table 1). Testing began after a 15 min individual warm-up, which consisted of low-intensity forward, sideways, and backwards running, multi-directional acceleration runs, skipping and hopping exercises, and jumps of increasing intensity.

Anthropometrics

Sessions started with the measurement of players' body dimensions which included; body height, body

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