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AN EXAMINATION OF TENNIS ACCORDING TO LONG-TERM ATHLETE DEVELOPMENT MODEL

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ABSTRACT

Science-based multi-dimensional developments are observed today in the field of sport which maintains its importance in terms of both healthy life and Olympic success. Long-term athlete development (LTAD) model applied by Canada as a governmental policy may be cited as an example to this. LTAD is an athlete-oriented and coach-driven model developed by Istvan Balyi. The purpose of

this review article is to examine LTAD model within the framework of tennis sport together with stages of athlete development and to evaluate the ranking position of Canada, which uses this system, in the world ranking *in line with the results achieved* specific to Association of Tennis Professionals (ATP).

Key Words: LTAD, Physical literacy, Tennis, PHV

INTRODUCTION

Long-term athlete development model (LTAD) is an athlete development program designed to make health better, increase physical performance, minimize the risk of injury and help athletes develop their self-confidence and self-efficacy in every aspect (Lloyd et al., 2016). The fact that sport has become a life style in order to continue life as a performance athlete and to stay healthy without regard to any age limitation, has inspired more interest in LTAD model (Pichardo et al., 2018).

Learning and practicing fundamental movements and skills is the building block for physical literacy. Development of fundamental movement skills is important for the children to believe themselves both among the peers and within training environment. Physical literacy is an important component of LTAD (Balyi & Hamilton, 2004). All branches of sport are based upon the same fundamental skills and it is difficult to perform a sport branch without developing such skills. LTAD is intended to promote performance athletes to Olympic athlete level as well as gaining individuals who are unable to achieve such competence with the habit of doing sport (Bayraktar, 2019).

Ten key factors can be used as a guideline for applying LTAD model. These factors are: ten year rule, background, early or late specialization, developmental age, optimum windows of opportunity, physical-mental-cognitive-emotional development, periodization, competition schedule, integration, continuous improvement (Balyi et al., 2016).

1. Ten Year Rule: Approximately a ten-year or ten thousand-hour training should be done following physical literacy for the development of the athlete. Athlete development to achieve a level to compete with other athletes requires exercising for a long time. Coaches and parents should support their athletes throughout this long-lasting period in providing continuity of trainings and maintaining the highest level of motivation in psychological terms in order for them to top out (Ericsson & Charness, 1994; Balyi et al., 2016).

2. Fundamentals: Several fundamental skills are needed to play tennis. Agility, balance, coordination, running, jumping, hand-eye coordination, reaction speed and making decision are among them (Altınkök & Ölçücü, 2012). Good fundamental movement skills contribute to physical, cognitive and social development of children and constitute the basis for

an active lifestyle. Fundamental movement skills are developed during childhood which thereafter are turned into sport-specific skills (Lubans et al., 2010). Playing tennis alone cannot develop motor coordination requirements sufficiently. For an all-round development, children should participate in other sport branches besides tennis, including basketball, swimming, throwing an object and hitting (Novick et al., 2009). It is known that many athletes' success in elders' category depends on the content of all-purpose fundamental trainings they did during childhood and youth (Bompa & Haff, 2017).

3. Early or Late Specialization: Gymnastics, one of the oldest sports, (Ors, 2020) is considered to be an example of early specialization. Even if it is necessary to start tennis at an early age, it is important to develop all coordination skills gradually. This early start (not specialization) should focus on supplementary coordination requirements in order to form a sound basis through participating in all-purpose and relevant activities (Novick et al., 2009).

- Unfavorable situations that may occur – due to early specialization in tennis are as follows:
 - One-sided and poor overall athletic preparation
 - Non-development of fundamental movement and sport skills
 - Extreme injuries
 - Impairment in muscle ratios
 - Early burnout (Novick et al., 2009).

4. Developmental age: To have a successful performance, individual athletes require performance relevant cognitive skills (Ors et al., 2019). An individual's degree of physical, mental, cognitive and emotional maturity is defined as developmental age. Differences in developmental age may cause advantages and disadvantages to individual athletes. Athletes who develop late need longer periods to develop their physical literacy levels and sport skills. Athletes who mature early outpace their rivals who mature late in terms of performance especially in individual sports like tennis. Coaches should plan their trainings in line with development speed of athletes who mature late (Lubans et al., 2010). Norm studies (Bayraktar et al., 2012), which are mostly done according to the calendar age, ignore the developmental age of children. It is known that there are differences in biomotor abilities between biological age and calendar age (Bayraktar & Bayrakdar, 2020).

5. Optimal Trainability Windows: LTAD asserts that there are important "windows of opportunity" during development years of children where they are more sensitive to training achievements (Lubans et al., 2010). The model also points out that if these windows are not used, this would cause limitation of future athletic potential. In other words, it argues that athletes must do training in order to develop the right motor skills at the right time (Balyi & Hamilton, 2004; Novick et al., 2009).

Trainability windows for female and male athletes according to peak height velocity (PHV) are given in Figure 1.

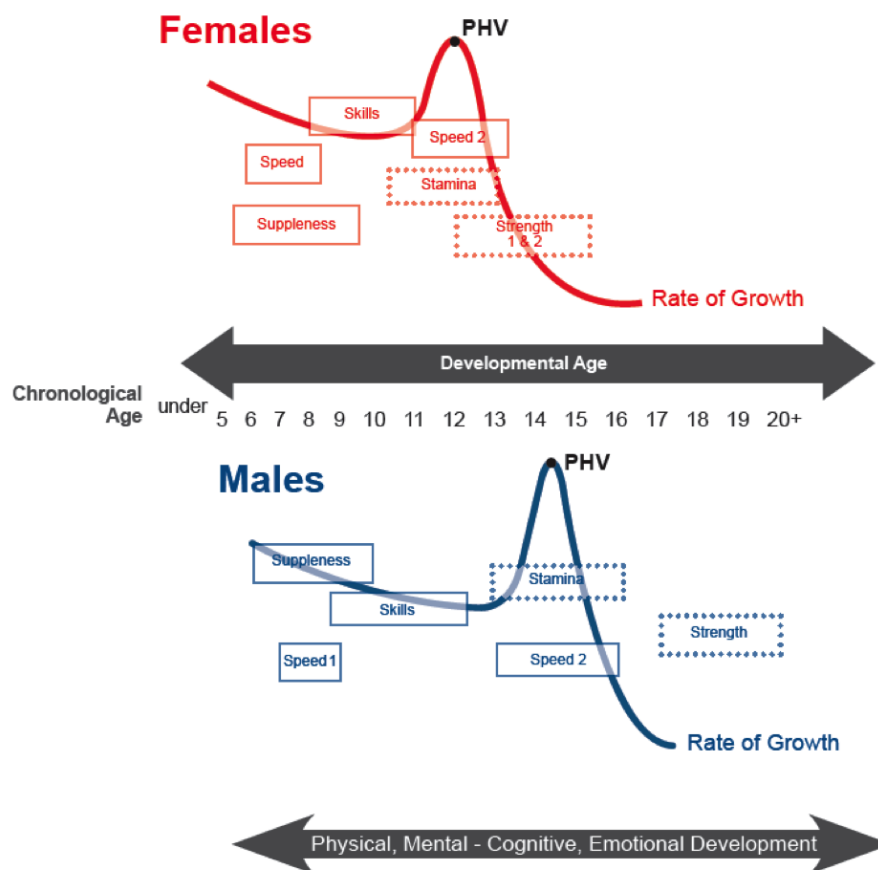


Figure 1. Sensitive Windows of Accelerated Adaptation to Training (Balyi & Way, 2005)

Besides strength, endurance, speed, tennis skills and flexibility in trainability windows for success, stature/structure, psychology, school life, life quality and socio-cultural life are also important in addition to these critical times for an exact and complete application of LTAD athlete development model (Labelle et al., 2009).

6. Physical, Mental, Cognitive and Emotional Development: Coaches and parents should know that physical, mental, motor and emotional characteristics of athletes develop at different ratios. Training programs for athletes should be made by considering all their developmental characteristics. It should not be focused only on technical and physical aspects of sport. Cognitive, mental and emotional development is critical for the performance of an athlete and it should be prioritized. Moreover, ethical behaviour, fair play, respect and determination are all important values to be instilled in athletes with regard to LTAD (Labelle et al., 2009).

7. Periodization: When it comes to periodization, which means planning and organizing trainings in line with certain targets, time should be mentioned. Such time may be a unit of training, one week (micro cycle), one month (meso cycle), a period (one or more meso cycles), a period (one or more periods), a macro cycle (one year or at least two periods) and mega cycle (at least two macro cycles) (Açıkada, 2018). It is important to form the right trainings with sufficient difficulty level and correct sequence for the success of the program in LTAD system. Sticking to the programs for a long time, will and motivation are important to become an elite athlete (Kirkwood et al., 2009).

8. Integration of systems: It is crucial that constituents of governance within the society support the programs for development of players and collaborate (school sports, physical education programs, entertainment activities, competition sports). All programs and projects should be consistent with LTAD model, well designed, athlete-oriented and coach-driven (Kirkwood et al., 2009).

9. Planning Competition Schedule: Competition schedule should be organized so as to make the athlete successful and encourage him/her to participate in sport throughout the rest of his/her life. Tournaments should be in appropriate number and level to contribute to the athlete (Borfiga et al., 2009).

10. Continuous Improvement: Knowledge is a matter of fact which is ever renewed and developed. LTAD model is a dynamic model, too. It has continuously renewed and developed over time. (Balyi & Hamilton, 2004; Higgs et al., 2019).

LTAD and TENNIS

In LTAD program structured for tennis, all processes beginning from birth are planned based on systematical and scientific foundations (Novick et al., 2009). This model consists of eight stages.

1. Stage - Active Start (Girls and Boys 0/5-6 years old): At this stage, the purpose is to instill sport love in the child and encourage the child for sport. The child learns to move effectively by developing agility, balance and coordination while participating in physical activities and various educational games. During these games, physical activities form random patterns within each other and this develops neural connections in the child's brain (Balyi & Hamilton, 2004).

Making children acquainted with racket and ball suitable for their age groups, ensuring hand-eye coordination, gaining self-confidence, learning various basic tennis movement forms are among the objectives to be achieved in this period (Novick et al., 2009).

2. Stage - Fundamental Training (Girls 5-8, Boys 5-9 years old): The purpose of this stage is to learn all basic movement skills and form general motor skills. Before tennis-specific movements, basic motor movements should be developed. An enjoyable training environment should be designed and athletes should be encouraged also for other branches of sport (Balyi & Hamilton, 2004).

It is important to catch up appropriate trainability window for speed and flexibility. Acquiring basic tennis skills, acquiring psychological skills, learning rules of the game and improving decision-making capability are among the objectives of this period (Novick et al., 2009).

3. Stage - Developing, Forming, Progressing (Girls 8-11, Boys 9-12 years old): The purpose of this stage is to learn all basic sport skills. Trainings should be based upon developing basic sport skills (Balyi & Hamilton, 2004), that is to say, tennis skills in terms of trainability windows.

General objectives of the period should be examined under two headings; tennis for high performance (for the purpose of participating in tournaments and becoming an elite athlete) and life-long tennis (for social and physical activity purposes) (Labelle et al., 2009).

4. Stage - Strengthening, Enhancement, Consolidation (Girls 12-14, Boys 13-15 years old): The purpose is to form strength and further develop tennis-specific skills. It is a critical period for a tennis player who wants to be an elite athlete. Because he/she learns competition. It begins with aerobic trainability, onset of PHV or major growth spurt during maturation. Aerobic training should be given priority after the onset of PHV. Skill, speed and strength capabilities should be maintained or developed further (Balyi & Hamilton, 2004). Anthropometric measurements should be frequently monitored during this period. A match environment should be designed and psychology in a match should be taught, game style should be determined according to the flow of the match. It should be continued to develop technical skills and importance of the concepts sleeping, sport massage, nutrition should be emphasized (Kirkwood et al., 2009).

5. Stage - Learning How to Apply (Girls 15-16, Boys 16-18 years old): During this period, the athlete should place training in the center of his/her life. He/she should realize that he/she needs to train efficiently in order to achieve peak performance and peak of his/her career (Balyi & Hamilton, 2004). Developing technical skills should be continued. The ability to think as a responsible and autonomous athlete and accordingly to cope with match stress and to exhibit learned skills under stress should be gained in this period. The athlete should learn to adapt to different tennis courts and various features of courts (height - wind etc.). Being aware of bad habits that will affect sport, he/she should adopt a life style that will positively affect performance. He/she should be conscious in selecting suitable equipment for himself/herself (Borfiga et al., 2009).

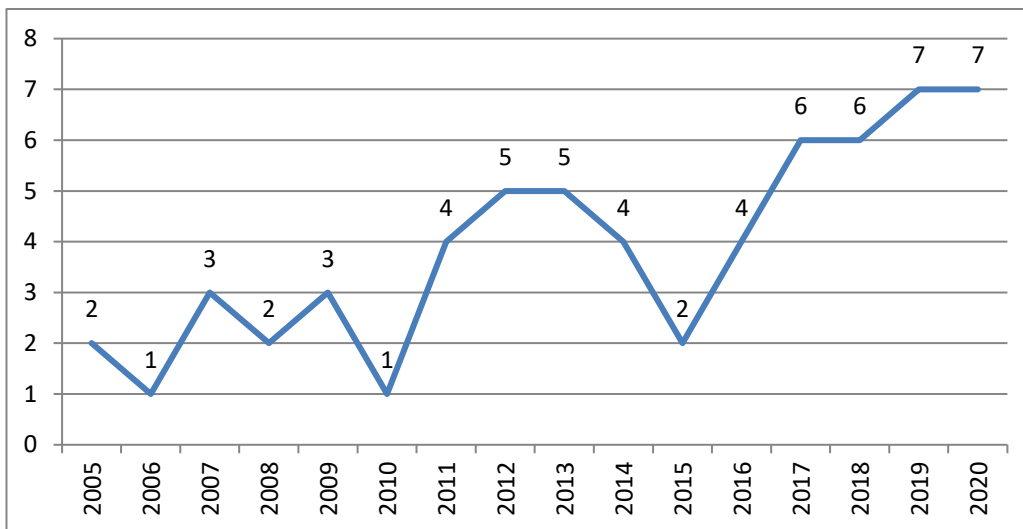
6. Stage - Learning How to be a Professional (Girls 17-21+, Boys 19-23 years old): Developing technical skills should be continued at this stage. It is important to focus on targets and design life according to targets. The athlete should realize the importance of being psychologically ready before, during and after the match in order to increase performance. Being in contact with the coach at any time is more important at this stage (Borfiga et al., 2009).

7. Stage - Living as a Professional (Girls 22+, Boys 24+): During this period, many factors (marriage, financial position, unfavorable situations within the family or among friends) that may increase performance of or distract the athlete may come into the athlete's life. The athlete should raise technical skills to the highest level, adapt to high intensity match atmosphere and cope with different match conditions (like court surfaces, game style, wind) (Borfiga et al., 2009). Primary focus for athletes who reach this level should be to achieve peak performance. The athlete should arrange every phase of his/her life according to the career plan made (Balyi et al., 2016).

8. Stage - Life-Long Tennis (after 12 years): According to this model, at the developing, shaping, progressing step in the third stage, athletes continue their sports life for two different purposes (to be a professional athlete or tennis for social and physical activity). Athletes who end their elite athletic lives and those who cannot continue tennis professionally for any reason and individuals who have left at the third stage continue their sports life for life-long sport at this stage (Staples et al., 2009). Those who achieve this level may increase their quality of life by participating in activities that are suitable for their game levels and age groups (Balyi et al., 2016).

Canada and Tennis

When we look at the place in tennis today of Canada, which has been applying LTAD model as the country's sport policy for more than fifteen years, we can see that it has made a significant progress by years. The numbers of Canadian athletes who ranked among top 200 between the years 2005-2020 in the list of Association of Tennis Professionals (ATP), a prestigious ranking in tennis world, are given in Graph 1.



Graph 1. Line graph for the numbers of Canadian athletes among ATP top 200 by years

While Canada had two athletes among top 200 in 2005, today it has 7 athletes according to the graph. Canada Tennis Federation drafted and put into practice "Long-Term Athlete Development Plan for Tennis" in 2009 (Novick et al., 2009). Considering ten-year or ten thousand hours of training rule, it is understood that present development of Canadian tennis specific to ATP is an outcome of the system.

CONCLUSION

Long-Term Athlete Development Model (LTAD) adapted for tennis provides different development steps according to development stages and objectives of the athlete. The model sets forth development steps for individuals who want to become a performance athlete and also for those in various age groups who want to play tennis for a healthy life. LTAD model emphasizes that everyone can play tennis.

LTAD not only categorizes individuals according to chronological age but also highlights importance of biological age in tennis. Accordingly, the fact that training plans and programs should be designed according to development level of the individual constitutes the subject matter of the model.

In conclusion, considering the increase in the number of Canadian athletes in world ranking after application of LTAD model, the study suggests that LTAD model will attract further interest of other countries.

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