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# The Physiological Demands of Table Tennis: A Review

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## Abstract

Go to:

Although table tennis has a tradition lasting more than 100 years, relatively little is known about players' physiological requirements – especially during competition. In this review we discuss research studies that have led to our current understanding of how the body functions during table tennis training and competition and how this is altered by training. Match and practice analysis of the table tennis game indicates that during intense practice and competition it is predominantly the anaerobic alactic system that is called into play, while the endurance system is relied on to recovery the anaerobic stores used during such effort. It is thus important for coaches to keep in mind that, while the anaerobic alactic system is the most energetic system used during periods of exertion in a table tennis game, a strong capacity for endurance is what helps a player

recover quicker for the following match and the next day of competition. This paper provides a review of specific studies that relate to competitive table tennis, and highlights the need for training and research programs tailored to table tennis.

Key Points

- Match and practice analysis of the table tennis game indicates that during intense practice and competition it is predominantly the anaerobic alactic system that is called into play.
- The endurance system is relied on to recovery the anaerobic stores used during hard practice and competition effort.
- It is important for coaches to keep in mind that, while the anaerobic alactic system is the most energetic system used during periods of exertion in a table tennis game, a strong capacity for endurance is what helps a player recover quicker for the following match and the next day of competition.

**Key words:** Racket sports, measurement, physiology, loads

## Introduction

Go to:

Table tennis competitors play one of the fastest ball games in the world and their performance is the result of a complex myriad of factors. Changes in the rules, techniques and table tennis equipment have seen ball spin and speed increase substantially compared to the past, shortening point rallies (Li et al., 2007). With the aim of making the game more attractive, the International Table Tennis Federation (ITTF) introduced a series of reforms like allowing the co-existence of white and yellow balls, having different rubber surfaces on each side of the racket, a 40-mm ball, regulations on serves, a shorter point system and a ban on glues containing harmful volatile compounds (VCs), such as non-water-based glues with organic and inorganic volatile compounds (Further information, see Regulations on table tennis game, 2012).

Despite being massively popular, not much is known about the

characteristics and competencies required for professional table tennis. Due to the sport's complexity, it is difficult for scientists to conduct measurements, for example, at the World Championships or the Continental Championships, to garner appropriate information to present to coaches and players.

A world-level competition often lasts a week, with a ranked player competing in many games. The heavy burden involved is always interwoven with various factors like a busy schedule, strong opponents, changes to diet and sleeping habits, a new environment and time differences (Guan, 1992; Huang, 2003; Martinet et al., 2011; Weber, 1982). A player must thus be in a good physical shape and mental condition. Notwithstanding the above, skill is the decisive factor in a table tennis match. Training at high speeds improves a player's skill and coordination for performing at higher intensities. Changes in a player triggered by training are best achieved when an optimal amount of work is performed at each training session and over a given period of time (Mouelhi Guizani et al., 2006).

It appears from our interviews with coaches around the world that only a small number of them consider the aerobic and anaerobic endurance factor. This is understandable since most coaches believe table tennis training is highly specific (Junhua et al., 2012; Pan et al., 2012). The question then arises: why spend a lot of valuable time training if an improved performance is not achieved, i.e. better results at table tennis competitions (Ochiana and Ochiana, 2010)? How important is aerobic endurance for table tennis performance? Like other sports activities that on the surface seem not to require staying power, table tennis does in fact have an endurance, or aerobic, component. For example, when doing multi-ball practice one might overlook the importance of cardiorespiratory endurance as an important element of a complete training program. A high level of aerobic endurance allows, for example, stroke quality to be maintained throughout a training session or game and to remain fresh for other games in a tournament (Iino and Kojima, 2011). In order to develop endurance, an athlete must subject specific muscles or organ systems to increased resistance (Zagatto et al., 2008a).

It is therefore important to include resistance training as part of a

J Sports Sci Med

table tennis training program: table tennis performance is not associated with muscular force and thus does not require high levels of strength (Djokic, 2007b). There is some fear in coaches' minds that additional strength might impair basic motor movement and fine coordination, i.e. the sense for a good stroke. However, top athletes in all sport disciplines do some resistance training in order to boost or at least maintain their general strength. Winning a table tennis match not only requires outstanding technique, tactics and psychology, but also great physical strength (Djokic, 2007c). The winner of a World Championship tournament usually has to remain in top physical and mental condition for many competitive matches over a period of 7 days. An athlete's ability to produce energy via metabolic processes is evidently the most important part of their physiology fitness. Understanding the core principles of metabolic processes will permit table tennis coaches to devise a fitness program that suits an athlete (Djokic, 2007c). Unfortunately, the understanding of such processes throughout the entire duration of a competition is poor in table tennis, even in the interested scientific community (Figure 1).

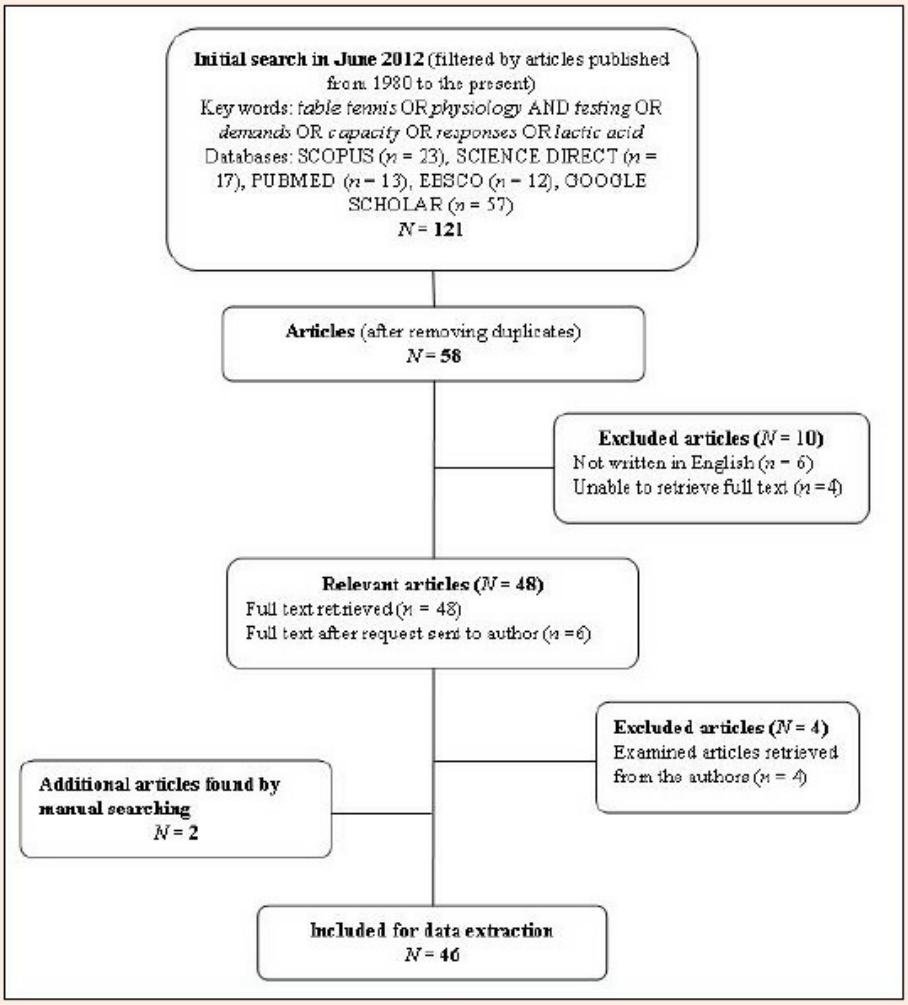


Figure 1.

Flowchart of the review process (criteria when determining which articles are relevant are: the impact factor of the publication, subject of the research, sample size and methods used).

An athlete's potential is determined by their genetic endowment (Tucker and Collins, 2012), including not only anthropometric characteristics, inherited cardiovascular traits, and muscular fibre-type proportions but also the capacity to improve with training (Bouchard, 1986). The amount and suitability of training before a competition is also very important (Tucker and Collins, 2012). The role of a table tennis player's basic training is to decrease stress on the body exercise creates so that workouts can be carried out in a more comfortable fashion while simultaneously achieving an increase in the maximum number of workouts (Bawden et al., 2004; Wu and Huang, 2007). This review aims to present an overview of the characteristics and physiological demands of table tennis match


J Sports Sci Med
J Sp

play and training in terms of the physiological aspects.

Scientists from around the world generally agree that table tennis is an aerobic metabolism sport that requires great endurance, often alternating with being an intense anaerobic metabolism sport over short periods (Pradas et al., 2010; Zagatto et al., 2010; 2011; Zagatto and Gobatto, 2012).

The review's purpose is to provide table tennis experts and scientists with up-to-date science research regarding the characteristics and physiological demands of table tennis match play and training in terms of the physiological aspects. Research studies conducted across the world have been consulted to unify the findings involving measurements of table tennis players' physiological characteristics. Among retrieved papers from different databases (see Figure 1) we have also checked out proceedings from ITTF sports science congresses.

## Physiological characteristics (aspects) of the table tennis game

Go to:

The information pertaining to the physiological profile and the match characteristics of table tennis should be used by coaches when planning physical training and specific exercise prescriptions aimed at achieving maximal sport performance.

The rules of table tennis have changed enormously in the last ten years. Since the introduction of a bigger ball (i.e., 40 mm ball instead 38 mm ball) and a shorter point system (i.e., 11 points instead 21 points), matches do not differ a lot from the aspect of physiological demands to matches played before the rules were changed. However, there is no study that measured the energetic contribution of each energy system during a table tennis game. Djokic (2007c) has found only minor increment in the rally length per point and the blood lactate values presented in Weber's (1985) research (small ball) and Zagatto et al., 2010 research (new ball) were similar.

Katsikadelis et al., 2007 stated that real playing time at the Olympic Games in Athens in 2004 in 120 games ranged from 3.12 min to 6.10 min in total. The mean duration of games grew as players moved closer to the quarterfinals. Djokic (2007a) analyzed differences


J Sports Sci Med
J Sports Sci Med

between play of 240 players with the 38mm ball up to 21 points and the actual system and found that the rally length per point (excluding service) increased from 3.87 min to 4.03 min.

A better understanding of the physiological attributes that determine the yield in a wide range of conditions may be instrumental for assisting future scientific research. Physiological traits in table tennis may be selected either directly or through the use of similar tools in racquet sports.

Mitchell, Haskell and Raven (1994) classified sports activities based on the static component, dynamic component and energy system involved, and placed table tennis into the low-moderate group of sports, along with baseball, softball, volleyball and tennis (doubles). From this point of view, table tennis requires significant energy from both the anaerobic a-lactic and aerobic energy systems (Zagatto et al., 2010). Most sports scientists (Djokic, 2009; Kordi et al., 2009; Suchomel, 2010) have found a significant positive relationship between player levels and heart rate responses. A player's table tennis skill level is a significant factor of the level of their exercise intensity, especially in singles matches.

Table tennis is characterized by periods of effort and rest. The anaerobic alactic system is predominant during moments of exertion and the endurance system comes into play to recover the anaerobic stores used during effort (Zagatto et al., 2004). Therefore, the aerobic system enables the anaerobic system's rapid recovery and, due to the greater pause time in a match (about 8 s in relation to 3-4 s of effort), the aerobic system dominates. Yet, despite the importance of precisely verifying aerobic endurance not many studies have measured this aerobic component using specific protocols for table tennis. Most investigations, that conducted specific tests, examined tennis, badminton and squash (Chin et al., 1995; Smekal et al., 2000; Wonisch et al., 2003; Girard et al., 2005). Moreover, there have been few applications of specific procedures in table tennis (Morel and Zagatto, 2008; Zagatto and Gobatto, 2007; Zagatto et al., 2008b; 2011). However, for fast and powerful movements during a rally it is the anaerobic system that is decisive, i.e. it represents the difference between winning and losing (Kondric et al., 2007; Zagatto et al., 2010; Zagatto and Gobatto, 2012).


J Sports Sci Med
J Sp

The best players usually have higher levels of endurance (Weber and Hollman, 1984; Weber, 1985). Endurance is a term that describes two separate yet related concepts: muscular endurance and cardiorespiratory endurance (Zagatto et al., 2008b). Each makes a unique contribution to the player's performance and hence each varies in importance for different players. Endurance is the quality of a table tennis player that allows him to sustain high speeds during top spin strokes with high ball rotation (Zagatto et al., 2011; Zagatto et al., 2008a). This quality is muscle endurance, the shoulder muscle group's ability to sustain repeated powerful strokes and rapid on-court movements (Folorunso et al., 2010). The resulting fatigue is limited to a specific muscle group (the shoulder girdle), and the activity's duration is usually very short. Muscular endurance is firmly related to muscular strength and anaerobic development.

In contrast, cardiorespiratory endurance relates to the body as a whole. It supports a table tennis player's ability to maintain prolonged activity in long table tennis competitions (Kasai et al., 2010). Cardiorespiratory endurance relates to the development of the cardiovascular and respiratory systems and hence aerobic development. The term aerobic endurance is therefore used to represent cardiorespiratory endurance.

$VO_2$max is defined as the highest rate of oxygen consumption attainable during maximal or exhaustive exercise. It is accordingly in a table tennis player's interest to have large aerobic endurance so their anaerobic metabolism can recover during rest periods (Zagatto and Gobatto, 2007). Coaches thus need to pay attention to this information. Sperlich et al., 2011 recently measured cardio-respiratory and metabolic characteristics in table tennis training and actual match play conditions among 7 junior table tennis players from German national team. These authors (Sperlich et al., 2011) observed that aerobic demand, both during training and during a match, is very low. In a match this result is expected because during exertion the energy source is supplied by the anaerobic alactic system.

As aerobic and anaerobic alactic energy systems are the main energy systems involved during a table tennis match and they can be

associated with the performance outcome of a game. Thus, it is necessary to use tests developed using procedures specific to table tennis to measure those systems, mainly the aerobic system that is a procedure that is investigated more scientifically (i.e., maximal oxygen uptake and anaerobic threshold). Physiological testing is used to monitor the progress of players and provide feed-back, to compare different groups of individuals, and to contrast different training procedures.

The methodology for measuring physiological characteristics in table tennis is not as developed as equivalent protocols available in other sports. The results of a proper field test should be seen as a complement to those obtained in a laboratory test. Since a laboratory test is a measurement conducted in a controlled environment and uses protocols and equipment to simulate a game, a field test is a measurement conducted while a player is performing in a simulated competitive situation. Researchers have taken various approaches to testing table tennis players and some of them are presented in this review.

A sports scientist can employ widely used tests to examine a player's progress. This can be achieved with the help of a program of properly selected and administrated laboratory and field tests. In order to improve the work of coaches and sportsmen we believe critical reviews are vital. Some attempts have been made in various fields and sports in different journals (Lees, 2002; Kovacs, 2006; Nicholls and Polman, 2007; Secher, 1983; Shepperd and Young, 2006; Williford et al., 1998). Conversely, we can also find texts dedicated to the physiology of various sports (Reilly et al., 1990; Garret and Kirkendall, 1999).

It is thus important that the protocols used to test table tennis players represent the table tennis game and the particular muscle groups engaged in a game. Tests of anaerobic potential (alactic and lactic) are both time- and muscle-specific. The criteria applied to isolate the different anaerobic energy systems being measured are based on time. Accordingly, tests of anaerobic alactic potential are conducted for brief periods and, conversely, tests of anaerobic lactate potential are conducted for longer periods. Table tennis researchers mainly conduct tests of anaerobic alactic potential since


J Sports Sci Med

rallies in a table tennis game are very short.

Djokic (2007b) pointed out that testing and measurement are means of collecting information upon which subsequent performance evaluations and decisions are made. The effective functional diagnosis of athletes allows a training program to be successful.

## Methods used to evaluate physiological characteristics of the table tennis game

Go to:

The findings of Zagatto et al., 2010 highlight the importance of measuring and training the anaerobic alactic system and aerobic system. While the aerobic system seems to be the predominant energy pathway in a table tennis match, the anaerobic system is the most important for adenosine triphosphate resynthesizing during periods of high effort, whereas the aerobic system enables the generation of repeated powerful strokes, rapid on-court movements, and ensures fast recovery, which helps maintain a player's ideal state (i.e., concentration and preparation) for their next effort during play.

The findings of Lu Yunxia (in Lin, 2007) indicate that Chinese coaches often attach great importance to skills and training tactics but hardly pay attention to training for physical strength since they believe player achievement is relatively unrelated to their physique.

In contrast, tests for assessing the aerobic system are more consolidated, although they are also scarce and call for further investigation. In an initial study, Zagatto et al., 2004 used the lactate minimum test (LMT) to assess table tennis players' aerobic endurance using cycle ergometer and arm cranking. The LMT consisted of three phases, where the first one comprises anaerobic effort to hyperlatemia induction, the second one is a recovery period (i.e., ~ 7-8 min) and the third one consists of incremental exercise (Morel and Zagatto, 2008; Zagatto et al., 2004). Accordingly, the LMT intensity is assumed to be a valid test to estimate the maximal lactate steady state intensity and it is determined by a lower blood lactate value from the polynomial relationship between blood lactate and exercise intensity measured during the incremental exercise phase (Morel and Zagatto, 2008; Zagatto et al., 2004). After this study, Morel and Zagatto, 2008 adapted the LMT for a

table tennis specific test using a robot. The procedure was similarly applied to a cycle ergometer. The first phase was an anaerobic exercise to create a hyperlactatemia state whereas the second phase was an incremental test performed on the table using the robot. In this phase, the player only performed forehand attack strokes and the exercise intensity was increased every 3 min by increasing the ball frequency. The LMT adapted by Morel and Zagatto, 2008 for table tennis is reproducible and valid for evaluating aerobic endurance and the prescription of exercise (Figure 2).

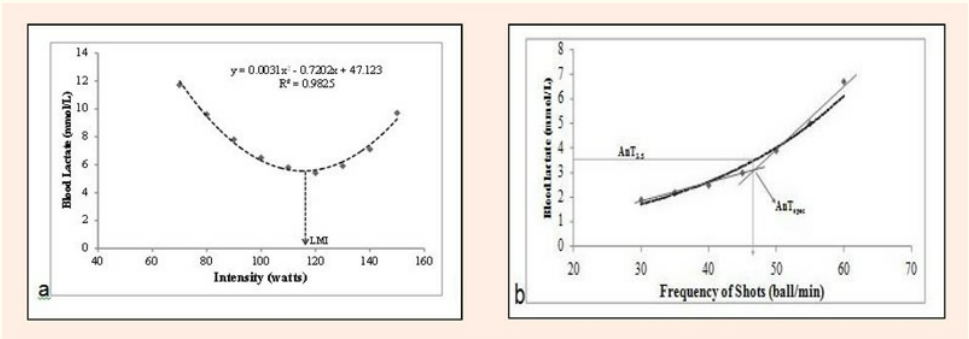


Figure 2.

Blood lactate response a) during a lactate minimum test and determination of the lactate minimum intensity (LMI); b) during a specific table tennis incremental test used to determine $AnT_{3.5}$ (intensity of blood lactate concentration corresponding to 3.5 mmol/L) and $AnT_{spec}$ (intensity of an abrupt increase in the blood lactate response identified using a bi-segmented linear regression model).

In an experiment Ellwood, 1992 aimed to establish whether $VO_2$ measured during a table tennis game was consistent with the level predicted by a progressive sub-maximal treadmill test for equivalent heart rates. The results suggest that a steady state treadmill test is unsuitable for predicting oxygen uptake during a table tennis game. The same conclusion was reached by Morel and Zagatto, 2008 who conducted research on 11 table tennis players. These authors compared the LMT applied in a specific condition with a laboratory test performed on a treadmill and established that it is necessary to measure aerobic endurance using a specific test and that the


J Sports Sci Med

anaerobic threshold applied to running on a treadmill must be used with care in table tennis.

For table tennis purposes (exercise prescription), we are more interested in the performance level that can be maintained without fatigue (i.e., maximal lactate steady state or aerobic endurance), rather than the aerobic power ($VO_2max$) available at the point of exhaustion. Some research in this direction has also been carried out. Zagatto et al., 2008b validated a critical frequency specific test (critf) for estimating the aerobic endurance of table tennis players. Eight male international-level table tennis players participated in their study. Specific tests were conducted using a mechanical ball thrower to control the intensity of the exercise. The data indicate that the critf model can be used for measuring aerobic endurance in table tennis.

Zagatto, Papoti and Gobatto (2009) verified the need to use a specific protocol for evaluating aerobic capacity among table tennis players, comparing the tests applied in conventional ergometers with a test applied to a specific ergometer. The study involved nine table tennis players. They performed lactate minimum tests in the arm ergometer and cycle ergometer; in addition to an incremental test in a specific ergometer for determining the anaerobic threshold ($AnT_{spec}$) through visual inspection. There was no significant correlation between the AnTspec ($48.11 \pm 6.82$ $shots.min^{-1}$) and the lactate minimum intensity obtained in arm ergometry ($91.94 \pm 11.51$ W) ($r = 0.18$; $p = 0.72$).

To date, in order to investigate the relationship between movement intensity and energy consumption among different athletic levels, typical junior high school students and skilled university students were tested as experimental subjects by Huan-Yu, Ushiyama, Fei, Iizuka and Kamijima (2010) with energy consumption over a 60 minute table tennis practice being surveyed. To advance players' skills in competitive table tennis, the implementation method of physical ability and training were investigated. Therefore, the authors tested subjects to investigate and compare a variety of pulse rates and energy consumption quantities in training conditions. Energy consumption per body weight per unit of time shows a range of exercise intensity: 0.050 ~ 0.083 $kcal \cdot kg^{-1} \cdot min^{-1}$.

## Evaluation of anaerobic capacity

In this area, the anaerobic system of table tennis players has mainly been assessed with the Wingate test (Kondric et al., 2007; Zagatto et al., 2004). The Wingate test corresponds to applying maximal effort for 30 s on a cycle ergometer with a workload of 7.5% of body weight. However, while the Wingate test is a valid test for assessing anaerobic power, it does not present the same motor pattern used during table tennis match efforts. Table tennis is an intermittent sport, and the anaerobic work capacity estimated from the critical power model does not seem very relevant. An intermittent exercise test like repeated sprint or throwing ability would be more appropriate. Zagatto et al., 2008a adapted the critical power model for table tennis using a mechanical ball thrower (robot) and tried to measured anaerobic aptitude using a curvature constant parameter (W´) of the intensity-duration relationship from the critical power model. The W´ value was compared with the outcome of the Wingate test performed on cycle and arm cranking ergometers, and no significant correlation between them was observed. Based on these results, Zagatto et al., 2008a concluded that W´ determined by a modified critical power test is not a good index for measuring the anaerobic system of table tennis players. These findings were reinforced in a recent study by Zagatto and Gobatto, 2012 where no significant correlation was found between W´ from a critical frequency test with the maximal accumulated oxygen deficit (MAOD), which is considered the gold standard test when assessing anaerobic capacity. However, a great advance of this study (Zagatto and Gobatto, 2012) was the adaptation of MAOD for a specific table tennis test, representing a good suggestion for measuring the anaerobic capacity of table tennis players.

Morel and Zagatto, 2008 compared three procedures that estimate the aerobic anaerobic transition in a specific test for table tennis using a mechanical ball thrower (robot) to control the exercise intensity, as used by the mentioned Zagatto et al., 2008b study. These procedures were lactate minimum, critical frequency and anaerobic threshold tests. Significant correlations were obtained amongst LMT and critf ($r = 0.69$), and $AnT_{3.5}$ and $AnT_{BI}$ ($r = 0.70$). Therefore, all of the procedures investigated can be applied when evaluating the aerobic-anaerobic transition among table tennis

players.

Shu-Chuan et al., 2010 investigated energy expenditure and cardiorespiratory responses during training and a simulated table tennis match. Sixty male university table tennis players from Division A (30 elite players) and Division B (30 amateur players) performed both a laboratory test and a simulated table tennis match. The Bruce protocol was used to evaluate their maximum oxygen uptake ($VO_2max$) and Cortex Metalyzer 3B were used to evaluate their peak oxygen uptake ($VO_2max$) during simulated table tennis match. According to this research, it belongs to the extremely heavy exertion sports to carry on the intensity of movement that table tennis trains. The intensity of the simulated match is fierce sports; the energy needed to be consumed for competition is much higher than in training.

Table 1 presents the testing procedures used to measure the aerobic aptitude, both aerobic capacity (AnT, MLSS, RPC, critf and other) and aerobic power ($VO_2max$), in table tennis players.

Table 1.

Methods used to evaluate the aerobic aptitude of table tennis players.

| Exercise testing | Method and description |
|---|---|
| Critical frequency test in a specific table tennis test (Zagatto et al., 2011; Morel and Zagatto, 2008; Zagatto and Gobatto, 2007; Zagatto et al., 2008b) | Application of 3 or 4 exercise rounds performed until exhaustion and estimated critical frequency using a linear regression among intensity and inverse of the time limit to exhaustion (1/tlim) and/or a hyperbolic relationship between time limit and intensity |
| Anaerobic threshold in a specific table tennis test (Morel and Zagatto, 2008; | Intensity of an abrupt increase of blood lactate during an incremental test identified by a bi-segmented regression. |

| Exercise testing | Method and description |
| --- | --- |
| Anaerobic threshold on a treadmill running test (Morel and Zagatto, 2008) | Velocity of exercise corresponding to blood lactate of 3.5mM during an incremental test |
| Lactate minimum test in a specific table tennis test (Morel and Zagatto, 2008; Zagatto et al., 2008b) | Intensity at minimum blood lactate response observed during an incremental test performed with a previous hyperlactatemia induction |
| Lactate minimum test on a cycle ergometer (Zagatto et al., 2004) | Power at minimum blood lactate response observed during incremental test performed with previous hyperlactatemia induction |
| Lactate minimum test in an arm cranking ergometer (Zagatto et al., 2004) | Power at minimum blood lactate response observed during an incremental test performed with a previous hyperlactatemia induction |
| Maximal lactate steady state in a specific table tennis test (Zagatto et al., 2008b) | Maximal intensity which is observed in blood lactate variation is less than 1.0mM between 8 to 20 min |
| Anaerobic threshold of fixed lactate concentration in a specific table tennis test (Morel and Zagatto, 2008; Zagatto et al., 2008b) | Intensity of exercise corresponding to blood lactate of 3.5mM during an incremental test |
| Respiratory compensation point (RCP) in a specific table tennis test ((Zagatto et al., 2011) | Intensity of increase of both ventilatory equivalents of $O_2$ ($V_E/VO_2$) and $CO_2$ ($V_E/VCO_2$ ) |
| Maximal oxygen uptake ($VO_{2max}$) in a specific table tennis test (Zagatto et al., | Maximal oxygen uptake value attained during an exhaustive incremental test |


J Sports Sci Med

| Exercise testing | Method and description |
| --- | --- |
| 2011; Shu-Chiang et al., 2010) | |

## Lactate and heart rate values

In the 2002/2003 season Djokic (2009) reported increasing heart rates as games unfolded. The average heart rate values during six official competition matches ranged from 162 to 172 beats·min$^{-1}$. During table tennis training the approximate heart rate value was 142 beats·min$^{-1}$. In purely tactical training when precision in performing and returning the serve is emphasized, the average heart rate values were 152-156 beats·min$^{-1}$. Djokic demonstrated that heart rate depends on the type of training, with more demanding training producing heart rates in excess of those found in competition.

Aiming to verify the physiological responses and match characteristics of table tennis and to compare those responses between two different performance-level athletes from official tournaments, Zagatto et al., 2010 investigated 20 Brazilian male table tennis players (12 regional experience and 8 national and international experience ). Blood lactate concentration and heart rate were measured as physiological parameters in 21 official table tennis matches, while the duration of rally, rest time, effort and rest ratio, total playing time, effective playing time, and frequency of shots were recorded in 12 other matches via video analyses. The results suggest that in table tennis matches the aerobic system provides the principal output energy, but the phosphagenic system (anaerobic alactic system) is the most important during periods of exertion. However, during a table tennis match the energy from the lactic anaerobic system is very low. Information pertaining to the physiological profile and characteristics of table tennis should be used by coaches when planning physical training and establishing the timing of specific exercises for achieving maximal sport performance.

The battery of tests designed for the study by Melero Romero et al., 2005 included impedanciometry, sanguine analytic and field tests, with lactate determinations in capillary blood, and control of heart

rate frequency. The sample was formed by sixteen table tennis players, four elite sportsmen, all males, and twelve young national promises. The data emerging from these tests reveal a better picture of an elite player's physical condition relative to the other two groups of players in an inferior sport category, and there was also a direct correlation among the variables, such as indicators of a good physical condition, and the sport yield evidenced through results of a field test.

Tests designed to measure a specific physiological function depend on the equipment which is used during the game. The smaller ball in use before the year 2000 is thought to have led to a different performance outcome of the game than the new one (40 mm).

## Conclusion

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In this paper we have reflected on players' training and general trends regarding how they adapt in response to such training. It should be made clear that we considered the adaptations of individual table tennis players and that not everyone responds in the same way. Account must also be taken of several factors that can influence player response to aerobic and anaerobic training. The prescription of table tennis training is generally still performed empirically. The relatively small number of research studies in this area limits the scientific information about specific procedures, physiological profiles, and characteristics of table tennis matches available to coaches. Our sample of international research allows us to conclude that modern table tennis requires both sub-maximal and maximal work and this exerts pressure on both the anaerobic alactic and aerobic systems.

Despite the not insignificant work that has been done, a considerable amount of information is still needed before we can claim to have comprehensive knowledge of table tennis. In this paper we have concentrated solely on the table tennis player's physiology.

The importance of muscular and cardiorespiratory endurance training for table tennis players has been demonstrated by sport scientists. Stamina is essential for players to fully realize their skills and tactics at the table. Table tennis players are often not only physically exhausted after a competition, but also highly mentally


J Sports Sci Med

tense. It is thus important for coaches to keep in mind that, while the anaerobic alactic system is the most energetic system used during periods of exertion in a table tennis game, a strong capacity for endurance is what helps a player recover quicker for the following match and the next day of competition.


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J Sports Sci Med
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