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Comparative study of lactaemia between girls and boys aged 11 to 12 years of the Club RNBoumerdes Case Athletics (400m Flat) and Swimming (100m 4swims)

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ABSTRACT

throw this study we aimed to reconsider the idea that there is no physiological difference between pre-pubescent boys and girls during lactic anaerobic exercise. ; Recent Studies Ratel. S, Martin. V (2012) show that the activity of the lactic anaerobic metabolism of the child is not different from that of the adult.

The study of anaerobic function during growth has not received the same attention from researchers as aerobic function. This is quite surprising in view spontaneous activity of children. We note that a lot of research has been done on anaerobic metabolism in children but very little on the comparison between girls and boys in the production of lactate.

In our study we have compared blood lactate result obtained during our experimentation, between the two sexes in runners as well as in swimmers, and between the total sample of females and males after exercise.

Keywords: lactaemia- heart rate- pre-pubescent- anaerobic exercise

INTRODUCTION

Being involved in sports, Swimming and Athletics, as a practitioner and coach of young athletes, we have developed a certain intellectual curiosity regarding the performance of children.

Swimming is an aquatic sport that can be individual but also collective because it is practiced in groups during training and also provides for relay events during competitions. It also includes artistic events such as diving and synchronized swimming. It is practiced in swimming pools but also in open water (sea, lake) in the context of triathlon for example.

With regard to athletics; Running, walking, throwing and jumping are fundamental gestures, it is a matter of exceeding the performance of opponents in speed in endurance, distance in height, which requires several physical, psychological and physiological components. Children learn the possibilities of their bodies, how to act safely while accepting to take measured risks, and how to exert effort while modulating their energy."

So, training in children aged 9to12 is an important period for Psychomotor development and it is from this age that it is essential to acquire the widest possible range of motor situations» **van Praagh E (2008) p56**. progressive development involves a combination of physical (the child grows up), psychological (he awakens to life and develops his cognitive interrelations with his environment), motor(he develops his qualities of strength, speed, coordination, balance and flexibility)and energy (he improves his endurance and the power of his metabolisms); To do this, the child's body is capable of adapting to all the situations offered by physical activity. The speed of growth and maturation differs from one child to another. A variety of factors can influence growth and maturation such as genetic inheritance nutrition history and general health.

Regarding exercise capacity, it appears that the pubertal period results in distinct and significant changes in physical potential at the same chronological age **Grodjinovskya A. and Bar-or O. (1984); Murase Y., (1981); L Aires et coll.p , (2010)p 35**. Physiologically, pre-pubertal children are characterized by relatively high aerobic metabolism compared to adults. The maximum aerobic potential and the oxidative muscle enzyme activities (Krebs cycle) are equal to, and usually even greater than, those of adults. On the contrary, anaerobic lactic metabolism is commonly considered to be inefficient and immature at pre-pubertal ages. The maximum power characterizes this energy chain, and its

measurement has long been of interest in monitoring and improving anaerobic physical abilities in different sports **Van praagh.E 2008 p20** Otherwise, children's anaerobic metabolism is relatively unknown, but children's spontaneous physical activity is largely composed of short sprints, in which anaerobic metabolism is extensively mediated. Measuring the potency of anaerobic metabolism is particularly important in children, since it is the ideal time to detect young talent and guide them towards sports specialization. 'The increase in lactic and lactic anaerobic potency was observed with age' **Grodjinovskya A. and BAR-OR O., (1984); Murase Y., (1981)p 36** Some recent research questions this immaturity of the anaerobic system during childhood **Ratel S. et Martin V., (2012**). P 41 Glycolytic muscle enzyme activities are always lower than in adults 'Anaerobic fitness, unlike aerobic fitness, appears to be closely related to muscle mass, as well as to other factors such as muscle architecture, fiber composition, substrate availability, metabolite accumulation (lactic acid), metabolic cycles and their activity levels' **Kemper H.C.G, (1985) ; TANNER. J.M., (1962) p 19**. Exercise that primarily involves anaerobic lactic metabolism in children is often a highly debated topic in these settings; many still consider this type of exercise to be unnecessary and even dangerous to children's health. During our observations during the different forms of training of prepubescent children, a large difference in the chronometric level between the two sexes was observed for the evaluation tests of the 100m 4 swims for swimmers, and the 400m flat for runners. Several explanations have been put forward by previous research, namely, differences in morphological, muscular, psychological and physiological aspects **Emmanuel Van Praagh 2008 p 42**, physiology of sport: children and adolescents.

For our part, the physiological aspect (study of the heart rate and of the rate of the serum potassium) will be our main axis of research through the evaluation of the lactatemia, heart rate and their impact on the performance of our athletes of different genders. However, according to Carlson. **J. S et Naughton.G. A, (1992)** ; **Dore. R et AL. , (1996) ; Haralmabie. G, (1979) ; Van Praagh. E et AL., (1990)** . "in pre-pubertal children no gender differences are observed». Even though **Komi. P et KArlsson. J (1979)** p32'support a more glycolytic profile in young males'. "However, the overall results for men and women remain contradictory."**Nygaad. E, (1981); Sale. D. G et Sprit. L. L, (1996).p85**

To this end and through this study we wanted to know: *if there is a difference between girls and boys in the pre-pubescent age regarding blood lactate levels? and which population produces the most blood lactate after a very*

high intensity of effort? at the Amateur Sporting Club "Rocher Noir" of BOUMERDES;

2. **Hypothesis:**

To address this issue, we have made the following Hypothesis:

- for our sample, there is a difference between girls and boys, lactatemia which has a direct link to performance.

*** Partial Hypothesis:**

- there is a significant difference in the rates of lactatemia between our two populations, and this for the same exercise has the same intensity.

- the rate of lactemia is higher in males than in females.

3. Characteristics of the prepubertal child:

"The child is not an adult in miniature and his mentality is not quantitatively but also qualitatively different from that of the adult, so that the child is not only smaller, he is also different**". Claparède. E (1937).** The child therefore goes through a transformation stage that brings him gradually to adulthood, he has particularities (different proportions, head, body), children, just like adolescents, do not grow continuously, but by bursts (leaps), the growth rate decreases until adulthood;

3.1 Growth and maturation:

Growth is the increase in body size. It is a childhood phenomenon linked to the interaction of genetic, neuroendocrine and environmental factors. Development is part of the growth process. It reflects the evolution of the different functions (cardiac, endocrine, sexual) according to **BRICOUT Véronique Aurélie.b** also **Le Chevalier J.M. (1989)** thinks that Growth is related to the increase in body size. It is a quantitative measure of the increase in weight and the increase in size of an organ or organism.".

According to **Le Chevalier J.M. (1989)** Maturation means that at certain periods of development, a tissue or organ changes and acquires other possibilities of functioning, so it is a qualitative fact." This is important as it affects, at puberty for example, the genitals, the growth plates and the muscles. The maturation of the nervous system also continues for a long time and is an essential condition for the optimum functioning of the body, Maturation, is a more or less slow,

genetically determined physiological process; it allows the specific development of an organ at an adult stage (Example: Sexual maturity = ability to reproduce). It is defined by 3 criteria: (a) chronological age, (b) biological age and (c) sexual maturity.

These two processes are assessed both quantitatively and qualitatively," according to BRICOUT **Véronique Aurélie**.

A. **Quantitative aspects:** Are assessed using biometrics. These indispensable measurements are reported on reference curves (Sempé and Pédron are the most used). Measurements of height, weight, and for younger head circumference and lower and upper segments are included.
B. **Qualitative aspects:** Correspond to tissue modification. Special attention is paid to ossification processes that occur during childhood. They are also being studied

1. Percentages of fat mass (concept of body mass index)
2. Maturation (dental, bone and sexual),
3. Nutritional status
4. The condition of the bones (deformities, static vertebral).

The child's body is constantly changing, and there is considerable variation between individuals because development rates depend on many extrinsic and intrinsic factors. Among **the extrinsic factors**, which are probably the most important, relate to diet, caloric and vitamin intakes which must be sufficient during childhood to ensure normal growth. Poor diet can impair the growth process.

The intrinsic factors are very important in this growth process. This includes mainly genetic factors but also hormonal factors (growth hormone, thyroid hormones and sex hormones).

3.2 Stages of development :

Each stage is characterized by an overall structure, and corresponds to an equilibrium level. They follow one another in the same order for all children, even if the age of access at each stage may vary a little, for example under the influence of the environment. The age shown here should therefore not be regarded as an absolute standard, but only as a benchmark. On the other hand, contrary to what Piaget thought, it is now demonstrated that the path within a stadium can vary according to the children. The transition from one stage to

another is due to a major acquisition that will change the child's usual mode of functioning, according to **Dr. Alain Renault**.

- The concrete operating stage: from 7-8 years to 11-12 years.
- The formal operating stage: From 11-12 years to 15-16 years.

The latency period: This is typically a period of conflict, between 7 and 12 years. In fact, earlier-stage conflicts persist in part, but are less acute because of a structural change in sexual impulses (let alone an organization of sexuality).

4. physiological - psychomotor - psychological - social development in pre-pubertal children:

Table 01: Physiological development - psychomotor - psychological according to Dr. Alain Renault

Age	Physiological and functional aspects	Psychomotor development	Psychological and social aspects

From 8 to 12 years	Growth is slowing. Appearance of ossification points: • Upper extremities for wrist rotation. • Lower extremities allow for more vigorous and active locomotion. The ribs become more oblique, allowing a greater range of breathing. Enlargement of the heart and lung apparatus in a cramped rib cage causes discomfort and an increased heart rate. Muscle strength is poor. Demonstrates a certain endurance but spends its energy in an uneconomical way.	The coordination of movements is at the end of acquisition. Balance is achieved. This is the best time for a quick acquisition of many automatisms (dance, skiing...) They access a precise body image. Attention can be increased. Intended immobility becomes possible for quite a long time.	Critical formulation and analytical tests. Need justice, initiative and relative independence. Have a sense of right and duty. There is a balance between interests inside and outside the family. Stage of association and organization of the group, age of friends. Desire for competition. Demand some autonomy but need the adult to set goals for their activity. Beginning of segregation: boys - girls. Are not together, but are observed. Creative activity is down. The mental image is acquired. Need adventure and discover the world.

4.1 - Main biological, psychological, motor characteristics of the prepubescent child :

- **Morphology**

- The size increases substantially, so does the weight.
- The fat disappears.
- Ossification points related to locomotion appear.
- For the first time, the chest predominates over the abdomen.

- **Functional**

- The heart is enlarging.
- The muscular apparatus becomes more elastic and contractile.
- Attitude tone is still low (vertebral deviations may occur)

- **Engine**

- A period of development of all natural gestures, rapid acquisition of automatisms.
- Movements become precise.
- Balance is tightening (skating, skiing, etc.)
- Acquisition of the first schema.

➢ **Psychological** Great progress in psychological development.

- Critical formulation tests.
- Becomes more available to adults.
- Need for initiative and independence.
- Discovery of the game rule.

➢ **Social**

- Balance between internal and external interests of the family.
- Internship of association, organization, in game group.
- Demands a certain amount of self-freedom.
- Emergence of the desire for competition.
- Beginning of segregation between boys and girls.

➢ **Indication and contraindication**

- Spends energy inexpensively and can become fatigued during a sustained effort.
- Gymnastics must remain attractive.
- Have homogeneous groups.
- Demonstrations are important here.
- Heal attitudes, not force exercises.
- Allow time for training to rest.

4.2- Gender differences

In prepubertal children, no gender differences are observed **Carlson. J.S. and Naughton. G. A (1992); Dore. R et AL (1996); Haralambie. G. (1979); VAN Praagh. E et AL (1990)**. Although obtained in a physically active population, the conflicting results obtained in girls by **Pëtersen. T et AL (1999**), however, raise the question of an inter-sex difference in the maturation of anaerobic metabolism. Some results still suggest a weak influence of testosterone on the production of **Fellman** lactate**. N et AL (1992**). During adolescence**, Naughton. G. A and AL (1997)** noted a lower OAD in girls compared to boys, while **Komi. P and Karlsson. J (1978**) favored a more glycolytic profile in young males. Overall results in males versus females remain contradictory **Nygaard.E (1981), Esbjornsson. M et AL (1993), Sale. D. G and Spriet. L. L (1996).**

- In girls, peak VO2 increases by 92% between ages 6 and 16, with a significant peak at age 9 to 12. So faster increase at onset and stabilization around 13-14 years. The decrease in VO2 max after 16 years is due to the manufacture of adipocytes.

- In boys, VO2 max increases by 120% between 6 and 16 years of age with a marked peak during the second part, i.e. around 14-16 years of age. Overall outcome in boys will be greater than in girls. Before 10 years, there is no improvement in VO2 max but simply in aerobic capacity.

An increase in performance is observed in the **Klausen** field tests**. K et AL (1989)**. The speed of sprints increases faster in boys than in girls. The differences are most noticeable from 11-12 years old **Blonc. S et AL (1992); Beunen. G. P et AL (1997); Rowland. T. W (1996)**. In children of this age, however, the differences obtained in a jump test appear to disappear when body mass is taken into account **Davies.L.G (1990)**. Speeds appear to correlate with age but primarily with maturation (pubertal stages), although relationships are less significant in **Hansen** girls**. A. L and AL (1997); Pineau.J .C and AL (1988); Szczesny. S and Coudert. J (1987).**

5. Physiological and technical characteristics of the test (100 4nages and 400m flat):

A- Physiologically:

- The mean maximum heart rate ($_{FCmax)\ in\ children\ is\ 198\ b.min}^{-1;\ it}$ was observed in the group of boys aged 6 to 14 years (min-max: 185-210), FCmax decreases with age (from 198 $b.min^{-1}$ to 10 years to 158 $b.min^{-1}$ to 75 years) **Robinson, S. (1938).**
- The serum lactate varies between an average of 7 $mmol.l^{-1}$ after a supra-maximal exercise of 30 seconds according to **Van Praagh. E and AL** (**1989)** and 10 $mmol.l^{-1}$ after an exercise which lasts between 100 and 120 seconds according to **Dore. R and AL** (**1991).**

B- On the technical level:

- **Athletics**

The 400 m is the most demanding event in atheism, where the athlete must go to the end of his strength to obtain a performance while maintaining his speed. It is defined as the most characteristic test of the lactic anaerobic pathway. The value of CF differs from race to race.

The 400m is raced on one lap of the stadium on an outdoor track, and on 2 laps of track in the theater. Outdoors, the runway must be rigorously 400m long and have two straight parallel lines and two turns with equal radii. Each athlete has a separate corridor 1.22m wide marked by white lines 5 cm wide, the race is composed of 5 phases (the start, 1st turn, 1st straight line, 2nd turn, and the last straight line).

- **Swimming**

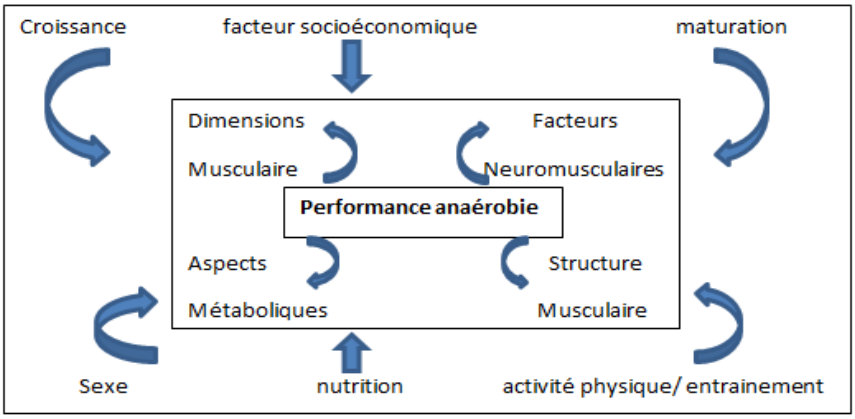
In Algeria, the transition from school to benjamin is made by obtaining the swimming certificate, which is awarded by the league.

This patent consists of a 100 4 swims, to be performed in a basin of 25 m, the performance is affected both by the swimming technique and by the physiological and physical parameters of the child. The swimmer must technically master the 4 swimming styles, namely: the crawl, and the back, which are alternative swims, the breaststroke and the butterfly, which are simultaneous swims; at each 25m the child must make an appropriate turn between each swimming style. Each swim is characterized by arm movements (aquatic and aerial phase) and leg movements (upward and downward movement) The swimmer is then evaluated on his technical and chronometric performance.

6. Determination of performance

Performance depends in part on metabolic aspects. However, the results obtained in the different studies (differences in results between absolute and relative power, between the different tools ...) indicate that performance is influenced by other determinants.

Fig 01: Factors influencing anaerobic performance

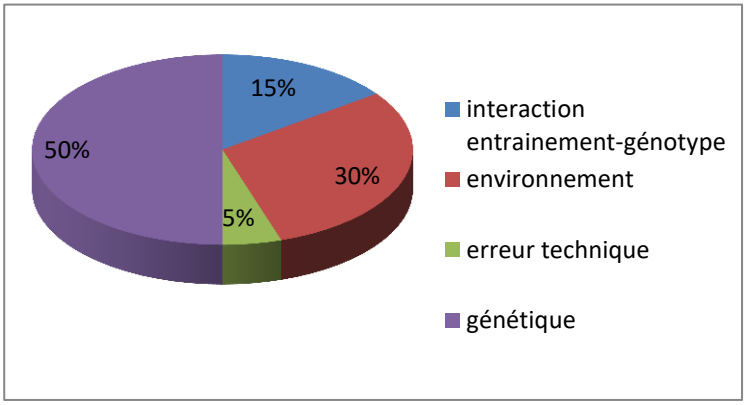


Source: Van Praagh .E (2008)

7. Influence of physical practice

The specialty of training is demonstrated indirectly by studies on the physical practice of individuals. In prepubertal boys **Falgairette.G and AL (1991),** there were no significant differences in potency between sporty and nonsporty children, contrary to data from **Crielaard. J. M. and Pirnay. F (1985)** on prepubescent boys **Dore.R (1993)** found no relationship between maximum ergocycle power and physical activity during the growth of boys and girls. More recently, **Bencke. J and AL (2002)** observe differences between elite and non-elite 11-year-olds, specifically in tests closest to competitive activity. Physical activity may be considered in the context of environmental variance or genotype-training interaction (Figure 2), as it would be necessary to monitor the complete life experience of each individual. However, the genetic-training interaction remains to be explored.

Fig 02: A factor influencing performance during anaerobic exercise, according to Simoneau and Bouchard 1998.



8. Effects of training on anaerobic metabolism.

The effects of anaerobic training on ATP resting rates are further discussed **Eriksson. B. O and AL (1973)** "have shown that 4 months of training can increase muscle stores of glycogen and phosphocreatine in children aged 11 to 13 years", it would appear that glycolytic activity can be improved in regularly trained children and adolescents. As proof, an increase in the maximum lactate production is also observed after the Mero training for the same exercise carried out**. B (1988)** In parallel, testosterone production after exercise is significantly increased after a regular year of training in children aged 11 to 12 years compared to Maro control children. **B and AL (1990).** Thus, as in adults, improvements due

to training appear temporary. Any cessation of training therefore leads to a return to standard levels, **Eriksson B. O et al., (1973**) of Fourinier's enzymatic activity**. M and AL (1982),** or hormonal concentrations **Botcazou.M and AL (2006).**

Exercises lasting 15 seconds to 1-2 minutes may activate immature metabolic pathways in prepubertal children. This is because the activity of glycolysis is likely to be maturation-dependent. Lower muscle glycogen concentrations, limited enzyme activities, and restricted catecholaminergic activity are all potential explanatory factors. For these reasons, practices for these durations of exertion should be offered gradually to children, knowing that an improvement in these parameters is possible at any age. It should also be noted that the lower lactate production in prepubertal children does not in any way indicate that they are able to perform this type of exercise. As proof, spontaneously, it is often these activities that are chosen within the school courtyards, on the playground or during sports activities (football, basketball...)

Indeed, the work of Eriksson et al. clearly shows that a six-week endurance training at an intensity close to the maximum heart rate significantly increases the activity of PFK by 45% And the activity of SDH (enzyme of aerobic metabolism) by 22.5% In children of 12 years of age. Thus, even non-specific training in anaerobic lactic metabolism would allow to induce changes favorable to the anaerobic capacity of the young athlete. However, only this study addressed the issue of the entrainability of anaerobic lactic metabolism in Ratel children. **S Martin. V (2012).**

9.Effects of training on anaerobic potential in children

There is limited information on the effects of training on muscle metabolism. The Swedish team of Eriksson. B. O. has shown that training results in a significant increase in muscle ATP and PCr concentrations in boys aged 11 to 13 years **Eriksson. B. O. and AL (1974)**. Likewise, training is thought to increase the use of glycogen and the production of lactate **Eriksson. B. O et AL (1973)**. An influence of training has also been shown on the enzyme activity of **Eriksson. B. O and AL (1973)**; Thorstensson. **A and AL (1975).** On the other hand, **Falgairette. G and AL (1993**) did not observe differences in active and non-active prepubescent swimmer’s post-exercise blood lactate concentrations. But the relationship between training (or physical activity) and maturation is difficult to grasp.

10. The importance of technical proficiency

Yes, it is possible to develop anaerobic abilities in children with a double explanation on the performance gains; on the one hand related to the famous better inter and intra-muscular coordination which will trigger a better mobilization of the motor units and on the other hand on an increase in the flow of energy of lactic anaerobic origin. Thus, the authors have shown that 2 sessions of EPS on a 7-session learning unit (conventional framework of a school learning unit) built on a training at intensities of between 100 and 130% of the VMA had entirely positive effects on the aerobic cross-over performance of the college or course and not of the school.

11. Anaerobic performance of the child

Anaerobic performance refers to two other concepts: anaerobic potency and anaerobic capacity

- **Anaerobic potency**: In metabolic terms, it corresponds to the maximum number of ATP molecules that can be resynthesized anaerobically, per unit time. In terms of performance, it is determined by the power The highest mechanism or peak of power that a muscle or muscle group can generate during a brief "0-10 second" exercise.
- **Anaerobic capacity**: In metabolic terms, it is the maximum amount of ATP molecules that can be resynthesized by anaerobic (whole-body) metabolism. In mechanical terms, anaerobic working capacity is assessed by the ability of muscles to sustain high power during short-term (15 to 60 seconds) supra-maximal exercise. Local muscular endurance or anaerobic endurance is sometimes substituted.

12. field study procedure:

Our objective is to highlight, the magnitude of the serum lactate levels for each sex and to reveal a possible difference between our two populations. Also Justify possible differences between them through the theoretical field, then Application of a battery of tests (analysis of lactatemia, and heart rate) during a 100m 4Swims for swimmers and a 400m flat for runners at a maximum intensity.

A. Study sample:

Our choice is made up of 23 swimmers, and 20 runners. (18 girls and 25 boys) from the Amateur Sports Club "Rocher Noir" in Boumerdes, from the two sections practicing athletics and swimming for 3 years at least, performing training sessions of 1 hour 30 minutes per session three times a week, at the

Djilali Bounaama stadium in Boumerdes and at the Semi Olympic swimming pool in Boumerdes. Swimmers and runners have a regional level.

Table 02: General parameters of the Swimming population

23 subject	Age years	sex	size Cm	weight Kg	FC_ Rest bpm	FC_ Effort bpm	AL Mmol/l	time_100m 4N seconds
averages	11.17 ±0.48	05G/18B	143.62 ± 7.67	38.97± 8.68	113.04 ± 12.59	186.08 ± 16.44	7.57± 1.96	130.04 ±19.01

Table 03: General population's parameters "Athletics"

20 subject	Age years	sex	size Cm	weight Kg	FC_ Rest bpm	FC_ Effort bpm	AL Mmol/l	time 400m seconds
averages	11.6 ± 0.47	12g/8b	151.80± 6.26	41.31±6	104.50± 11.61	159.50± 15.96	8.34± 2.24	87.90± 8.54

- Subjects and their guardians were informed of the objectives of the research, the benefits of the investigations, as well as the experimental procedure.
- Subjects and their guardians were reassured that the data would be used for scientific purposes while respecting confidentiality and anonymity.

B. Material resources:

Stopwatch; Tape meter;Scale; Scorecard

·Lactate scout "lactate analyzer":

The Lactate Scout+ analyzer is a small device. It has reactive bands for lactic acid analysis, using an amperometric enzymatic Biosensor as a measurement element. The measurement interval ranges from 0.5 to 25.0 mmol/l and as a volume of blood, it just needs 0.5 microliters for its analytical process. Various comparative studies have been carried out in which correlations were found above 0.95 for the most common levels in lactic acid analysis (figures below 15 mmol/l), which guarantees the reliability of the results.

c. Statistical methods:

The results will be synthesized in a computational manner on Excel spreadsheet. All values are expressed by their mean plus or minus standard deviation. In this work we used the following statistical tests: Standard deviation (δ), Arithmetic mean, F-test Fisher's test, The Student test, or t-test.

D. Conduct of the experiment:

The samples were taken at the end of the specific evaluations, namely, 100 4N for swimmers and the 400m flat for runners, the tests were carried out on 22 March 2023, at the "djilali Bounâama"Boumerdes stadium and at the semi-olympic swimming pool "Berrabia Mahfoud" in Boumerdes, during a training session. After a specific warm-up, the samples were taken at the end of each test, namely, the 100m 4N for swimmers, and the 400m 00m flat for runners, we used a lactate analyzer of the scoute lactate type, thanks to a strip inserted at the end of the analyzer (A quantity of 0.5µ liter of blood is sufficient). A time of 06 seconds is required to obtain the results.

Athletes are stung with a sterilized syringe in two areas of choice:

- The ear lobe;
- The tip of the finger.

For lactatemia: Specimens are taken just after the test.

The results thus obtained are reported on a protocol sheet designed for the occasion.

E. Choice of tests :

From a physiological point of view, the anaerobic lactic sector reaches its maximum between 30 seconds and 2 minutes 30" according to the Condorcet Le Creusot University Center, 2011

- In children, peak blood lactate following supra-maximal exercise is achieved between 2 and 3 minutes **VAN PRAAGH and AL 1990, CHIA and AL 1997.**

- After a supra-maximal exercise of 30 seconds **on VAN PRAAGH and AL 1989 ergocycle,** concentrations of 7 mmol.l-1 are obtained. In the boys and girls of

- 11 years, during a 500m running event (lasting between 100 and 120 seconds**), DORE and AL 1996** obtained values of 10 mmol.l-1.

The level of our athletes and their chronometric performance corresponds to that time space where lactic acid production is maximal.

13. Presentation and interpretation of results for swimmers and runners

A. General parameters

Table 04: Presentation of the descriptive statistic of the General Parameters of the two populations (runners, swimmers)

----------	Girls / Boys		
	size	weight	Age
Average	147,43	40,06	11,40
Stander Deviation	8,24	7,73	0,54
Maximum	165	60	12
Minimum	133	24,9	10
Coefficient of variation	5,59	19,30	4,74

The average age of the general group is 11.40 ± 0.54, consisting mainly of subjects aged 11-12 years; these subjects have almost the same traits and growth dynamics, as this age coincides with the pre-pubertal period. The coefficient of variation for age is 4.74, indicating homogeneity between subjects.
For the mean stature of the group is estimated at 147.43 ± 8.24, the coefficient of variation of this index between subjects is determined by homogeneity (5.59).

B. Heart Rate

Fig 3: Comparison of HR in runners before and after exercise.

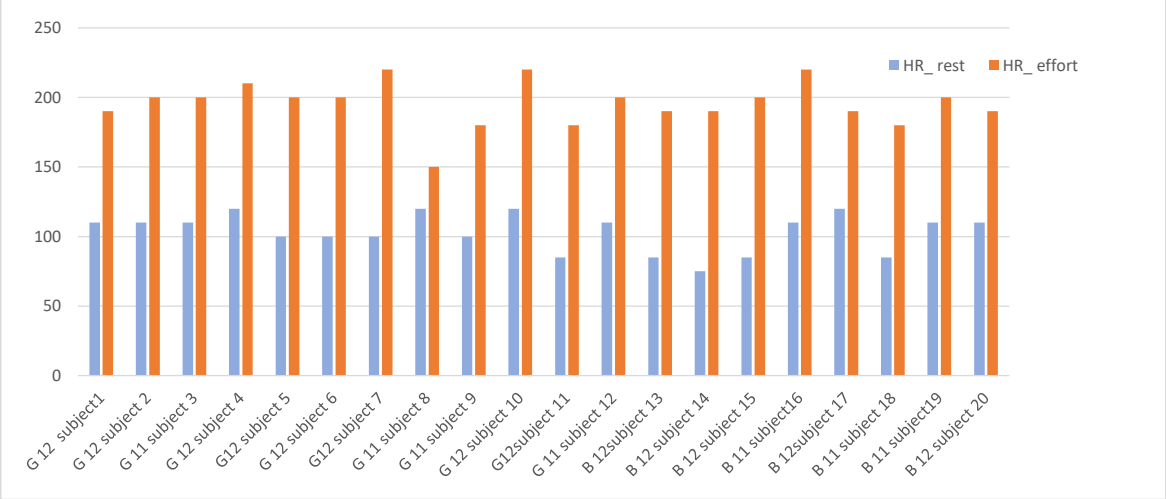
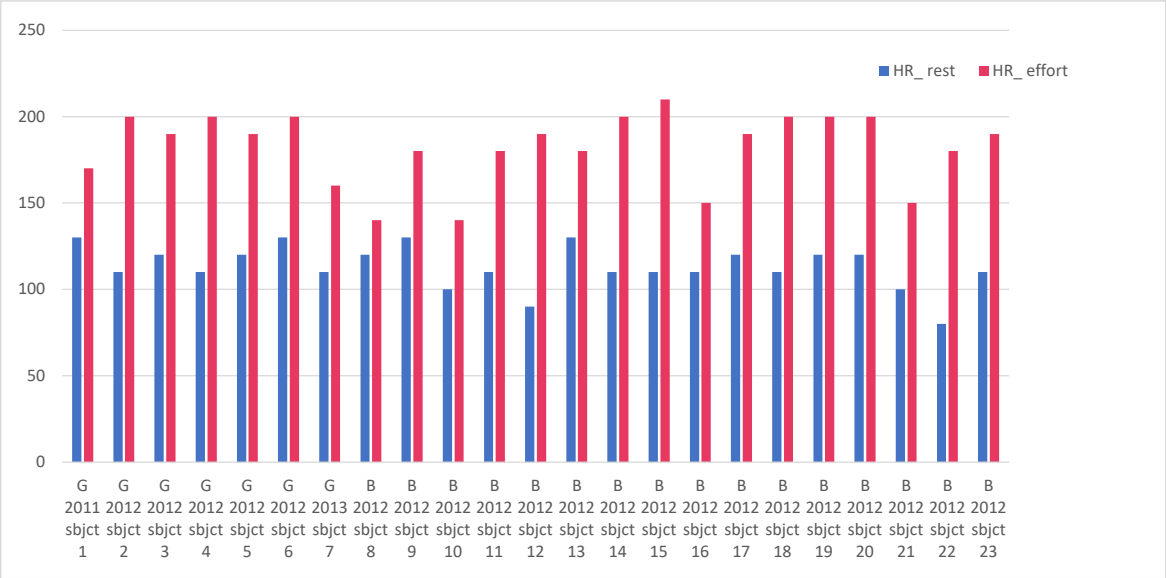


figure 4: Comparison of HR in swimmers before and after exercise.



Heart rate equal to its theoretical maximum value taking into account the age of the subject. Since HR max is relatively constant during growth. Values of 195 b.min-1 and 200 b.min-1 respectively can be considered as acceptable criteria in children **Rowlan, TW (1993)**

c-Lactataemia:

Fig 5: Summary histogram of lactate level in girls and boys

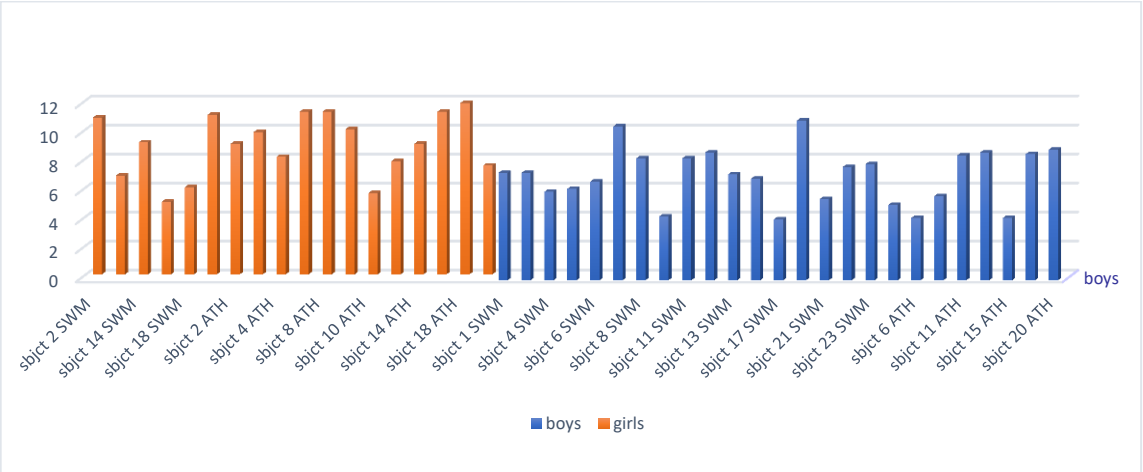


Table 05: Test of equality of variances (F-test) of the two populations

F	1.27
P(F<=f) unilateral	0.29
Critical value for F (one-sided)	2.05

Table 06:the test of equality of expectations: of two observations with equal variances in the two populations.

t-statistic	2.74
Critical value of t (two-sided)	2.02
P(T<=t) two-sided	0.009 ***

According to table N°06, we note that in the test of equality of expectations: of two observations of equal variances in the two populations, that there is a difference in the level of lactataemia between pre-pubescent boys and girls, since our t-statistic equal to 0.009 is very significant.

Table 07: Presentation of the descriptive statistics of the lactate level for the two populations(girls and boys)

----------	**Girls**	**Boys**
Mean	8.94	7.21
Standard deviation	2.13	1.90
Maximum	11.8	11
Minimum	5	4.2
Coefficient of variation	23.82	26.40

Table 07 shows an average value of the lactate level equal to 7.21 Mmol/l-1 ± 1.90 in boys and an average of 8.94 Mml/l-1 ± 2.13 in girls, the groups of boys and daughters are heterogeneous since the coefficient of variation is 26.40/23.82 respectively. The maximum value of the lactate level in girls is 11.8 Mmol/l-1

and 11 Mmol/l-1 in boys, while the minimum value is 5 Mmol/l-1 in girls and 4. 2 Mmol/l-1 in boys

14. Presentation and interpretation of results swimmers

Fig 6: Comparison of blood lactate levels between "girls" and "boys" swimmers

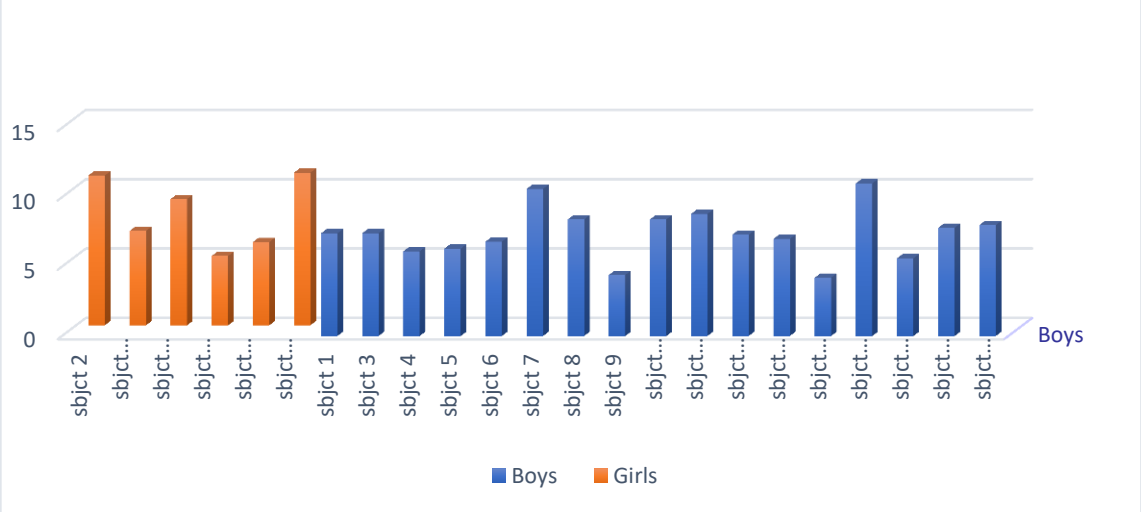


Table 08: Presentation of the descriptive statistics of the General Parameters in male and female swimmers.

----------	**Girls / Boys**		
	Size	**Weight**	**Age**
Mean	143.62	38.98	11.17
Standard deviation	7.84	8.88	0.49
Maximum	164	60	12
Minimum	133	24.9	10
Coefficient of variation	5.46	22.78	4.39

Table 08 shows an average height value equal to 143.62 ±7.84 among male and female swimmers, the group is homogeneous since the coefficient of variation is 5.46. We also find in the results of this statistical study that the average weight is 38.98 and a standard deviation of 8.88, as for the coefficient of variation is equal

to 24.9, therefore our group is heterogeneous. This can be justified by the presence of several overweight subjects (subject 21, 11.7).

The average age among swimmers is estimated at 11.17. The homogeneity is average since the coefficient of variation is 4.39.

Table 09: Equal variance test (F-test) in swimmers

F	1.94
P(F<=f) unilateral	0.14
Critical value for F (one-sided)	2.85

The variance F equal to 1.94 is lower than the critical value for F which is equal to 2.85 this means that the variances are equal for swimmers

Table 10: the test of equality of expectations: of two observations of equal variances among swimmers.

t-statistic	0.75
Critical value of t (two-sided)	2.08
P(T<=t) two-sided	0.45NS

Statistical analysis reveals non-significant differences (two-sided P = 0.45) at the age of 11 to 12 years among swimmers; this difference between the means may be due to the reduced number of the female population compared to the male population. In other words ; a larger female population would perhaps have allowed us to have more reliable results.

Table 11: Presentation of the descriptive statistics of the lactate level for each sex in swimmers.

----------	**Girls**	**Boys**
Averege	8.12	7.38
Standard deviation	2.55	1.83
Maximum	11	11
Minimum	5	4.2

Coefficient of variation	31.37	24.79

Table 11shows an average value of the lactate level equal to 8.12 Mmol/l-1 obtained in the female population, and with a standard deviation of 2.55 the group is heterogeneous since the coefficient of variation is 31.37. We find in the result of this statistical study that the average lactate level in boys is 7.38, ±1.83, as for the coefficient of variation is equal to 24.79, therefore our group is heterogeneous.

The maximum value of the lactatemia level in swimmers is equal to 11 Mmol/l-1, while the minimum value is 5 Mmol/l-1 in girls, and 4.2 Mmol/l-1 in boys.

Table 12: Presentation of descriptive statistics of chronometric results in swimmers of both sexes**.**

----------	**Girls**	**Boys**
Mean	134.33	139.35
Standard deviation	16.35	20.72
Maximum	150	170
Minimum	110	92
Coefficient of variation	12.17	14.87

Table 12shows us that the average of the chronometric results recorded in boys is 139.35 ± 20.72 seconds compared to the average recorded in girls 134.33 ± 16.35 seconds, As for the coefficient of variation is equal to 12, 17 for girls and 14.87 for boys, the two sexes are moderately homogeneous. The maximum value of chronometric results recorded in swimmers is equal to 150 seconds, while the minimum value is 110 seconds. Among swimmers, the maximum chronometric value is 170 seconds and the Minimum value is equal to 92 seconds.

With regard to the chronometric results, the statistical study reveals non-significant results because the average chronometric performances between the two sexes are very close. On the other hand, if we take the best male chronometric performance and the best female chronometric performance, we find that of the boys is of an average equal to 139.35 seconds is clearly higher than that of the girls which is of an average equal to 134.33 seconds.

Fig 7. Presentation and interpretation of results in runners

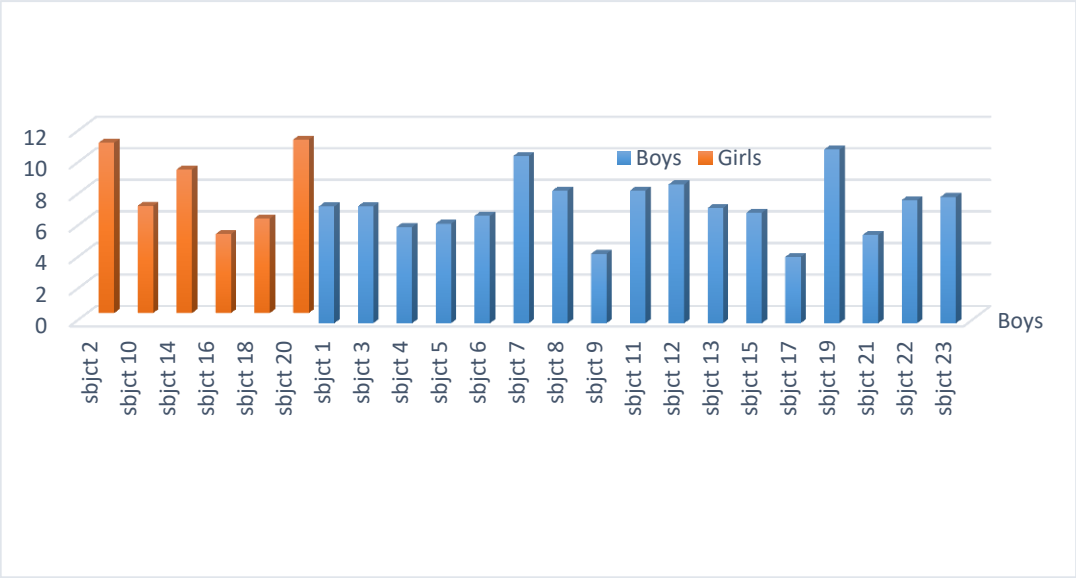


Table 13: Presentation of descriptive statistics for General Parameters in runners

----------	**Girls / Boys**		
	Size	**Weight**	**Age**
Mean	151.8	41.31	11.65
Standard deviation	6.42	6.15	0.49
Maximum	165	52	12
Minimum	143	33.8	11
Coefficient of variation	4.23	14.89	4.20

In the runners (Girls and Boys) the average height is equal to 151.8, and with a standard deviation of 6.42, the results show homogeneity since the coefficient of variation is 4.23.

The average weight equal to 41.31 ± 6.15, the coefficient of variation is equal to 14.89, so the group is moderately homogeneous. The average age among the runners is equal to 11.65, the group is homogeneous the coefficient of variation is 11.

Table 14: Equal variance test (F-test) in runners

F	1.29
P(F<=f) unilateral	0.34
Critical value for F (one-sided)	3.01

Table 14 shows us that the value of F is < the critical value for F (unilateral) which informs us that the variances are equal

Table 15: the test of equality of expectations: of two observations of equal variances among runners.

t-statistic	2.78
Critical value of t (two-sided)	2.10
P(T<=t) two-sided	0.01 **

Table 15:shows us very significant differences recorded in girls and boys aged 11 to 12 in athletics concerning the level of lactatemia because the bilateral P value is equal to 0.01.

Table 16: Presentation of the descriptive statistics of the lactate level for each gender in runners.

----------	**Girls**	**Boys**
Mean	9.35	6.84
Standard deviation	1.87	2.13
Maximum	11.8	9
Minimum	5.6	4.3
Coefficient of variation	20.03	31.14

According to table 16, the descriptive statistics indicate that the lactate level in girls is an average of 9.35 Mmol/l-1 ± 1.87, an average homogeneity in girls since the coefficient of variation is of 20.03. The lactate level in boys is an average of

6.96 Mmol/l-1 with a standard deviation of 2.13, the results show heterogeneity compared to the group of girls, since the coefficient of variation is 31.14.

The maximum value of the lactatemia level in girls is 11.8 Mmol/l-1, and 9 Mmol/l-1 in boys, while the minimum value is 5.6 Mmol/l-1 in girls and 9 Mmol/l-1 in boys. 4.3 Mmol/l-1 in boys.

Table 17: Presentation of the descriptive statistics of the chronometric results for each gender in the runners.

----------	**Girls**	**Boys**
Mean	86.42	90.13
Standard deviation	6.27	11.72
Maximum	98	115
Minimum	79	80
Coefficient of variation	7.30	13

Table 17 shows the average of the chronometric results recorded among the runners; in boys the average is equal to 90.13 seconds and the average recorded in girls is equal to 86.42 seconds, which justifies that the production of blood lactates is significantly higher in girls which is an average of 9 .35 Mmol/l- than in boys which is an average of 6.84 Mmol/l-1 (table N°19), because they produce more effort for better performance than acid boys milk plays a role ofa natural brake The female population is homogeneous (coefficient of variation is equal to 7.30) while the boys are moderately homogeneous (coefficient of variation is equal to 13).

The maximum value of chronometric results recorded in runners is equal to 115 seconds, while the minimum value is 80 seconds. For female runners the maximum value is 98 seconds and the minimum value is equal to 79 seconds**.** With regard to the chronometric results, the statistical study reveals non-significant results because the average chronometric performances between the two sexes are very close. On the other hand, if we take the best male chronometric performance and the best female chronometric performance, we find that of boys with an average of 90.13 seconds is clearly higher than that of girls with an average of 86.42 seconds.

Discussion

According to Di Prampero and Cerretelli (1969) "the concept of maximum power in humans is associated with the ability of anaerobic metabolism to quickly provide the energy necessary to carry out a large amount of work in a minimum of time" , the objectives of our research were, that during the tests the subjects perform their best possible chronometric performance so that afterwards, we measure the post-exercise lactate rate which corresponded to the intensity of the effort to be made. According to the statistical analysis of the results of the lactate level in children and more particularly in pre-pubescent girls and boys (swimmers and runners), it turned out that at this age of 11 to 12 years, there was a very significant in the production of lactatemia; the results show that the production of blood lactates is significantly higher in girls (8.94 ± 2.13) than in boys (7.21 ± 1.90), despite the fact that the children have not reached their puberty phase (table 10),through these results we confirm our general hypothesis and go in the same direction as other researchers (Pétersen et Al.1999), namely that the production of lactate in pre-pubescent children differs between girls and boys, that can be explained by the influence of several factors among them:

- Genetics:the optimal speed would be directly related to the percentage of fast fibers on the isolated muscle as shown by Faulkner et al. (1981, 1986)
- Growth: These results highlight the difficulty of choosing the mode of expression of the bioenergetic parameters, in particular during the period of growth when there are significant body changes. The contribution of each parameter in the evolution of a bioenergetic datum is difficult to estimate, “the difference in Pmax. between child and adult persists even when muscle mass, lean mass, height, cross-sectional area of active muscles is controlled” Davies et al, (1972); Komi and Karlsson, (1979); Inbar and Bar-Or, (1986); Blimkie et al., (1988); Mercier et al., (1989).

"post-exercise lactatemia increases significantly with age” Falgairette et al (1991), “between 6 and 12 years, report a significant improvement in anaerobic performance and post-exercise [L]s” Falgairette et al. (1991).

However, “Pmax is always higher in boys compared to girls of the same age, and the difference is accentuated after puberty” Crielaard and Pirnay, (1985b); Van Praagh, (1988); Van Praagh et al (1990), from the age of 11 boys present Pmax values. Higher than those obtained in girls, which invalidates our secondary hypothesis. The average stature of the group is estimated at 147.43 ± 8.24. The coefficient of variation of this index between the subjects is determined by homogeneity. This rapprochement can be explained by the fact that the group has not yet reached the stage where the size is at maximum velocity; and that at this

age period, height is sometimes marked by one or more small pre-pubescent growth peaks Hauspie, R (2003). These contradictory results are in favor of a maturation of glycolytic activity during the puberty period, but do not establish a direct relationship with testosterone concentrations (which only represents a maturation index highly correlated with other factors such as body dimensions)

On the other hand, non-significant results in swimmers are due to poor effort management, Welsman and Armstrong (1994) and Pfitzinger and Freed-son (1997)The optimal speed is more the reflection of a neuro-muscular maturation, of motor coordination". Peres et al (1989)pooled information about the lactate concentrations of children performing exercise. These authors emphasized that when comparing studies of the glycolytic responses of children and adults to exercise, it was essential to take into account the variables that could influence plasma concentrations. For example, duration, intensity of exercise, and type of exercise protocol can affect glycolytic response and lactate concentration. Also the difference between the means of tatemia between the two sexes can be explained by the small number of the female population compared to the male population (06 girls/17 boys). In other words ; a larger female population would have allowed us to have more reliable results. The average of the chronometric results recorded in the boys is 139.35 ± 20.72 seconds is lower than that of the girls which is 134.33 ± 16.35 seconds, and the average of the lactatemia is 7.21 Mmol / l -1, 8.94Mmol/l-1 (table n°15) respectively, this can be justifiedby a predisposition to early maturation in girls.

In athletics, the choice of the 400m flat was not taken by chance because "a duration of effort between 15 seconds and 1-2 minutes can be, in pre-pubescent children, likely to activate metabolic voices that are still immature Van Praagh. E (2008). In our statistical study the results of the lactate level in girls (9.35 ± 1.87) are very significant to those of boys (6.84 ± 2.13) the t test = 0.01, these results can be explained by the predisposition of girls to an early sexual maturation than in boys of the same age (boys mature later than girls). As long as the average of the chronometric results recorded in the boys is lower than that of the girls, is equal to 90.13 seconds as long as the average recorded in the girls is equal to 86.42 seconds, which goes the same with Doré research. R and AL (1991) "the lactatemia varies between an average of 10 Mmol/l-1 after a supramaximal exercise which lasts between 100 and 120 seconds" by comparing the results of the level of lactatemia in girl and boy runners with their chronometric results, the results show better chronometric performance and higher blood lactate production in girls, this can be explained by the intensity of effort provided, which is higher in girls.

conclusion

the objective of this study was to prove that there is no physiological difference between pre-pubescent boys and girls during lactic anaerobic exercise. ; Recent Studies Ratel. S, Martin. V (2012)show that the activity of the lactic anaerobic metabolism of the child is not different from that of the adult.

The study of anaerobic function during growth has not received the same attention from researchers as aerobic function. This is quite surprising in view spontaneous activity of children.

We note that a lot of research has been done on anaerobic metabolism in children but very little on the comparison between girls and boys in the production of lactate.

In our study we have compared blood lactate result obtained during our investigation, between the two sexes in runners as well as in swimmers, and between the total sample of females and males after exercise.

The results of the experiment show that:

- Among swimmers, the reduced number of girls leaves its mark on the comparative study of the lactatemia rate in both sexes. The statistical study revealed a non-significant difference.
- In runners, the chronometric results in the male population are better than in girls, but the lactatemia in girls is higher.
- The gender variable has an important influence on the production of blood lactic acid and this through the difference in results observed between girls and boys in the total population.

Through these results obtained, we confirm our general hypothesis and go in the same direction as other researchers (Pétersen et Al. 1999), namely that the production of lactatemia in pre-pubescent children differs between girls and boys.In girls, there is a markedly higher blood lactate level than in boys, which would be due to a predisposition to early maturation in girls compared to boys of the same age.

After critical examination of the literature, it therefore appears that it is neither useless nor dangerous, on a physiological level, to solicit thesectorlactic

anaerobic in children, due to a more developed oxidative metabolism. Taylor et al 1997Children are able to more quickly eliminate muscle metabolites from anaerobic lactic metabolism and more quickly replenish muscle phosphocreatine and ATP necessary for the restoration of maximum power(the child tires quickly and recovers faster).Contrary to what has long been maintained, lactic glycolysis can be functional in this age group, and does not present any proven metabolic danger in children practicing lactic anaerobic type activities, the only constraint that exists is that the child has difficulty supporting lactic efforts (poorly tolerates fatigue).

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