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Impact of a training program on the development of physicals capacities in young judokas (15-17 years old): case of the DRARIA sports high schools

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Abstract

In the field of high level sport, specific training and physical preparation are intertwined and the importance of physical preparation is often decisive on performance.

The aim of this research is to provide a physical framework for young judokas by evaluating the physical qualities and to grasp the dynamics of development of the physical and technical qualities of young judokas, in relation to the sporting activity practiced and under the effect a training program based primarily on muscle building. This is how we wanted to check the impact of a training program on the development of the physical qualities of young judokas. Analysis of the tests submitted at regular intervals will make it possible in order to measure assess the rate of individual growth of the evaluated factors and will therefore allow the evolution of the training effects on the athletes previously tested.

Our study focused on a sample of 33 judokas, competing pupils at the national sports school of DRARIA, their age characteristics: (16 years ± 2.12) weight: (68.55kg ± 6.85) and height: (170 , 6cm ± 0.04)

We carried out a comparative evaluation of the pre-and post-intermediate and final tests.

Statistically significant differences at the level of the experimental group for all the tests evaluated and the most improvement were observed in the technical tests Since the calculated p-value is less than the significance level alpha = 0.05, we must reject the null hypothesis ho, and retain the alternative hypothesis ha its difference of means is very significant.

It can be concluded that the training program allowed an increase in the level of performance in terms of physical and technical capacities by transferring the adaptations made in strength training to the sporting task.

I. Introduction

Competitive and high-level sport constitutes a complex field of research, and a privileged area for studying the complexity of a certain sport discipline. The evolution of high-level sport has resulted in a very strong rationalisation of coaching, preparation and selection of sportsmen and women. In literature, various works of Testou, (2012) give, each in their own field, an overview of the criteria required to define an approach to highlevel performance. Comparing the evolution of performance over the years, we can see significant changes in both the training and the performance of the athlete. The scientific approach in the sport area has generally experienced a significant update in the technical evolution and particularly at the level of physical training. Physical preparation must be included as far as possible in the practice of sport.

The assessment of the development of general and specific physical abilities is one of the main aspects of optimizing sports performance (Koutchouk, 2011). The assessment in physical education is a basic phase that allows the physical training to be objectified and individualized, (Cometti, 2013).

The performance analysis can only lead to a very limited interpretation of the evolution of the athlete's abilities and even if the performance is one of the objective criteria, it is actually no more than a result. The obtained performance is the combination of a great number of various factors, so that it may be used as the unique reference base for an objective assessing of the subject’s merit. As Cometti (2013) and Clarys and al,(2010) point out, it is essential to make physical training objective. This stage consists of assessment sessions or even daily assessments in order to identify a fitness condition.

The Sports division, previously known as "Sports studies", is a training session that combines school education and sustained sports training with a club. The aim of the Sport-study classes is to promote the practice of high-level sport by students. We intended to carry out an assessment of the physical and technical abilities of the young judokas at Draria sports high school. Nowadays, the level of physical fitness of a subject can be expressed not only by the performance but also by the laboratory or a field. measurement results

When we talk about assessment, we are referring to the tests shall be applied. A variety of tests can be collected, such as the vertical relaxation test (Hallouz and Hannat, 2019; Sayeh and al., 2020; Deradji and Mazari, 2020), or the speed tests (Bensalem and al., 2020; Ghidi and sedira, 2019) from which the most appropriate ones should be selected for assessment. As

such, the field in which we work is the general physical value and the purpose of our assessment is the physical preparation and training supervision for competitive practice. The success of the technical movement and the accessto high performance in judo are dependent, among other things, on the level of physical growth. The results of the supervision tests of the general physical preparation, along with those of specific tests, express in a more complete and accurate way, the athlete's sport fitness (Franchini,and al ,2011).

Physical preparation in combat sports is often a crucial factor in performance(Hahn, 2011, Tahri and Aboura, 2020). It is taken increasingly more seriously in combat sports. Thus, we wanted to examine the effect of a training program on the physical abilities of judokas.

For young athletes, the assessment will enable the detection of an emerging physical potential and the supervision of the evolution of physical abilities in line with growth. The tests will allow us to define the areas of physical work to prepare them for the challenges of competition.

« Without periodical verification of the training condition, one may run the risk of going into bankruptcy without being aware of it. »

The setting up of a training program including some relevant training methods, according to a well-established protocol, may allow improving the performance of young judokas.

Combining muscular reinforcement work with specific work will help to enhance the strength transfer in the sporting gesture.

II. Method and Materials

In order to carry out our study, it was preferable to set up a training program that could be conducted in the field. Therefore, it was necessary to use the experimental method in order to answer the questions linked to our research.

II.1.Participants

Thirty-three (33) subjects participated in the study. Our study community is composed of judokas, pupils at Draria National Sports High School aged between 15 and 17 years old. The characteristics of the participants are presented in table No.01.

table No. 01 : Characteristics of the Participants (mean (M)± standard deviation)

Number of participants (n)	Age (years)	weight (kg)	Height (cm)
33	16±2,12	68,55±6,85	170,65±0,04

II.2.Materials

For the Anthropometric measurements, we used Martin type Anthropometer, Digital Balance, a digital manual chronometer and a decameter.

Design and Procedure

The first tests were conducted at the beginning of the general physical preparation (G.P.P.) stage, the second assessment was held at the end of the special physical preparation (S.P.P.) stage and the beginning of the competition period. The last assessment was carried out at the end of the competition period.

2.3.1. Experimentation

The program consists of:

One session per week for low plyometrics (small jumps) without load (strength/speed development), all low amplitude jumping exercises: Vertical, horizontal, and multidirectional jumping, skipping strides, skipping rope, skip jumps (20cm).

Two sessions per week for circuit training of muscular strengthening (to develop strength and muscular endurance), an important method especially in the phases of general physical preparation. The circuit will consist of a number of movements that will be more or less important, but mainly complementary. In general, at least 7 or 8 different exercises are chosen, in order to have a global but not separated work. The objective of the weight training circuit will be to involve the entire body, in order to allow a high-energy expenditure and an increased burning of body fat. Training in this way aims to improve both muscular strengthening and endurance.

The plyometric session is inserted between the 2 weight training sessions. Thus, we have achieved 3 (non-consecutive) sessions per week.

We conducted a Comparative Assessment of the Intermediate test, Final test, Pre-test and Post-test. The aim was to measure the effects of the training program on the judokas during and at the end of the training cycle as well as to measure the evolution of the pre-tested abilities.

2.3.2. General physical tests

Evaluation is an operation which consists in estimating, in appreciating, the qualitative and quantitative value of the knowledge, the know-how and the know-how of a person by comparing the observable characteristics with established standards, on the basis of explicit criteria and precise, qualitative and quantitative, in order to understand, inform judgment and decision-

making with accuracy in the pursuit of a goal or an objective. (Sacripanti, 2008).

Judo, which is an opposition sport lasting 4 to 5 minutes, requires very good physical qualities

It is a very intense sporting discipline that varies from a few seconds to 4 or 5 minutes, offering intermittent muscle activity (effort + recovery) characterized by the alternation of static and dynamic tensions.

In order to assess to measure the physical level we use tools that consist of stress tests.

The tests used in the context of our work are tests that are easy to perform and accessible to all and which inform us about the development of physical qualities useful for judoka, such as:

Speed, strength, flexibility, coordination etc.

The trainer must be able to assess these physical qualities in the competitors in order to improve the deficient ones and to perfect the existing ones, while respecting the personality of the judoka to help him to forge a personal expression, that is to say his body shape.

Finally, it should be noted that the physical qualities are very important for the judoka and go in the direction of a domination over the technique, so we often notice that such a competitor could not express himself so much he was subjected to the physical domination of his. opponent. (Prouteau, and all, 2007).

a. 50m speed test

Speed is a main quality in the majority of sports activities: However, it is obvious that speed is particularly expressed in each one of its sports activities. In combat sports or duel sports, the activities require taking one's opponent by speed.

The speed may be assessed in different ways from the maximum running speed over different distances with or without change of direction, or particular supports. The distance of 50m enables us to measure the maximum speed, usually obtained between 30 and 40 meters (Mokkedes, 2013) at such a level of practice (Hubiche and Pradet, 1996). This test assesses both the ability for speeding and the anaerobic alactic power. It is currently admitted that the two most important biomechanical abilities in a flat sprint race are the developed muscular strength and the elastic properties of the lower limbs.

b. Vertical jump test

Relaxation is an essential quality for numerous and various activities. Vertical relaxation allows the power, explosiveness and elastic properties of the lower limb to be assessed in a very simple way.

Vertical relaxation is the demonstration of the concentrated strength abilities of the leg's extensor muscles (mainly calves, quadriceps and buttocks). It can be enhanced by working on the strength and flexibility of the leg's extensor muscles(Cazorla,2008)

c. The 5x10m shuttle run

This test assesses Speed Coordination. **Speed with change of direction** is turning or changing direction and would in fact be the expression of a physical ability: agility. The agility criterion is to waste as little time as possible in making a change of direction, thus wasting overall as little of its linear speed as possible.

The ability to achieve a change of direction according to a known path is 50% depending on the interaction of speed, relative maximum force and relative lean mass. This is referred to as power. The other half of the performance would be dependent on coordination abilities, (Cazorla, 2008).

d. 3Kg Medicine Ball Throw

The throw test measures the strength of the upper limbs and the trunk (upper limb power). It consists of an arm extension by throwing a medicine ball. It is a useful test to assess the explosive strength of the upper body, especially the arms and pectorals. **The medicine-ball is very useful as the numerous possibilities exercises of effectively involve and strengthen all the muscle groups(Cazorla,2008)**.

e. The 12-minutes Cooper test

The endurance is the ability to maintain an effort for as long as possible without reducing efficiency, whatever the intensity. Endurance concerns all the energy systems that cause muscle contraction and is therefore not only reduced to low intensity efforts. The aerobic system is at the core of performance in many sports for many reasons. This energy production system is actually used in efforts as soon as they are prolonged and repeated, yet it is also, and above all, one of the most important systems used during the training sessions. Furthermore, its effect on the ability to recover after a more intensive effort (lactic acid for example) is significant. Finally, this system constitutes a real "basement", common to all the physical abilities. Assessing, developing and supervising the evolution of

this training program seems to be essential in the physical preparation of an athlete.

f. Bench press test

This very common weight-training exercise is a basic exercise that uses two joints (elbow and shoulder) and works the whole chest, not just the pectorals. It is used to assess the muscular strength of the upper limbs and is used in athletic strength tests. This test is called maximal because we are looking to move the true maximum possible load.

The maximum force is the highest force that the neuromuscular system can exert by a voluntary contraction in isometric (static) or dynamic (load lifted once = 1 Repetition Maximum). The maximum load in weight training (more often called 1RM or 1 rep max) is the maximum weight that may be lifted in the bench press test. It is important to define this maximum load so as to be able to work on a certain percentage during the next sessions.

A table to extrapolate the 1RM (A simplified version of Berger's table)

table No. 02: Berger's table for extrapolation from 1RM

Likely number of repetitions	1	2	3	4	5	6	7	8	9	10	11	12	15
% of 1RM	100	95	93	90	87	85	83	80	77	75	70	67	65

g. Squat test

This is one repetition maximum load, which consists of bending the legs. The squat test has the same objective as the bench press test. The maximum squat load or 1RM is the maximum weight that may be pushed during the test (Seguin,2002).

2.3.3. Specific physical tests

a.Five Projections Test

This nage-komi (projection) test is used to assess the specific speed. The skill or technique refers to concrete, consolidated, and task-specific motor actions. (Seguin, 2002).

b.Kumi - kata releasing test

The purpose of the kumi - kata release test is to assess the specific explosive force in judo. (Thomas, 1989).

c. Immobilization release test

The purpose of this test is to assess the specific maximum strength. (Seguin,2002).

2.4. Statistical Analysis

All statistical analyses were conducted using Excel. Descriptive statistics (mean and standard deviation (SD)) were generated for all variables. The Friedman test is used to assess whether there are statistically significant differences between the distributions of three assessments. A multiple comparison method is suggested.

3. Results and analysis

3.1. General test analysis

The descriptive and analytical results of the experimentation of the general tests are presented in table No. 03 and Figure No.01.

Table No. 03 : descriptive and analytical results of the experimentation of general tests

Tests	50 m (s)	V.R (m)	Shuttle 5× 10m (s)	Throw of m-b (m)	Cooper 12 m (m)	Bench press (kg)	Squat (kg)
Test 1 (T1)	6,53±0,51	41,71±4,34	16,21±1,13	5,48±0,40	2350,9 ± 134,27	106±21,34	125,91 ± 18,97
Test 2 (T2)	6,52±0,56	42,73±4,20	16,05±1,04	5,78±0,41	2395,61 ± 132,37	110,70±20,34	131,55 ± 17,57
Test 3 (T3)	6,51±0,51	43,79±4,02	15,97±0,95	5,94±0,37	2432,09 ± 131,65	113,88±13,26	134,97 ± 16,15
Friedman test	Sig p<0,001	Sig p<0,001	Sig p<0,001	Sig p<0,001	Sig p<0,001	Sig p<0,001	Sig p<0,001
Increase (T1-T2) %	0,19	2,43	0,99	5,46	1,94	4,43	4,48
Increase (T1-T2) %	0,15	2,48	0,49	2,88	1,52	2,87	2,6
Increase (T1-T2) %	0,33	4,98	1,47	8,50	3,49	7,43	7,20

V.R : the vertical relaxation ; Sig : significant

The average performance of the judokas in the 50 meters has in improved by an average of 0.19% in test 2 and 0.33% in test 3compared to the results recorded in test 1, which naturally shows significant differences in averages. Similarly, the difference in averages between test 2 and test 3 is significant with an average gain of 0.15% (Figure No. 01). The difference in averages for the 50m variable is significant.

The average performance of the judokas in the vertical relaxation test has been improved significantly on average by 2.43% in test 2 and 4.98% in test 3 in comparison to the results recorded in test 1. The

difference in the averages between test 2 and test 3 is similarly significant, with an increase of 2.48%. The difference in the averages of the vertical relaxation variable is very significant.

The average performance of the judokas in the throw test has been improved significantly by an average of 5.46% in test 2 and 8.50% in test 3 in comparison to the results recorded in test 1, with a significant difference in the averages between test 2 and test 3 with an increase of 2.88%. The difference in the averages of the medicine ball throw variable is very significant.

The average gain of 1.94% between test 1 and test 2 is significant. The average performance in the 12min Cooper test of the judokas has been improved significantly on average by 3.49% in test 3 in comparison to the results recorded in test 1 and by 1.52¨% in test 3 in comparison to the results recorded in test 2. The difference in the averages of the Cooper variable is very significant.

The average gain of 4.43% between Test 1 and Test 2 is significant. The average performance has been improved significantly on average by 7.43% in test 3 compared to the results recorded in test 1 and significantly by 2.87¨% in test 3 in comparison to the results recorded in test 2 (Figure No.01). The difference in the averages of the bench press variable is very significant.

The average performance of the judokas in the squat has been improved significantly on average by 4.48% in test 2 and 7.20% in test 3 in comparison to the results recorded in test 1, with a significant difference in the averages between test 2 and test 3, with an increase of 2.60%. The difference in averages for the squat variable is very significant (table No.03).

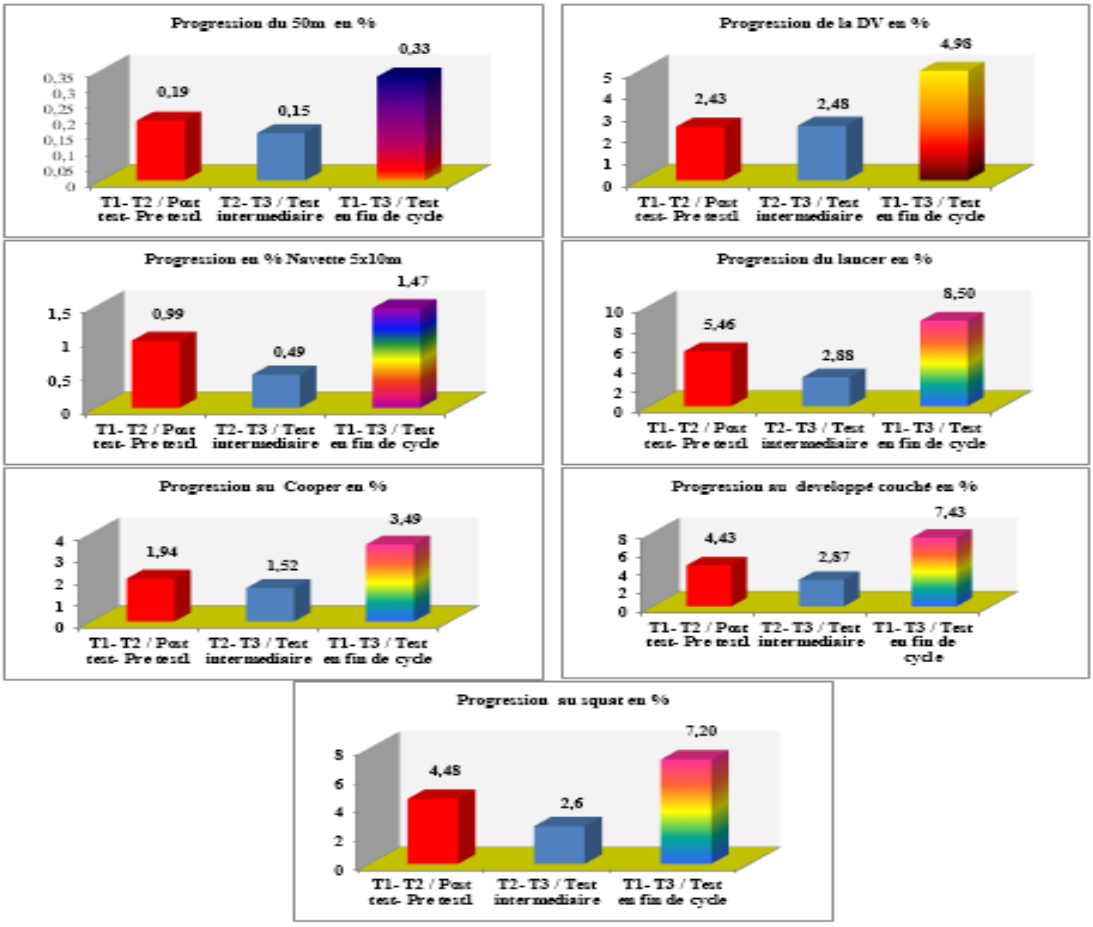


Figure No. 01 : percentage increase in general tests

Progression du 50m en %= Increase in 50m in %.
Progression de la DV en %= VR increase in %
Progression en % Navette 5x10m= Increase in 5x10 m shuttle in %
Progression du lancer en %= Increase in throw in %
Progression au Cooper en %= Increase in Cooper in %
Progression au developpé couché en %= Increase in brench press in %
Progression au squat en %= Increase in squat in %
T1-T2/ Post-test Pre-test= Post-test Pre-test /T2-T3/test intermédiaire= intermediate test/ T1-T3/ Test en fin de cycle= End of cycle test

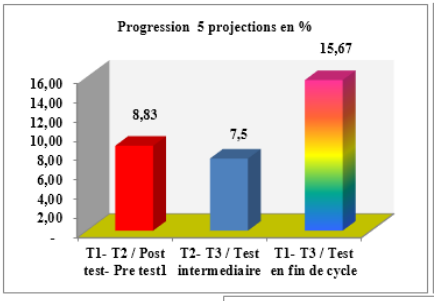
3.2. Specific test analysis

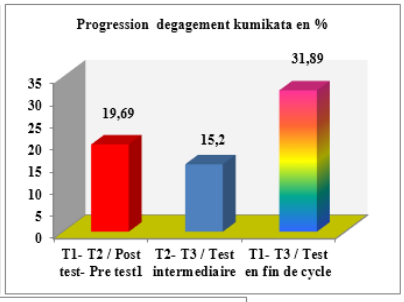
The descriptive and analytical results of the experimentation of the general tests are presented in table No.04 and figure No. 02.

Table No.04 : **descriptive and analytical results of the experimentation of specific tests**

Tests	5 projections (s)	Kumi - kata release (s)	Immobilisation release
Test 1 (T1)	10,64±1,52	7,70±2,99	6,85±2,29
Test 2 (T2)	9,70±1,47	6,18±2,59	5,45±2,02
Test 3 (T3)	8,97±1,24	5,24±2,32	4,48±1,80
Friedman test	Sig p<0,001	Sig p<0,001	Sig p<0,001
Increase (T1-T2) %	8,83	19,69	20,35
Increase (T1-T2) %	7,5	15,2	17,78
Increase (T1-T2) %	15,67	31,89	34,51

The difference in the averages of the three variables is very significant (table No. 04). The average performance of the judokas in the 5 projections has been improved significantly on average by 7.5% in test 2 and 15.67% in test 3 in comparison to the results recorded in test 1. The average performance of the kumi-kata release test has also significantly been improved by 15.2% in test 2 and 31.89 in test 3 in comparison with the results recorded in test 1, and finally, an increase of 17.78% in test 2 and 34.51% in test 3 in comparison with the results recorded in test 1, for the immobilization release test (Figure No. 02).





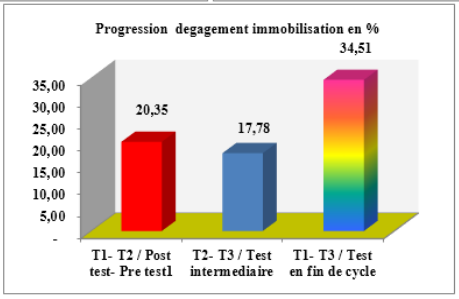


Figure No. 02 : percentage of increase in specific tests
Progression 5 projections en %= 5 projections increase in %
Progression dégagement kumikata en %= Kumikata releasing increase in %
Progression dégagement immobilisation en %= Immobilisation releasing Increase in %
T1-T2/ Post-test Pre-test= Post-test Pre-test /T2-T3/test intermédiaire= intermediate test/ T1-T3/ Test en fin de cycle= End of cycle test

4. Discution

The suggested training program revealed a significant improvement at the level of the group assessed for all the tests and the highest percentage of improvement was observed in the technical tests (release and projection tests). These results show that "every technique is sustained by the physical means it requires".

However, if there is one controversial point in the exercise science, it is the matter of the effectiveness and potential risk of weight training for young athletes. Over the last 20 years, however, the opinion has changed considerably. According to J. Duchateau (1992), the term «weight training» is used to describe specific strength training in sport. Whereas weight training used to be considered dangerous, several studies have shown the contrary and have demonstrated that young athletes can and must do strength training, which is essential for the optimal development of physical and technical abilities and particularly to improve explosiveness and power, as can be seen in the relaxation, squat, bench press and throw tests (sterkowicz, franchini, 2001).

Several studies, especially by Deradji et al (2020), have demonstrated a significant increase in strength not through hypertrophy but through nervous mechanisms with, for instance, a training of 2 sessions per week over 10 weeks. It seems that neural factors more than muscular hypertrophy explain the gains in strength observed in children (wicks ,2009).

At the end of experimentally controlled strength training programs, several recent studies by Ghidi et al (2019) have clearly demonstrated that gains in strength are obtained in a very significant way and without harm to the child's health' when et's combined with another discipline.

Therefore, we need a model of a long-term athlete development based on the scientific foundations of physical preparation, thus breaking with the conventional, empirical and occasional physical preparation of the 1950s-1960s. Pradet, (1999) and Leplanquais,(1996) have demonstrated that physical preparation is currently based on scientific, technological, methodological, and professional basis, thus breaking with the conventional, empirical, and occasional physical preparation of the 1950s-1960s. In their book "La Préparation Physique", they clearly highlighted the relationship between certain parameters and sports performance. They show how physical preparation is currently taking advantage, along with training and the whole

environment of athletes and performance, from scientific progress, technological innovations, new methodological approaches and, finally, from a new professional context recently emerged. The very essence of performance is the multifactoriality that characterises it. This context makes the old conception and implementation of physical preparation obsolete (Almansba, and all, 2010).

5. Conclusion

The evolution of modern sport, either in terms of technicality or athletic preparation, has necessarily led to an increasingly early specific care for young athletes for physical preparation, especially within sports classes. The main issue we wanted to tackle is the effect of muscle strengthening as a means of optimising the young judoka's physical abilities. The effect of the training program on the test results shows similar developments in all the tests.

It may be concluded that the training program allouwed an increase in the level of performance in terms of physical and technical abilities, through a transfer of the adaptations made in strength training to the sporting task. However, if there is a controversial area in the exercise science, it is the matter of the effectiveness and potential risk of weight training for young athletes.

Finally, we believe that weight training for young athletes is a good complement to physical preparation. In order to prevent damaging health, it must be technically mastered and especially very progressive. The weight training of the athlete, whatever his discipline, must respond to the intrinsic logic of his discipline, even if it is obvious that a maximum strength base is required. Weight training shall in no case be superior to other activities in order to preserve the specificity of the activity.

As we have already mentioned it, this type of experiment has methodological weaknesses in terms of controls, i.e. the management of evidence concerning the experimental treatment. It is referred to as pre-experimental, which without meeting the optimal requirements for monitoring the second variables, is nevertheless acceptable when it is impossible to organise the verification of hypotheses more rigorously. This kind of experiment goes particularly along with periment in schollont can be used in groups as they exist (classes, sholls, clubs, etc…)

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