INTERNATIONAL SEVEN JOURNAL OF HEALTH
ISSN: 2764-9415

Study of the Electrocardiographic Profile in Judokas

Estudo do Perfil Eletrocardiográfico em Judocas

DOI: 10.56238/isevjhv1n3-002
Recebimento dos originais: 03/10/2022
Aceitação para publicação: 25/10/2022

Patrícia Coelho
Sport, Health & Exercise Unit (SHERU)
Qualidade de Vida no Mundo Rural (QRural)
Instituto Politécnico de Castelo Branco, PhD

Hudson Rodrigues Rocha
Instituto Fisiologia Clínica
Montes Claros, Brasil, BSc

Francisco Rodrigues
Qualidade de Vida no Mundo Rural (QRural)
Sport, Health & Exercise Unit (SHERU)
Instituto Politécnico de Castelo Branco, PhD

ABSTRACT
Introduction:Depending on the number of hours, load and type of physical exercise, the heart of an athlete undergoes changes throughout the sports practice, since it has an increase in its work to meet the metabolic needs. These changes may result in a condition known as "athlete's heart," where physiological cardiovascular changes are seen during exercise. Some of these changes can be observed at the electrocardiographic level, and can be differentiated between pathological and non-pathological changes, according to the criteria defined for athletes, and the Seattle criteria were used in this study. Objective: It was intended to analyze the electrocardiographic profile in judokas, to observe if these athletes have or not ECG alterations, and if these alterations are physiological or pathological. It was also verified the relationship between training load and electrocardiographic alterations, and relationship between training load and ECG results. Methodology: Questionnaires and 12-lead electrocardiograms at rest were performed in a group of 20 judokas who practice judo for 1 year or more and age between 15 and 25 years. Main results: It was found that of the 20 judokas evaluated, all had sinus rhythm, 1 case with right axis deviation, 2 cases with sinus bradycardia, 1 case with sinus tachycardia, 1 case of left ventricular hypertrophy, and the remaining variables were unchanged in the ECG. Conclusion: Although a small sample was analyzed, it was found that changes in ECGs were found, but they are not statistically significant, and also are not pathological for athletes, according to the Seattle criteria.

Keywords: Judo, electrocardiogram, athlete heart.

1 INTRODUCTION

The practice of physical activity is undoubtedly one of the most efficient ways to promote health, however, the intense physical training performed by athletes, aiming at better sports performance, exposes the heart to changes in cardiac function in its morphological characteristics, resulting in a condition known as "athlete's heart”[1].

Physical exercise is characterized by a situation that modifies the body's homeostasis, because it increases the energy demand of the exercised muscles, and consequently of the whole organism [7]. Exercise can be divided into two types, where muscle strength is tested and worked on in different modalities, these are static strength (isometric) and dynamic strength (isotonic)[3]. The isometric is considered as that in which neither the muscle length nor the joint angle, on which the muscle is acting, changes, does not increase or decrease. The isotonic is any muscle action that involves movement and consists of a change in the length of the muscle fiber[4].

Depending on the number of hours, load and type of physical exercise, an athlete's heart undergoes changes throughout the sports practice since it has to increase work to meet metabolic needs, because the heart muscle is in constant work and increases the beats during sports training, which will favor the increase of cardiac mass generating ventricular hypertrophy[6]. Some of the electrocardiographic alterations found in athletes are linked to the presence of left ventricular hypertrophy, which is often related to sudden death in young athletes [5]. According to Sadaniantz and Thompson (2001) it is estimated that one sudden death occurs for every 165,000 people who practice regular physical activity per year, and 5.9% have a relative risk of suffering acute myocardial infarction within one hour after vigorous physical exercise equal to or greater than *Metabolic Equivalents* (METS). Although this risk occurs, physical exercise should not be reported as the sole responsible for sudden death, but as an adjuvant that involves a pre-existing pathology, often silent, and at a certain critical moment changes the balance in order to initiate the chain of events leading to sudden death [8].

Judo is considered a mostly static sport, and since it can be competitive, it demands a high physical performance from the athlete, with intense and prolonged activities that can lead to cardiovascular, functional and anatomical adaptations. The main characteristics of the "athlete's heart" are, on the one hand, increased cardiac output to meet the athlete's metabolic needs, increased ventricular mass, which can lead to hypertrophy, and on the other hand, decreased heart rate at rest[1].

The electrocardiogram is a test that records the electrical activity of the heart, through the placement of electrodes at specific points on the surface of the chest, being the most used complementary diagnostic test in cardiology, simple to perform and can be used in large studies due to its low cost[2].

The study of the Electrocardiographic Profile in Judokas can contribute with important information at the electrocardiographic level, through the study and analysis of a small group of athletes who are part of this specific sport. Among the benefits is the collection of information regarding the differentiation between pathological and non-pathological alterations in judo practitioners. In addition, it is possible to verify if there are electrocardiographic alterations in the selected judokas, and if there are other electrocardiographic alterations according to the number of hours of training. Finally, it is also possible to know if there is a relationship between the age of judokas and their electrocardiographic profile.

2 MATERIALS AND METHODS

A 12-lead electrocardiogram was performed at rest in dorsal decubitus position to evaluate the electrocardiographic profile of the individuals studied. The inclusion criteria were judokas with time of practice equal to or greater than 1 year and ages between 15 and 25 years.

2.1 STUDY TYPE

This is a cross-sectional observational study, carried out with a sample of judokas from the Ana Hormigo Judo School.

2.2 POPULATION AND SAMPLE

The study population consists of all judokas who agreed to participate in the study and who met the inclusion criteria. Of this only those who agreed to participate in the study and who met the inclusion criteria are part of the sample.

The total sample size is 20 individuals, with more males 13 (65%) than females 7 (35%), with an age spectrum ranging from 15 to 25 years with a standard deviation of 3.086 years. There were 2 (10%) blacks and 18 (90%) Caucasians.

2.3 STUDY PROTOCOL

A 12-lead electrocardiogram was performed to each individual at rest, in the supine position, from which variables such as heart rhythm, ventricular hypertrophy, sinus bradycardia, sinus tachycardia, respiratory sinus arrhythmia, heart rate, electrical axis, duration and amplitude of the P wave, PQ interval, duration and amplitude of the QRS and QTc interval were extracted.

To collect anthropometric and sports data and clinical history, a questionnaire was given to each participant of the study, being the same filled out by the researcher or by each judoka, where we obtained the knowledge of age, sex, weight, height, body mass index (BMI), race, years of sports practice, hours of daily training, number of days of weekly training, training load that refers to a relationship between years of training x days of training per week, if they practice another sport besides judo, and if they have cardiovascular risk factors (smoking, diabetes *mellitus*, cardiovascular history, hypercholesterolemia, hypertension).

The collection began with the completion of a questionnaire by each judoka or by the researcher after entering the room, then the judokas were referred to the performance of electrocardiogram (ECG). *Standard* recommendations(17) were followed when performing the ECG. The participants were asked to sit and rest for a period of 5 to 10 minutes before the test, then they were positioned on the table in dorsal decubitus, made the application of electrodes, applied the conductive gel in each specific point of the body such as arms, legs and chest. The peripheral electrodes were placed on the four limbs and always followed the same orientation: red electrode (clamp) on the right arm, green electrode (clamp) on the left leg, yellow electrode (clamp) on the left arm, and black electrode (clamp) on the right leg. The precordial electrodes were positioned in the following order: V1 in the fourth intercostal space on the right edge of the sternum, V2 in the fourth intercostal space on the left edge of the sternum, V3 between electrodes V2 and V4, V4 in the fifth left intercostal space on the hemiclavicular line, V5 in the fifth left intercostal space anterior axillary line, and V6 in the fifth left intercostal space on the axillary midline.

The paper recording was made at a speed of 25mm/second, with recording of leads DI, DII, DIII, aVF, aVR, aVL, V1, V2, V3, V4, V5 and V6 and a calibration of 10mm/milivolts (mv), the equipment used was an electrocardiograph model AT-101 and Schiller® brand.

To interpret the electrocardiograms (ECGs) of the judokas, the Seattle criteria were used to classify the presence of changes considered normal and pathological in athletes. Regarding the measurements of the waves and intervals of each ECG, a single measurement standard was followed for all ECGs, being the electrical axis measured in the QRS in leads DI and DII, it was considered as normal electrical axis between -30º to +90º, right deviation is between +90º and +180º, and left deviation between -30º and -90º. Heart rate was calculated taking into account the average between the HR of leads DI, DII, and V1, (for this we evaluated by the 1500 method the HR at three different times, but always in the same leads, thus obtaining a weighted average HR of the ECG). The durations and amplitudes of the P wave, PQ interval, QRS, QT, and QTc were calculated in the DII lead of all electrocardiograms.

In relation to the alterations found, the indexes used to evaluate the presence of ventricular hypertrophy were *Cornell* and *Sokolow-Lyon* modified for left ventricular hypertrophy, and for right ventricular hypertrophy the R>S wave voltage criterion was used in V1 + right axis deviation.

2.4 STATISTICAL ANALYSIS

Initially, a simple descriptive analysis was performed for the general characterization of the sample and the distribution of variables. Measures of central tendency and dispersion (mean and standard deviation) and absolute and relative prevalence (n and %) were obtained. The data collected were statistically treated using the SPSS® (*Statistic Product and Service Solution)* version 24.0 for *windows*®.

The distribution of normality was evaluated with the *shapiro-wilk* test and the statistical tests used were: the parametric t-*student* and the non paramaetric *Kendall's tau-b correlation*, both to verify if the electrocardiographic profile varies according to the years of practice, if there is a correlation between the age of the judokas and their electrocardiographic profile, and to verify if the judokas with more hours of training have more electrocardiographic alterations. It was considered significant $p < 0.05$ for all tests.

2.5 ETHICAL PRECEPTS

Before the collection of any data, the research project was submitted to the Ethics Committee of the School of Health Dr. Lopes Dias for assessment and authorization.

Throughout the research, all procedures were described and explained, all questions and doubts were clarified, and the informed consent was signed by all participants included in this study. Underage participants had informed consent signed by their parents or legal guardians.

The research team guarantees the privacy and confidentiality of all data provided and preserves the anonymity of the study participants. It also declares that there are no conflicts of interest in conducting the study and that it has respected the principles expressed in the declaration of Helsinki.

3 RESULTS

3.1 ANTHROPOMETRIC CHARACTERIZATION

Initially, a characterization of the sample was made regarding anthropometric characteristics, represented in table 1. It was verified that males had a higher body weight than females, with a minimum weight of 60 kilograms (kg) and a maximum of 102 kg, while females had a minimum weight of 47 kg and a maximum of 85 kg. As far as height is concerned, males have a minimum height of 1.69 meters (m) and a maximum of 1.83 m, while females have a minimum height of 1.52 m and a maximum of 1.70 m, with males being taller than females.

Table1: Anthropometric Characterization

	Minimum	Maximum	Average
Male Weight (kg)	60	102	71,46
Female Weight (kg)	47	85	64,28
Male Height (m)	1,69	1,83	1,74
Female Height (m)	1,52	1,70	1,61

Legend: Kilogram (Kg), Meters (m).

3.2. ELECTROCARDIOGRAPHIC CHARACTERISTICS

3.2.1 Rhythm, Rate, and Cardiac Axis

We began the analysis of the electrocardiograms by their rhythm and found that all 20 judokas included in the study showed sinus rhythm. Next, we tried to understand the heart rate of each of the electrocardiograms, thus obtaining a weighted average HR of the ECG. We found that 2 individuals had bradycardia and 1 had tachycardia; all the others had HR within normal limits, as shown in table 2.

Table 2: heart rate characterization

		n	%
Heart rate <50bpm and >30bpm	-	2	10,00%
Heart rate between 50 and 100bpm	-	17	85,00%
Heart rate above 100bpm	-	1	5,00%
Average	66,6	-	-
Standard Deviation	12,06	-	-

Legend: Beats per minute (bpm).

Next we calculated the cardiac axis for each of the judokas. From this analysis we saw that most individuals had a cardiac axis between -30º and 90º, with only 1 with a right deviation of the axis.

3.2.2 Auricular Depolarization

Following the analysis of the ECGs, the auricular depolarization was evaluated and its duration and amplitude was calculated in the DII lead. After this analysis, no electrocardiographic changes were reported. Next, the PQ interval was also analyzed in the DII lead. As for the P wave, also in this analysis no electrocardiographic alterations were seen, as shown in table 3.

Table 3: characterization of the variable auricular depolarization and PQ interval

		n	**%**
P-wave duration in milliseconds	40ms	1	5,00%
	80ms	15	75,00%
	120ms	4	20,00%
P-wave amplitude in millimeters	1mm	11	55,00%
	2mm	9	45,00%
PQ interval duration	120ms	5	25,00%
	160ms	14	70,00%
	200ms	1	5,00%

Legend: Milliseconds (ms), Millimeters (mm).

3.2.3 Ventricular depolarization and repolarization

The ventricular depolarization was evaluated by the QRS complex in its duration and amplitude in the DII derivation. Repolarization was assessed by morphology and polarity of the T wave. The results were within normal limits (asymmetric T wave with slower onset and faster end, positive in almost all leads, with polarity similar to the usual QRS), as shown in table 4.

Table 4: characterization of the variable QRS complex duration

		n	**%**
QRS duration in milliseconds	20ms	20	100,00%
Average	13,1		
Standard Deviation	3,56		

Legend: Milliseconds (MS).

In order to understand if there were alterations in the QT interval, it was evaluated from the beginning of the QRS until the end of the T wave, in the DI derivation. However, the presence of abnormalities in the QT prolongation was not verified, thus all of them were within normal limits. *Bazett's* formula (QTc= QT/√ RR) was also used to correct QT to HR, and QTc <470ms for males and <480ms for females were accepted as normal values. There was one female case with QTc greater than 480ms. In males, four cases of QTc greater than 470ms were found, with the remaining cases within normal limits, as shown in table 5.

INTERNATIONAL SEVEN
JOURNAL OF HEALTH
ISSN: 2764-9415

Table 5: characterization of the variable QT and QTc interval duration.

	Minimum	Maximum	Average	n
Male Gender QT duration	280ms	440ms	366,15	13
Female Gender QT duration	320ms	400ms	371,43	7
Male Gender QTc duration	320ms	610ms	451,67	13
Female Gender QTc duration	310ms	490ms	434,28	7

Legend: Milliseconds (ms).

3.2.4 Ventricular hypertrophies

By analyzing all the ECGs, it was possible to verify that there is only 1 case of left ventricular hypertrophy by the modified *Sokolow-Lyon* voltage criterion and the *Cornell* criterion. This individual was black and 17 years old.

3.3 CARDIOVASCULAR RISK FACTORS

Considering the cardiovascular risk factors, it was possible to verify through the questionnaire whether some of the athletes had cardiovascular risk factors such as hypertension, diabetes, hypercholesterolemia, high body mass index (BMI), family history of cardiovascular disease, and smoking. None of the athletes were smokers, had no hypercholesterolemia, hypertension did not have or could not answer, BMI verified overweight in four athletes (BMI>25kg/m2), and 2 cases with grade 1 obesity (BMI >30kg/m2). The presence of one athlete with diabetes and several with family history of cardiovascular disease was verified, as we can see in the data of table 6.

Table 6: Cardiovascular Risk Factors

	n	%
Cardiovascular disease in the family	8	40,00%
Athletes with Diabetes	1	5,00%
BMI between 25 and 30kg/m²	4	20,00%
BMI between 30 and 35kg/m²	2	10,00%
No risk factors	5	25,00%

Legend: Body Mass Index (BMI), Kilogram per square meter (kg/m^2).

3.4. BEHAVIOR OF THE ELECTROCARDIOGRAPHIC PROFILE

3.4.1. Relationship between Training Load and Electrocardiographic Changes

A comparative analysis was made between the mean value of the training load, years of practice in judo, and age of the athletes with the electrocardiographic alterations found, thus it was verified that these variables have no statistically significant relationship, as we can see in table 7, where the *p value* is greater than 0.05.

Table 7: Electrocardiographic Profile Behavior

	Electrocardiographic Changes	Average	Standard Deviation	p value
Training load	Yes No	24,00 25,07	13,94 15,26	0,885
Years of Judo Practice	Yes No	8,00 8,93	4,64 5,28	0,714
Age of Athletes	Yes No	18,33 20,00	1,63 3,46	0,280

3.4.2. Relationship between Training Load and Electrocardiogram Results

To analyze the existence of the relationship between the training load and the electrocardiogram results, *Kendall's tau-b* correlation was used, thus assessing the relationship between training load and athletes' age, mean HR, P wave duration, P wave amplitude, PQ interval duration, QRS amplitude, and QTc duration. It was verified that there is no statistical relationship in the variables mentioned, as shown in table 8.

Table 8: Relationship between Training Load and Electrocardiogram Results

	P *value*	*tau-b*
Training Load and Age of the Athletes	0,549	0,105
Training Load and Average HR	0,599	0,089
Training Load and P-wave Duration	0,222	0,237
Training Load and P-wave Amplitude	0,760	0,060
Training Load and PQ Interval Duration	0,249	0,223
Training Load and QRS Amplitude	0,593	0,093
Training Load and QTc Duration	0,576	0,094

Legend: Heart Rate (HR).

4 DISCUSSION

The athlete is recognized by society as a strong and healthy individual. In the last decades there have been several cases of sudden death among them, increasing the interest of physicians and the general population for information about this unexpected phenomenon(11). When we look for physical exercise we think of preventive aspects for diseases, especially heart-related diseases.

But if on the one hand there is a great preventive benefit in the relationship between exercising and sudden death, there is also the risk of dying during or after physical activity(12).

Sudden death is defined as a fatal event that occurs abruptly in individuals considered previously healthy within 24 hours after the onset of symptoms(11). It is estimated that one sudden death occurs for every 165,000 people who practice regular physical activity per year(11). According to the Portuguese Cardiology Foundation, sudden death of cardiac origin corresponds to 20% of all deaths, with an incidence of about one for every 1000 people per year (13). It should be noted that physical exercise should not be pronounced as the only responsible for sudden death, but as an adjuvant where there is already a pre-existing disease, often silent, and in a moment that occurs changes in balance starts a chain of events that results in sudden death(11).

he practice of physical activity is undoubtedly one of the most efficient ways to promote health; however, the intense physical training performed by athletes who seek a better sport performance exposes the heart to changes in cardiac function and morphological characteristics, resulting in a condition known as "athlete's heart"(1). In the search for better performance, the athlete exposes the heart to intense overload over the years, and with this frequent exposure, it ends up resulting in alterations in the cardiac automatism, such as resting bradycardia, alteration in the auriculoventricular conduction, depolarization and ventricular repolarization(14).

Judo is considered a mostly static sport, and since it can be competitive, it requires a high physical performance from the athlete, with intensive and prolonged training can lead to cardiovascular, functional and anatomical adaptations. Thus, electrocardiographic alterations may occur(1).

All judokas who participated in our study have more than 1 year in the practice of judo, and train at least 3 times a week, when analyzing the results found, it is possible to see that in relation to the characterization of rhythm, HR and cardiac axis, it was found 2 cases with sinus bradycardia, 1 case with sinus tachycardia, and 1 case with right axis deviation. Although these 2 cases of bradycardia were found, they are considered normal for athletes, for having a HR above 30bpm, being considered abnormal for athletes a HR < 30bpm according to the Seattle criteria. A study conducted by Japy Filho *et al* (2015) with a group of 14 judokas, 3 cases of sinus bradycardia were observed, which we can deduce is a frequent alteration in judokas, even in small samples(21). Regarding the isolated case of sinus tachycardia, it is also considered normal by the Seattle criteria, being considered abnormal if it were ventricular tachycardia, which is not the case.

When analyzing the results about QTc, we observed the presence of 5 alterations, 1 case of QTc>480ms in the female sex, whereas in the male sex 3 cases of QTc>470ms were found.

Although these athletes present increased QTc, we cannot say that this is long QT syndrome (LQTS), because this syndrome is a congenital, autosomal recessive disease, where mutations are found in the genes that encode the cardiac ion channels (sodium and potassium)[(15)]. Thus, a more thorough diagnosis would have to be made for these athletes, such as clinical history and family history to relate to the electrocardiographic findings, as well as genetic testing. Even if only the QTc interval is evaluated and it is increased, it can be normal in up to 5-6% of the patients[(15)]. So we can only say that we found 4 cases of long QT after heart rate correction.

When the existence of ventricular hypertrophy, only one case of left ventricular hypertrophy (LVH) was observed, and in this athlete no other changes were found in the ECG. When analyzing the questionnaire of this participant, it was found that he practices another physical activity besides judo, which may have contributed to ventricular overload. Moreover, an evaluation by echocardiography is necessary for a better diagnosis of ventricular hypertrophy, and this alteration is considered physiological for athletes, in the absence of other criteria, such as left atrium dilation, left axis deviation, ST segment depression, pathological T or Q wave inversion, according to the "Seattle Criteria"[(18).]. we cannot say that this is hypertrophic myocardiopathy, which is an autosomal dominant genetic disease[(18)], characterized by left ventricular hypertrophy in the absence of other causes that can lead to increased myocardial mass[(14)]. Therefore, a more detailed evaluation is necessary in order not to confuse physiological LVH (Athlete's Heart) caused by exercise with pathological LVH, also known as Hypertrophic Myocardiopathy. One of the differences between these two is in the diastolic function, where in the athlete is normal and in Hypertrophic Myocardiopathy is deteriorated with the evolution of the disease[(14)]. ince this is an athlete and with no other significant evidence, we can say that this alteration is related to the "athlete's heart", but to be more precise, an echocardiogram evaluation would have to be performed.

Teixeira Cristina *et al* (2011), observed in a study conducted with 40 male judoka athletes, aged between 18 and 25 years, with at least three years of training, which had as results, ECO analysis showing that of the 40 athletes who underwent evaluation, 4 showed concentric hypertrophy of the left ventricle. But none of the athletes presented signs that could characterize Hypertrophic Myocardiopathy[(1)]. As we can see in this study by Teixeira Cristina et al (2011), although the presence of LVH was found in judokas, none of these cases was characterized as Hypertrophic Cardiomyopathy, which leads us to consider that not every change caused by physical exertion is malignant.

INTERNATIONAL SEVEN JOURNAL OF HEALTH
ISSN: 2764-9415

As for the cardiovascular risk factors evaluated through a questionnaire, not many significant cases were observed. One case of athlete with diabetes, 6 cases of athletes with BMI >30kg/m2, 4 of these 6 athletes with overweight and 2 with grade 1 obesity were found. Despite this, they are not impaired in their sports performance, since judo is competed by weight category[(19)], and because they have a good training load, supposedly they are not at risk of developing other risk factors as a consequence of being overweight. We also found 8 cases of athletes with family history of cardiovascular disease, but without great significance for judokas.

We evaluated the relationship between training load, which is characterized by the years of practice in judo multiplied by the days of training per week, with the existence or not of electrocardiographic changes, to try to understand if those who train longer and more times a week have more changes in the ECG, but this relationship was not statistically significant with p *value*=0,885. In this way we cannot say that in this sample the judokas who have been training longer will have more alterations in the electrocardiogram in a significant way. We also evaluated the relationship between years of judo practice with the existence or not of electrocardiographic alterations, to verify if the athletes who have practiced judo for more years have more changes in the ECG, however, this relationship was also not statistically significant, with p *value*=0,714.

As for the relationship between the age of the athletes and the electrocardiographic alterations, it was intended to understand if the older athletes had more alterations in the ECG. However, this relationship was not statistically significant with p *value*= 0,280. Therefore we can see that age in this group of athletes did not influence the existence or not of electrocardiographic changes.

Finally, the relationship between training load and the results obtained in electrocardiograms was evaluated. This relationship intended to thoroughly evaluate whether there was a relationship between training load and the athletes' age, HR mean, P wave duration, P wave amplitude, PQ interval duration, QRS amplitude, and QTc duration. However, these relationships were not statistically significant. The fact that the study sample was small may present as a limitation for the results found in these relationships. Farahani Ali *et al* (2009), demonstrated in a study of 63 Iranian wrestlers, males aged 37 to 78 years, that they obtained as results in the 12-lead electrocardiogram, no changes in 66.5%, with the most found ischemic changes in 13.6%, which includes pathological Q wave in 3.4% and inverted T wave in 10.2%. There were premature auricle contractions and ventricular extrasystoles in 11.4%, abnormal axis in 3.4%, first-degree auricle ventricular block (BAV) in 3.4%, abnormal rhythm in 1.7% of the cases[(9)]. We can observe that in this study by *Farahani Ali et al* (2009), the athletes are older than our study, and even though changes were found in the ECGs, they were present in the minority of Iranian fighters, which raises the question whether the very intense training load can lead to more serious changes to the heart, or the older age of the athletes contributes more to the emergence of changes regardless of their training load. A new study with a larger number of athletes and with several judo clubs could be done, with more details of the type of training, because each club follows different training to have better sport performance, and this may influence the electrocardiographic findings. Judging that we are facing athletes, and they are in constant physical work, both in competitions and in training, one of the best ways to assess the electrocardiographic profile both at rest and in effort, would be through stress test, with this test we would have more information at the electrocardiographic level of athletes, at the peak of effort, it could be detected changes that only appear in effort, and assess whether the athlete is in good condition to perform the sport without health risk.

5 CONCLUSION

Although a small sample was analyzed, it was found that changes in the ECGs were found, which, however, are not statistically significant, and also not pathological for athletes, according to the Seattle criteria. Moreover, no serious risk factors were observed that limit athletes to practice judo, it is worth mentioning, however, only one case of a diabetic athlete, and for being in a sport has great benefits to her health. Due to the potentiation of insulin in skeletal muscle, and also the exercise helps in glycemic control, it increases insulin sensitivity[20].

Thus, we can conclude that the electrocardiographic profile of judokas in this sample showed no pathological changes, doing sport is good for you.

REFERENCES

Teixeira cristina,junior jairo,fernandes roberta, et al. Identificação da hipertrofia cardíaca induzida pelo treinamento de judô. 2011 unievangélica-centro universitário de anápolis-go-br.

Diretriz de interpretação de eletrocardiograma de repouso.*arq. Bras. Cardiol.*[online]. 2003, vol.80, suppl.2, pp. 1-18. Issn 0066-782x.

Macaluso, a.; de vito, g. (2004). Muscle strength, power and adaptations to resistance training in older people. *Eur j appl physiol* . 91: 450-472.

Dirix a, knuttgen hg, tittel k. The olympic book of sports medicine. 2nd ed. Oxford: blackwell scientific publications; 1991.

Wasfy,et al.ecg findings in competitive rowers: normative data and the prevalence of abnormalities using contemporary screening recommendations.*br j sports med* 2014 0 (2014).

Farahani av, asheri h, alipour s, amirbeigloo a. Pre-participation cardiovascular screening of elderly wrestlers. Asian journal of sports medicine 2010;1(1):29-34.

Brum, patrícia chakur, et al. Adaptações agudas e crônicas do exercício físico no sistema cardiovascular. *Rev paul educ fís*, 2004, 18.1: 21-31.

Bronzatto, h. A., r. P. Da silva, and r. Stein. "morte súbita relacionada ao exercício." revista brasileira de medicina do esporte 7.5 (2001): 163-169.

Teixeira c, et al. Identification of cardiac hypertrophy induced by training judo. Rev jopef. 2011;11:02-10.

Farahani ali, et al. Pre-participation cardiovascular screening of elderly wrestlers. Asian j sports med. 2010 mar;1(nol 1):29-34.

Bergamaschi jp, matsudo s, matsudo v. Morte súbita em atletas jovens: causas e condutas. Rev bras ci e mov. 2007;15(3): 123-135.

Bronzatto, h. A., da silva, r. P., & stein, r. (2001). Morte súbita relacionada ao exercício. Revista brasileira de medicina do esporte, 7(5), 163-169.

Gomes joão, a morte súbita cardíaca. Disponível em <http://www.fpcardiologia.pt/a-morte-subita-cardiaca/>. Acesso em 18 de maio, 2017.

Manço, adelle cristina ferreira; figueiredo, denise nicácio; navarro, francisco. Detecção de hipertrofia ventricular esquerda fisiológica em atletas judocas através do eco-dippler. Revista brasileira de prescrição e fisiologia do exercício (rbpfex), 2008, 2.9: 9.

Camanho, luiz eduardo montenegro, et al. "preditores eletrocardiográficos de síncope e de morte súbita em portadores de síndrome do qt longo congênito." revista da socerj 20 (2007): 91-96.

Michael h. Gollob, md, calum j. Redpath, mbchb, phd, jason d. Roberts, md. The short qt syndrome - proposed diagnostic criteria. J am coll cardiol 2011; 57:802-12.

Guimarães, jorge ilha; moffa, paulo j.; uchida, augusto h. Normatização dos equipamentos e técnicas para a realização de exames de eletrocardiografia e eletrocardiografia de alta resolução. Arquivos brasileiros de cardiologia, 2003, 80: 572-578.

Oliveira m. Cardiomiopatia hipertrófica, atividade física e morte súbita. Revista brasileira de medicina do esporte. 2002;8(1):20-25.

Preux c. Perfil da aptidão física de praticantes de judô do centro universitário do leste de minas gerais – unilestemg. Revista digital de educação fisica. 2006;1.

Crepaldi, sandro; savall, paulo javier; fiamoncini, rafaela liberali. Diabetes mellitus e exercício físico. Rev. Digital, 2005, 10: 88.

Filho1–sp, japy angelini oliveira, et al. Paralímpicos judocas e coração de atleta, rev derc.2015;21(1):15.