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SEXUAL FEATURES OF THE TIME CHARTS OF THE ELECTROCARDIOGRAM IN YOUNG PEOPLE WHO ARE ENGAGED AND NOT ENGAGED IN SPORTS

Summary. *The article specifies the features of electrocardiographic indices in young people depending on gender and sport. It is*

established that in young sportsmen and volleyball players the duration of the P wave is significantly greater than in the girls of similar groups, the duration of the PQ interval for volleyball players is significantly greater than for volleyball players, the duration of the QRS interval for athletes is significantly greater than in athletics, for young athletes and volleyball players Of the QT interval is significantly less than in the girls of the corresponding groups. Such data can be used as a theoretical basis for the physiological functioning of the heart, and also find their application in medical practice to explain pathological disorders in athletes during long training.

Key words: *electrocardiography, juvenile age, athletics, volleyball, not athletes.*

Introduction

Sport - a special kind of activity, combined with regular high (often extreme) physical and emotional exertion, increased demands on the health of athletes. Leading chain, which limits the degree of athlete physical performance is the cardiovascular system condition (CVS) [1, 2, 3]. In recent decades, accumulated rich experience in instrumental assessment of the functional state of the CVS using the assessment of systolic and diastolic myocardial function, electrophysiological aspects of heart work, condition of endothelial function, systemic autonomic reactions as temporal and spectral heart rate variability [4, 5, 6]. The European experience, which formed the basis for the recommendations of the International Olympic Committee, includes a careful history and physical and electrocardiography (ECG) study with the indicating of abnormal heart murmurs, changes in blood pressure, ECG criteria of hypertrophy of the heart chambers, signs of myocardial ischemia, shortening or lengthening intervals QT and PR, ventricular and supraventricular tachycardia [7, 8, 9]. Features of CVS determine the level of possible sports achievements in any kind of sport, so the study of ECG parameters is actual and does not lose practical significance. The purpose of our study was to establish sex differences in time ECG scores between athletes of different sports.

Materials and methods

We have examined athletes who at least three years involved in volleyball and athletics s, and a high level of sports skills (from the first adult grade to masters of sports). Of these, 127 practically healthy girls who were not engaged in sports and 73 sportsmen (46 volleyball players and 27 athletes) aged 16-20 years. And also 94 non-sports boys and 115 sportsmen (37 volleyball players and 78 athletes) aged 17-21. We conducted an ECG study using a computer diagnostic system that provides simultaneous recording of the electrocardiogram, phonocardiography and blood pressure measurements. The analysis of the results was carried out using the STATISTICA 5.5 program (National Pirogov Memorial Medical University, Vinnytsya, SRC, licensed number AXXR910A374605FA). The reliability of the difference in values between the independent quantitative values was determined with the normal distribution of the t-criterion of the Student, and in other cases, using the U-criterion of Man-Whitney.

Results. Discussion

Analyzing the ECG temporal indicators in juvenile

persons with different levels of physical activity, we decided to stay on the II standard lead. It is established that the duration of the wave P in young volleyball players is statistically significantly higher than that of those who are not engaged in sports. Girls engaged and not engaged in sports, this indicator did not have statistically significant differences. At the young athletes ($p < 0,05$) and volleyball players ($p < 0,01$), this indicator is significantly higher than that of girls of the same types of sports (Table 1).

The duration of the PQ interval in volleyball players also has the highest values compared to non-athletes ($p < 0,05$) and athletes ($p < 0,01$). In female subjects of different groups, this index of electrical activity of the heart did not have significant differences (in all cases, $p > 0,05$). The duration of the interval PQ only in boys volleyball significantly higher than in girls volleyball ($p < 0,01$). Indicator of QRS interval duration in young athletes and not athletes had significant differences. We have found that this indicator is only volleyball players girls more than in athletes girls ($p < 0,01$). Of all the groups of comparison, only in young men of athletes, this indicator is statistically significantly more significant than in athletes girls ($p < 0,05$). When comparing the QT interval duration between groups of boys, no statistically significant differences were found. It is established that in athletes girls the index of the study tends to increase, compared to non-sportsmen ($p = 0,065$). At the young men athletes and volleyball players, this indicator is significantly lower than that of girls of the respective groups ($p < 0,01$ in both cases) (see Table 1).

We have been researching some options of integrated electrical activity of the heart, including angles electrical axes QRS and P, the internal deviation time of the right and left ventricles, corrected interval of QT, which is determined by the Bazet formula and duration of the interval RR (Table 2).

The inclination index of the QRS electric axis has no sexual differences. Indicator electrical tilt axis P males in different groups (non sportsmen ($p < 0.001$), athletes ($p < 0,01$) and volleyball players boys ($p < 0,01$)) had higher values than girls in respective groups.

The internal rejection of the right ventricle has bigger values in the group of boys that are not involved in sports ($p < 0.001$), total group of athletes ($p < 0,05$) and volleyball players boys ($p < 0,01$) than in girls of similar groups.

In the study of the time of the internal deviation of the left ventricle, no significant differences and trends have been established in all groups of men and women with different levels of physical activity.

In the study of QT interval established phenomenon

Table 1. Time-based electrocardiographic indices in II standard lead in boys and girls engaged and not engaged in sports (ms).

Indicator	Sport activities	Young men	Girls	p
		M±σ	M±σ	
Wave P	Not sportsmen	81,12±1,320	80,63±1,040	>0,05
	Sportsmen	83,54±1,040	79,80±1,370	<0,05
	Volleyball	87,03±13,06	78,91±11,41	<0,01
	Athletics	83,10±13,88	79,33±14,22	>0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	<0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	>0,05		
PQ interval	Not sportsmen	147,2±2,600	142,2±1,800	>0,05
	Sportsmen	148,0±2,200	142,2±2,300	>0,05
	Volleyball	164,5±43,20	143,1±17,70	<0,01
	Athletics	144,9±20,70	141,9±26,70	>0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	<0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	<0,01	>0,05		
Complex QRS	Not sportsmen	81,35±1,090	80,60±0,890	>0,05
	Sportsmen	82,20±0,820	80,30±1,130	>0,05
	Volleyball	80,54±11,63	83,22±10,17	>0,05
	Athletics	82,28±10,39	76,96±9,140	<0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	<0,01		
QT interval	Not sportsmen	365,4±2,400	366,9±2,400	>0,05
	Sportsmen	364,3±2,100	374,2±3,200	<0,01
	Volleyball	359,4±27,60	376,2±28,50	<0,01
	Athletics	368,1±29,10	372,8±29,80	>0,05
	p ₁₋₂	>0,05	=0,065	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	>0,05		

Table 2. Integral indicators for boys and girls engaged and not engaged in sports.

Indicator	Sport activities	Young men	Girls	p
		M±σ	M±σ	
Electric axle QRS (°)	Not sportsmen	66,28±3,090	66,32±2,37	>0,05
	Sportsmen	64,64±2,280	69,99±2,60	>0,05
	Volleyball	66,62±3,740	69,41±26,56	>0,05
	Athletics	66,81±32,13	70,74±19,70	>0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	<0,05		
Electric axle P (°)	Not sportsmen	87,81±1,170	79,97±1,020	<0,001
	Sportsmen	86,26±0,980	82,43±1,170	<0,05
	Volleyball	89,95±12,57	82,22±9,730	<0,01
	Athletics	85,36±13,56	81,48±11,17	>0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	>0,05		
Time of internal deviation of the right ventricle (ms)	Not sportsmen	26,41±0,840	22,88±0,450	<0,001
	Sportsmen	25,79±0,460	23,80±0,800	<0,05
	Volleyball	25,46±4,850	22,87±6,890	<0,01
	Athletics	25,36±5,260	25,11±7,590	>0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	>0,05		
Time of internal deviation of the left ventricle (ms)	Not sportsmen	39,81±0,640	39,04±0,520	>0,05
	Sportsmen	40,43±0,430	40,18±0,600	>0,05
	Volleyball	40,22±6,120	40,39±5,840	>0,05
	Athletics	40,46±5,410	40,15±4,960	>0,05
	p ₁₋₂	>0,05	>0,05	
	p ₁₋₃	>0,05	>0,05	
	p ₁₋₄	>0,05	>0,05	
	p ₂₋₃	>0,05	>0,05	
	p ₂₋₄	>0,05	>0,05	
p ₃₋₄	>0,05	>0,05		

of sexual dimorphism revealed that this figure was significantly higher in the groups of girls not involved in sports, total group of athletes, volleyball players and

athletes (p<0.001 in all cases) than in similar levels of physical activity by groups of youths.

Found that the rate of RR interval statistically significantly

Continuation of table 2.

Indicator	Sport activities	Young men	Girls	p
		M±σ	M±σ	
Adjusted QT interval (s)	Not sportsmen	0,372±0,002	0,391±0,002	<0,001
	Sportsmen	0,371±0,001	0,392±0,002	<0,001
	Volleyball	0,374±0,016	0,392±0,020	<0,001
	Athletics	0,370±0,022	0,392±0,020	<0,001
	P ₁₋₂	>0,05	>0,05	
	P ₁₋₃	>0,05	>0,05	
	P ₁₋₄	>0,05	>0,05	
	P ₂₋₃	>0,05	>0,05	
	P ₂₋₄	>0,05	>0,05	
	P ₃₋₄	>0,05	>0,05	
Interval RR (s)	Not sportsmen	1009±16,00	918,9±11,60	<0,001
	Sportsmen	1045±13,00	980,4±20,40	<0,01
	Volleyball	1003±155,0	973,9±166,3	>0,05
	Athletics	1084±185,0	974,2±196,8	<0,01
	P ₁₋₂	>0,05	>0,05	
	P ₁₋₃	>0,05	<0,05	
	P ₁₋₄	<0,01	>0,05	
	P ₂₋₃	>0,05	>0,05	
	P ₂₋₄	>0,05	>0,05	
	P ₃₋₄	<0,05	>0,05	

higher in boys not involved in sports ($p<0.001$), athletes ($p<0.01$) and athletes ($p<0.01$) than girls respective groups (see Table 2).

Conclusions and perspectives of further developments

1. In the youth athletes and volleyball players, the duration of the wave P is significantly higher than that of girls of similar groups.

2. The duration of the interval PQ in volleyball players boys is significantly greater than that of volleyball players girls.

3. The length of the interval QRS in athletes boys is significantly greater than athlete girls.

4. In the youth of athletes and volleyball players, the duration of the interval QT is significantly lower than that of the girls of the respective groups.

Prospects for further development consist in the use of the obtained data in diagnosing the state of the cardiovascular system in young people of different sexes and athletic direction. Such data can be used as a theoretical basis for the physiological functioning of the heart, and will also find their use in medical practice to explain pathological disorders in athletes during long training. Based on these indicators, it is possible to adjust the level and intensity of training programs for male and female youths.

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ПОЛОВЫЕ ОСОБЕННОСТИ ВРЕМЕННЫХ ПОКАЗАТЕЛЕЙ ЭЛЕКТРОКАРДИОГРАММЫ У ЛИЦ ЮНОШЕСКОГО ВОЗРАСТА, КОТОРЫЕ ЗАНИМАЮТСЯ И НЕ ЗАНИМАЮТСЯ СПОРТОМ

Резюме. В статье установлены особенности электрокардиографических показателей у лиц юношеского возраста в зависимости от пола и вида спорта. Установлено, что у юношей спортсменов и волейболистов продолжительность зубца P достоверно больше, чем у девушек аналогичных групп, продолжительность интервала PQ у волейболистов достоверно больше, чем у волейболисток, продолжительность интервала QRS у легкоатлетов значимо больше, чем в легкоатлеток, у юношей спортсменов и волейболистов продолжительность интервала QT достоверно меньше, чем у девушек соответствующих групп. Такие данные могут быть использованы в качестве теоретического обоснования физиологического функционирования сердца, а также найдут свое применение в медицинской практике для объяснения патологических нарушений у спортсменов при длительных тренировках.

Ключевые слова: электрокардиография, юношеский возраст, легкая атлетика, волейбол, не спортсмены.

Кириченко Ю.В., Сарафинюк Л.А., Ліщишин Г.В., Іванова Є.І., Романенко О.І.

СТАТЕВІ ОСОБЛИВОСТІ ЧАСОВИХ ПОКАЗНИКІВ ЕЛЕКТРОКАРДІОГРАМИ У ОСІБ ЮНАЦЬКОГО ВІКУ, ЯКІ ЗАЙМАЮТЬСЯ ТА НЕ ЗАЙМАЮТЬСЯ СПОРТОМ

Резюме. У статті визначені особливості електрокардіографічних показників у осіб юнацького віку в залежності від статі та виду спорту. Встановлено, що у юнаків спортсменів і волейболістів тривалість зубця Р достовірно більша, ніж у дівчат аналогічних груп, тривалість інтервалу PQ у волейболістів достовірно більша, ніж у волейболісток, тривалість інтервалу QRS у легкоатлетів значуще більша, ніж у легкоатлеток, в юнаків спортсменів і волейболістів тривалість інтервалу QT достовірно менша, ніж у дівчат відповідних груп. Такі дані можуть бути використані в якості теоретичного обґрунтування фізіологічного функціонування серця, а також знайдуть своє використання в медичній практиці для пояснення патологічних порушень у спортсменів при тривалих тренуваннях.

Ключові слова: електрокардіографія, юнацький вік, легка атлетика, волейбол, не спортсмени.

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