

department for a 1-year period.

Further analysis of the ECG changes showed that the incidence of these changes increases with age. The length of the period after ceasing athletic activities has an insignificant effect on the incidence of ECG changes. All ex-sportsmen had given up athletic training suddenly.

#### SOME PECULIARITIES OF THE PULSE RATE RECOVERY AFTER HIGH INTENSITY PHYSICAL EXERCISES

D. Dobrev - Bulgaria

The follow up of the pulse rate changes during physical exercise or during the recovery period is widely applied in sports medical practice. On this basis a number of methods, tests and formulas have been offered for estimating the conditioning level of athletes and the effect of stress on the organism. In these cases it is essential to be familiar with the dynamics of pulse rate recovery which runs a course after the type of the exponential curve - with an initial stage of rapid, and a subsequent stage of slow, gradual restoration of the initial level termed by Karpmann, 1964 as stages of early and true restitution).

In earlier studies (D. Dobrev, and D. Stefanova, 1967, D. Dobrev, 1969), carried out on outstanding swimmers after exposure to high intensity exercises during swimming, the conclusion was reached, that with the progress of training the strongly increased pulse rate after the loading, recovers during the first stage much more quickly and to a higher degree compared to its recovery during the earlier stages of training (Picture 1). At the same time in some of the investigated subjects we observed an abrupt and consi-

derable pulse rate decrease reaching its initial prestress values (negative pulse stage). In these cases, especially when the exercises were carried out with an increased intensity immediately after the abrupt pulse rate decrease we observed arrhythmia, sometimes very strongly expressed, and usually recorded within 2 or 3 minutes. It was hardly after it subsided, when the pulse rate was at a higher level than its initial decrease, that the second stage of slow, gradual recovery began (Picture 2).

It should be borne in mind that the persons in whom arrhythmia was observed, were clinically healthy and were in their best athletic shape. At the same time, the electrocardiogram recorded during the recovery indicated that the arrhythmic signs had a clear-cut sinus character.

It is long since known from literature reports (see H. Herzheimer, 1933 et al.) that in trained persons at rest the vagus tone is increased. Presumably, the increased vagus effect as the result of training which manifests itself especially strongly immediately after the high intensity stress ceases, has led to a considerable decrease in pulse rate, in some cases to a level not adequate to the still high for the moment circulatory requirements of the organism, especially in terms of oxygen tissue supply. The arrhythmic phenomena occur against the background of the strongly expressed vagus influence and as a result of development compensatory reactions for a new increase in metabolic activity. We suppose that its duration and cessation reflect the moment when under the influence of the compensatory mechanisms, the abnormally increased vagus effect is eliminated, and a new increase in pulse rate is reached, this time adequate to the still elevated demands of the blood circulation and oxygen tissue supply.

In support of the concept about the strongly pronounced vagus

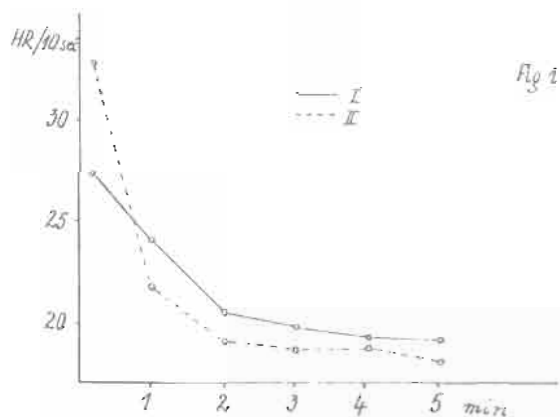


Fig. 1. Pulse rate recovery at different training level  
 I - during the preparatory period  
 II - during the basic period

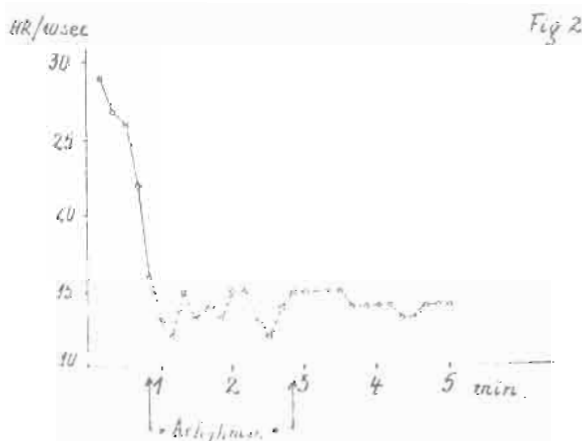


Fig. 2 Schematic curve of the pulse rate recovery of Ju.R. after an intensive physical loading (with an initial stage of rapid recovery, period of arrhythmia, and a stage of slow, gradual recovery).

influence immediately after the cessation of stress we can mention the established by us (D. Dobrev, 1969) in a number of cases pulse rate decrease in the first recovery stage through an unsteady and abrupt transition from a higher to a lower contraction rhythm of cardiac activity. This was particularly evident during the periods of increased training level of the investigated athletes.

Furthermore, phenomena of inadequate decrease in pulse rate with occasionally ensuing considerable increase, have been described reflex reactions in the pulse after an unsupported conditioned signal for changing the body position from standing into lying without the change itself being carried out.

During the second stage of slow, gradual pulse rate recovery, according to us a decisive influence on its duration and character is exerted, first of all by the capabilities of the organism to meet the still high oxygen requirements of the tissues and by the compensatory possibilities of the cardiovascular system. In connection with this we can mention that during investigations carried out by us under high mountain conditions (i.e. at a lowered atmospheric pressure and a difficult oxygen supply) in most of the examined subjects a considerable delay of the recovery in the second stage was observed, while the first stage of recovery proceeded according to their training level - curve.

On the basis of the above data it is assumed that in the cases when pulse rate recovery after high intensity exercises is used as an index for estimating the athlete's training level, the first stage or rapid recovery should be interpreted as an expression of the manifested compensatory vagus possibilities in the competitor to restore the cardiac activity to its initial level immediately after the cessation of loading. At the same time the second stage of slow, gradual recovery should be related to the capabilities

of the organism for complete oxygen tissue supply during that period.

## CHRONIC OVERSTRAIN OF THE HEART IN FOOTBALL PLAYERS

L. Tomov - Bulgaria

Repolarization changes in the athlete's electrocardiogram pose important problems in sports cardiology. The alterations occur usually as a result of large and intensive physical loads exceeding the functional possibilities of the organism. There is a strong dependence between the degree of training stresses and the disturbances of the repolarization -  $r = 0.948$  /after Iv. Georgiev/. Predisposing factors for the appearance of disturbances in the bio-electrical activity of the myocardium are the focal infections, concomitant mental stress, breach of the sports regime and participation in workouts or competitions in diseased condition. Some authors emphasize also the extensive use of corticosteroids and alimentary mixtures rich in sodium and poor in potassium. Numerous experimental and clinical observations confirm the role of some emotional overstrains of stress type.

Repolarization changes are usually a sign of dystrophic myocardium alterations as a result of upsetting the hormonal equilibrium, destructive alterations in the ultrastructure of cells, mainly of mitochondria, disorder of carbohydrate metabolism, as well as a sharp elevation of parasympathetic tone. A decrease in the contractile capacity of myocardium is also observed in overstrain of the heart. The changes in the phase analysis showing some regularity depending on the stage of the overstrain are also noteworthy. Similar alterations in the phase analysis in the 1st stage

after Dembeu can be considered as a compensatory reaction, in stage III they point to a decrease in the functional reserve, and are assumed as a sign of real hypodynamia of the myocardium.

In spite of the general tendency towards intensification of the electrocardiographic variations, we have been impressed by some specific features of the cases observed.

During the last seven years we have registered and observed 23 cases with chronic overstrain of the heart from three top list soccer teams. The continuing ECG monitoring at determined stages of the training process enabled us to diagnose comparatively early the variations and, in addition, to draw some conclusions on the character and extent of the training loads.

The age distribution was the following: 2 at the age to 20 years, 15 - from 21-22 years, and 6 - 23-25 years. Besides the young age, the football players have a short history as participants in the national League - 16 of them (70%) are new competitors having passed from junior teams or from the lower league, 4 have athletic training service from 1 to 3 years, and only 3 - more than three years /table I/. Evidently, the lack of individual approach to the learning and training process has led to ECG deviations among novices; here the training stresses turned out to be inadequate for the possibilities of the competitors in whom the necessary structural and functional adaptation changes allowing the exposure to hard training had not yet occurred. In addition, the competitors with rather low qualification prevailed - 25/87% were first class, and only 3 - candidate sports masters.

During the first recording, the impression is that the highest number of the cases (21.5%) were studied during the training period, and only 2/9% - during the competitive season. These data

ly after the training camps - 11 cases /48% were registered, and after the winter camps - 6 cases /30% which indicates that the training in middle mountain conditions is not complied with the functional possibilities of the football players, especially of the younger ones and those with a shorter training service in the National League /A/. In addition, the camps are organized immediately after the transitory period with a weekly work load of 20-26 hours which points to a forced preparation of the players in this stage /table 2/.

Regarding the etiology of the electrocardiographic variations, 13 had chronic tonsillitis /57% and 2 - deviations in the stomatological status; the sports regimen was systematically violated by one player.

No relation was established with acute infections or concomitant mental exertion.

Only in 5 cases /22% subjective complaints were established - shooting pains and oppression in the cardiac region and apathy to training, anorexia and faintness - in 4 competitors.

The physical examination did not reveal any pathological variations.

After the primary registration the cases were distributed in stages according to Sembeau, as follows: 12 /52% - I stage, 10 /44% - II stage, and 1 /4% - III stage.

In terms of the stages of overstrain the high percentage in stages II and III shows that it is necessary to carry out more often electrocardiographic examination of top ranking football players in order to improve the early diagnosis of the variations.

According to localization, the cases were distributed as follows: septal region - 5 cases /22%, anteroseptal - 3 /13%, antero-lateral - 12 /52% and total - 3 cases /13%.

Concomitant electrocardiographic variations were recorded in 5 cases. Two had single chamber extrasystoles at rest, one of them after loading as well, 1 had single supernodal extrasystole at rest, one - a mid-nodal rhythm, and another one - atrioventricular block 1st degree.

After physical exercises, there are no changes in the primary electrocardiographic finding in 6 persons /26%, impairment was observed in 8 /35%, slight improvement - in 7 /30%, and a paradoxical reaction with almost complete disappearance of repolarization changes was established in 2 /9%.

The dynamic follow-up of the series shows that 19 cases /82% have improved or normalized repolarization changes, which relapse after starting activities included in the training program, 2 are without alteration and 2 show permanently normalized ECG variations. All focal infections were cured by resorting to a treatment with a complex of vitamins, penanginum, calgam, potassium orotate, and recently - phosphobion and cocarboxylase. The rehabilitation period lasted one month on the average which is extremely insufficient.

A marked impairment of sports-technical performances was established in 7 players /30%. It is difficult to estimate the dynamics of the sports-technical performances in the remainder.

The football players with deviations have been subjected to rehabilitation for various periods of the active season which exerted a deleterious effect on their training. In addition, they were unable to withstand intensive training stresses, and as a result 10 players /43% had to leave the teams, and after a further year - 5 more athletes totalling 56.5%.

All these facts make the problem of chronic overstrain of the heart in outstanding athletes a still actual one for sports-medical science and practice.

## CONCLUSIONS

1. The dynamic electrocardiography is a valuable method for early diagnosis of heart overstrain, but it is necessary to carry out a more frequent ECG monitoring, especially during the stages of intensive training loads.

2. Inadequate training efforts, especially in new players, coming from junior teams or from lower class teams, leads to heart damage very often.

3. The forcing of the training process, particularly during the mountain camp period, has an unfavourable effect on the health and functional condition of football players.

4. It is necessary to treat in advance all chronic focal infections in the newly admitted players.

5. An optimum treatment and rehabilitation term is necessary to obtain a lasting effect.

DISTURBANCES IN THE FUNCTIONAL FITNESS OF MYOCARDIUM  
UNDER THE EFFECT OF HARD TRAINING

(dynamic electrocardiographic investigations)

I. Georgiev - Bulgaria

It is well known that a characteristic feature of contemporary athletic training is the constantly growing tendency to use hard training work loads.

From sports-medical and medicobiological viewpoint this solution of the problem is correct since one of the basic preconditions for structural and functional perfection of the organism and formation of the necessary qualities to achieve higher athletic per-

performances is the degree of physical loading of organism, the proper selection and combination of training means and ways.

Practice showed, however, that in the last few years, parallelly with the increased amount and intensity of training work loads the incidence of electrocardiographic variations in outstanding athletes also increases. This disturbing phenomenon, established both by us and by some foreign authors (Butchenko L.A., Dembo A.G. et. al.), reasonably raises the question of the etiological nature and electrophysiological substantiation of the ECG variations, and more particularly, of the role played by training stresses as etiological factor.

The elucidation of this problem, in our opinion, is of considerable importance for sports-medical science and practice, as it is directly related to the problem of increasing the functional possibilities of organism and attaining higher athletic performances without threatening the health of athletes, i.e. it is closely related to the problem of scientific guidance of athletic training from medicobiological aspect.

It is the purpose of the present report to inform you about some of the results obtained by us during the complex study of the frequency, character, structure and dynamics of electrocardiographic variations in 3750 outstanding athletes who have been systematically followed by us and members of national teams for the period 1956 - 1972, i.e. within four complete Olympic cycles (Rome - Tokyo - Mexico - Munich).

#### METHODS

Electrocardiographic investigations were carried out at least twice a year, along with following up a complex of clinical, para-clinical - biochemical and functional indices, including respiratory metabolism at rest, dosed or maximum loading on Veloergometer.

At indications special differential-diagnostic medicamentous test were applied (atropine, indural etc.), as well as investigations in conditions (Belmeken, Mexico) or during practice sessions. ECG recordings include the twelve usual leads using standard technique and completely reliable sensitivity and characteristics of the apparatus (Schwarzer, Hellinge, Simens).

#### RESULTS

Because of the great bulk of data and the limited time allotted, with your permission, we will present in brief only some of the results outlining the basic points of our study and illustrated in a series of diagrams.

Diagram I shows in a dynamic aspect the percentage of ECG variations by years and Olympic cycles. Two points deserve special attention when analyzing the diagram - the high incidence of ECG variations for the period up to 1962. During that period our investigations include only masters of sports from national teams. The other point worthy of notice is the clearly manifested tendency of the incidence of cases with ECG variations to increase during the last years, and especially after the cycle "Mexico" when the training of national teams included the model of increased in amount and intensity training work loads. It should also be stressed that the rising frequency of ECG variations for that period stands out against the background of an extended contingent including all the athletes - members of national teams.

Accepting conditionally that the distinct dynamics in the percentage expression of ECG deviations established by us during the period under observation is directly related to the degree of athletic qualification or to the changing conditions of athletic training, we built up a preliminary working hypothesis. According to the

latter the value of training stress is considered as phenomenon - cause, while the established ECG deviations are assumed as a phenomenon - consequence.

To prove or reject this supposition, we carried out a dynamic comparison of the two phenomena over the last two Olympic cycles (Mexico and Munich), illustrated in diagrams II and III.

The additional processing of the obtained results according to the method of correlational analysis showed that there is a statistically reliable dependence between the percentage expression dynamics of ECG deviations and the value of training stress expressed in training days, workouts or covered training distance, the correlational index being respectively 0.7%, 0.65 and 0.92.

The dependence established by us and statistically confirmed raises the question of the compatibility between the high and growing incidence of ECG variations, on the one hand, and the undoubtedly positive dynamics of the performances of athletes investigated by us during the last years, and especially during the Olympic games in Munich.

To elucidate this problem which has an essential practical bearing on sports medicine, we modified the conditions of our researches. The incidence of ECG variations was followed up among national recordholders and among the first ten athletes in the rang-lists of sports federations, and was compared to the frequency of ECG variations in the rest of the national competitors.

The results obtained from the comparative study are given in diagram IV. The analysis shows that such a criterion of selection between the two groups ensures a significant and statistically reliable difference in the incidence of ECG variations which is markedly lower in outstanding athletes within the range of 1% - 2.22%

against 26.0 2.60 %.

### CONCLUSIONS

The dependences established by us give us sufficient ground to draw the following basic conclusions:

1. There is a reliable difference between the percentage expression of ECG variations in outstanding athletes and the value of training loads, but their absolute amount and intensity are assumed as a potential factor causing variations in ECG.

2. A basic etiological factor for the appearance of ECG variations in athletes is the inadequacy between the demands during the athletic training and the actual adaptation possibilities of organism.

3. In sports-medical practice the dynamic electrocardiography seems to be a highly sensitive and reliable method supplying prompt information on the athletes, adaptation to training stress exposure and it ought to be widely applied in the scientific management of athletic training from medicobiological point of view.

### REVIEW OF THE MOST FREQUENT DISEASES IN PUPILS, EXONERATED FROM PHYSICAL EDUCATION CLASSES

N.Hristov, V.Nikolov, R.Kaledzhiska - Yugoslavia

The organized exoneration of pupils from the obligations and classes of physical culture suffering from different diseases began in 1965 with the formation of a department of sports medicine at the specialized polyclinic "Bucharest" which later developed into a Centre of Sports Medicine.

#### Personal Observations

Parallel to the other results which have been obtained during

work with pupils exonerated from the obligations and classes of physical education in the Centre of Sports Medicine the data about the most frequent diseases because of which pupils were exonerated, are also submitted. These results are illustrated in tables according to school years starting with the school year 1966/1967 and ending with 1973/1974 (Tables 1 - 7 are enclosed).

Table 1

School year	Schools	Most frequent diseases					
		Heart diseases	Rheumatic diseases	Lesions and deformations	Anemia	Asthenia	ORL dis.
1966/1967	8 years old	180	136	83	93	86	95
	above 8	114	87	59	65	62	41
	Total	294	223	142	158	148	136
1967/1968	8 years old	128	71	68	64	67	89
	above 8	94	52	60	66	42	44
	Total	222	123	128	130	109	133

Table 2

Year and Half-year	Schools	Most frequent diseases						
		Heart dis.	Rheumatic dis.	Lesions and deformations	Anaemia	Asthenia	ORL dis.	Renal dis.
I half-year 1968/69	8 years old	61	71	50	47	33	58	28
	above 8	67	57	70	56	19	47	22
	Total	128	128	120	103	52	105	50
II half-year 1968/69	8 years old	23	28	26	9	6	25	11

II half-year 1968/69	above 8	28	16	24	17	4	8	7
	Total	51	44	50	26	10	33	18
	Total	179	171	170	129	62	138	68

Table 3

Year and Schools Half-year		Most frequent diseases						
		Heart dis.	Rheumat. dis.	Lesions and de- forma- tions	Anaemia	Asthe- nia	ORL dis.	Renal dis.
I half-year 1969/70	8 years old	119	89	55	27	30	31	28
	above 8	82	58	65	32	13	53	26
	faculties	-	-	1	-	-	1	-
	Total	201	147	121	59	43	125	54
II half-year 1969/70	8 years old	75	36	40	52	42	55	18
	above 8	48	33	37	34	20	23	18
	faculties	-	-	1	4	1	1	1
	Total	123	69	78	90	63	79	37
	Total	324	216	199	149	106	204	91

Table 4

Year and Half-year		Most frequent diseases						
Schools		Heart dis.	Rheum. dis.	Lesions	Anaemia	Asthe- nia	ORL dis.	Renal
I half-year 1970/71	8 years old	81	58	81	53	90	37	29
	above 8	76	51	83	63	37	44	33
	faculties	8	3	12	6	2	4	-
	Total	165	112	176	122	129	85	62

	above 8	81	42	119	38	37	60	20
	faculties	8	5	9	4	5	3	1
	Total	162	101	214	61	81	111	55
II half-year 1972/73	8 years old	20	15	33	13	20	14	13
	above 8	28	16	44	16	15	20	6
	faculties	1	-	-	-	3	1	3
	total	49	31	77	29	38	35	22
	Total	211	132	291	90	119	146	77

Table 7

Year and Half-year	Schools	Most frequent diseases						
		Heart dis.	Rheum. dis.	Lesions deformations	Anaemia	Asthenia	ORL dis.	Renal dis.
I half-year 1973/74	8 years old	44	21	50	27	22	26	13
	above 8	86	51	130	29	41	44	24
	faculties	10	3	19	2	1	10	1
	Total	140	75	199	58	64	80	38
II half-year 1973/74	8 years old	10	5	27	14	9	15	10
	above 8	25	4	43	14	6	24	15
	faculties	1	1	9	-	-	1	-
	Total	36	10	79	28	15	40	25
	Total	176	85	278	86	79	120	63

### Analysis of the results

The enclosed tables show data about diseases that are the most frequent every year and cause the exoneration of pupils and students from their obligations and classes in physical education. They include heart diseases, rheumatic diseases, lesions and deformations, ORL diseases, asthenias and anaemias. It is characteristic for them that their incidence changes each year. Although the number of heart and rheumatic diseases during the first several years, i.e. from the school year 1966/67 to the school year 1970/71, was the highest and ranked first and second, the situation changed during the school year 1971/72. Though the number of heart diseases is still high, in 1971/72 rheumatic diseases replaced them from the second into the fifth and fourth place.

Lesions and deformations in 1971/72 were on the first place which was kept till the end of the school year 1973/74. The third place was occupied by the ORL diseases, followed by asthenias and anaemias.

The number of some of the diseases increases every year, while the number of others decreases.

From the tables it is evident that their number has increased but it is still not so high, so that the number of students exonerated during each school year is approximately the same, but only, seemingly. We have used the term "seemingly" because we have in mind that during 1966/67 the total number of students in Skopje amounted to 39,932/29,772 students in primary schools and 14,160 students in secondary schools, while in 1973/74 there were 65,500 students in primary schools and 27,661 students in secondary schools. It is evident that there is a decrease in the number of diseases, and a parallel decrease in the percentage of students

exonerated from obligations and classes of physical education.

The number of students exonerated from the obligations in physical culture increases every year with the gradual introduction of physical education in the faculties.

Why do individual diseases increase while others tend to decrease?

The factors determining the answer to the above question are numerous. We are in the opinion that better living conditions, the achievements of medicine, and especially the early diagnosis and detection of individual diseases and their timely treatment determine the decrease of heart and rheumatic diseases.

On the other hand, lesions and deformations during the last years take the first place as an indication for exonerating students and pupils from physical education obligations. Their number has increased as result of advanced technique, increased transport and insufficient observance of the traffic regulations. Therefore the number of exonerated students and pupils because of lesions and deformations has shown an increase.

In this paper we do not want to discuss the various problems related to our work during classes of physical culture (which is not our task here) but we want to decrease the percentage of students exonerated from obligations and at the same time to be pleased and satisfied with the present state of things.

We consider that their number would have been smaller if the problem concerning the individual loading of pupils during classes in physical culture was solved in a way to serve the purpose of dividing the pupils into groups according to their health and functional capabilities, with due consideration being given to their inclination for certain sports disciplines. In this way the prob-

lem how to evaluate properly the pupils during physical education classes might be solved.

As a matter of fact exonerating some pupils from their obligations in classes of physical culture is in itself avoiding of their school obligations though these students are neither ill, nor with decreased functional capabilities. The highest number of pupils wishing to be exonerated are those without any excuse to avoid physical activities. Some pupils who have never suffered from any illnesses come to an examination as they are capable to master some disciplines and to reach the required norms. Such pupils become afraid of classes in physical education as their bad marks in this subject might lead to a lower general success. As a result parents themselves start looking for different ways to relieve pupils of their obligations in classes of physical education and later on to include them in various sports clubs. This is determined, among other things, by the constantly growing number of pupils in one class with different ages (as some children start school earlier). Physiological old age shouldn't be forgotten either. It has been noticed even in pupils of the same age.

In order to solve some of these problems it is necessary to secure a closer collaboration between teachers in physical education, parents, physicians and pupils.

The opinion of these dealing with this problem is not to exonerate pupils completely from obligations in physical education, with the exception of the periods of hospitalization, home treatment or in a phase of medical rehabilitation.

#### Conclusions:

1. Exonerating pupils from obligations in classes of physical education in Skopje is a problem first observed in 1969 when the first trials for organized exoneration were made. Therefore this

problem is resolved to some extent.

2. The number of pupils exonerated from obligations in physical education on the territory of Skopje is gradually decreasing from year to year, and the number of students exonerated is growing because of the introduction of compulsory physical exercises in faculties. The number of students exonerated is very small, most likely because the physical education programs in faculties are set on a completely different basis compared to those in primary and secondary schools.

3. From the school year 1966/67 to 1973/74 the characteristics of the most frequent diseases as an indication for exonerating pupils from obligations in physical education, has not changed. The most frequent diseases because of which pupils have been exonerated are the following: heart diseases, rheumatic diseases, traumatic lesions and deformations, ORL diseases, anaemias and asthenias. Their incidence changes from year to year relatively, the number of some of them decreasing, and of others increasing.

4. The number of pupils with reduced functional capabilities of the cardio-respiratory system is growing.

5. It is necessary to make not only a chronological and health, but also a physiological categorization of pupils, in order to dose the work loads in classes of physical education.

6. To decrease the number of pupils exonerated from obligations in classes of physical education, the prophylaxis and early discovery and treatment of the ill pupils are of utmost importance.

7. The improved conditions in schools, the inclusion of specialized teaching personnel to work with pupils partially exonerated from their obligations in classes of physical education, might greatly contribute to the reduction of the number of fully exonerated students from obligations in classes of physical education.

POST-TRAUMATIC ARTHRITIS IN THE WRISTS AND HANDS OF  
BOXERS

M.Luugas - Greece

To study the influence of minor injuries on the formation of Post-traumatic arthrititis in the wrists and hands of professional boxers, the author investigated the clinical and radiological pictures in series of boxers. To compare the results, a control group of men of the same age and occupations, but not engaged in boxing activities were also studied.

It is concluded that;

1. Systematic exercises in boxing increase the hazards and incidence of minor injuries to the wrists and hands of the athletes.
2. These repeated minor injuries result in the formation of post-traumatic arthropathies in the small joints of the wrists and hands of boxers.
3. The symptoms and X-ray changes typical of post-traumatic arthritis seem to appear quite early, since in the material of the author only 5 years after the start of regular training, the majority of the athletes are already complaining of pains and stiffness in the above mentioned joints.

PARTIAL TENDINOSIS OF THE PREPATELLAR TENDON

N.Dagorov - Bulgaria

In 1958 we came upon a peculiar disease of the prepateLLar tendon in athletes. It appears in competitors performing many times repeated sudden force contractions of the quadriceps, mainly during jumping drills, and therefore we called it "a disease of jumpers". A preliminary communication was made during the

1959 session of the Society of Sports Physicians, and in 1966, we presented a report to the Institute for Inventions and Rationalization (Author's certificate for invention N 12010 from 21.II.1967)..

The disease is manifested with pains in the prepatellar tendon. At the beginning they are weak and usually appear after rather intensive jump efforts. They gradually increase and become a constant companion of the forced quadriceps contraction. After rest the pain decreases or attenuates, and then reappears as soon as the training is resumed.

The clinical investigation showed a characteristic finding: a palpatory painful induration of part of the tendon situated longitudinally within the latter in the form of a cord. Its width in the middle part of the tendon is 2-3 mm., in the proximal part it is expanded in a cup-shaped fashion, in the distal part it becomes thinner, and immediately above tuberositas tibiae its diameter is 1-2 mm. The finding might be detected by means of a transverse massage of the tendon at full extension of the knee joint and a completely relaxed biceps.

The routine paraclinical examinations of blood and urine are normal, as well as the X-ray picture of the patellar where exostosis and periosteal reaction of apex patellae is established in some inveterate cases only.

As our attempts at treating the disease conservatively, i.e. using compresses, electrotherapy, baths, mud-baths, local injections with hydrocortisone preparations, failed in most cases, and led only to a temporary improvement in the remainder, since 1960 we resorted to operative treatment. The operative finding was a compact, hard, grey-brownish cord-shaped formation, situated alongside the tendon and surrounded on all sides by normal tendon parts.

The surgical intervention employed by us consists in a total extirpation of the changed part of the tendon - cordectomy. Since the operation accounted for disappearance of all complaints and return of the athlete to routine training activities, it is considered as a method of choice in the treatment of more advanced cases with a clearly differentiated pathological finding. This enabled us to study histologically the tendon changes. Most of the histological preparations showed tendon tissue degeneration. In some preparations, however, a rupture of the collagen fibres of the tendon was observed.

Institute of Postgraduate Medical Specialization - Institute of Pathology and Anatomy. Biopsy study No 522/1960: The material under study is a collagen connective tissue, arranged in bundles. In some places the bundles are interrupted alongside their length and between the formed parts proloferating young blood vessels with moderately pronounced chronic non-specific inflammatory changes around them can be seen. The inflammatory infiltration consists mainly of tiny, round lymphoid cells, macrophages charged with hemosiderin and young fibroblasts with succulent vesicular nuclei. Around them are visible thin collagen fibres, situated irregularly relative to the bundles of collagen connective tissue. It is a matter of a process of organization of a lesion involving the connective tissue bundles, which has been accompanied by a slight haemorrhage where from the hemosiderin originates, absorbed by the macrophages of the inflammatory infiltration. The investigation was carried out by Dr. D. Doitchinov. On the basis of the above study, the following conclusions can be drawn:

1. The repeatedly performed sudden maximum strength contractions of the quadriceps lead to damage of the prepatellar tendon

tissue.

2. The changes in the prepatellar tendon involve those parts of the tendon which first reach their maximum stretching during proximal movement of the patella under the action of the forced quadriceps contraction. This is usually a group of bundles, situated centrally in the tendon and attached to apex patellae and tuberositas tibiae.

3. The mechanical stimuli in some instances produce degenerative changes as a result of the disturbed adaptation processes to high mechanical stresses, and in other - to microruptures of the collagen fibres of the central bundles with microhaemorrhages. The pathological changes in these bundles in the latter case are due to restoration processes. The differences in the pathological manifestations of the affected bundles are probably due to differences in the character and degree of the physical strain.

4. Since periosteal reaction of apex patellae was observed only in old cases, we should accept this reaction as a secondary one and appearing as a result of the increased demands on the insertion site of the changed tendinous part because of the lost elasticity in it.

#### ATHLETIC INJURY AND FOCAL INFECTION

N.Kolev - Bulgaria

A series of 100 athletes with 116 chronic and acute sports injuries combined with focal infection have been treated in the Republican Center for Sports Medicine over the period 1971 through 1974. Chronic athletic injuries amount to 97, and the acute ones - to 19. According to nosological entity the chronic injuries are divided as follows: 59 tendinous, out of which 45 of the lower extre-

mity, 9 of the upper and 5 of the trunk. Their localization in the lower extremity is the following: insertions of the adductors to the pubic region - 15, knee joint - 20, heel - 10. In the upper limb: shoulder 3, elbow 6. Chronic synovitis 9, retropatellar chondropathy 7, bursitis 3, lumbosacral radiculitis 4, humeral scapular peri-arthritis 4, others 11.

Acute injuries according to nosological entity are distributed as follows: 8 sprains running a protracted healing course, 4 ruptures of muscle fibers, 5 suspect and established meniscus lesions, 2 acute tendinitis.

109 focal infections have been proved in the group of 100 athletes subjected to treatment; 7 of them had more than one infectious focus.

The focal infection distribution is as follows: chronic tonsillitis 68, chronic sinusitis 27, dental infections 8, chronic appendicitis, adnexitis and others 6.

On admission 23 cases showed insignificant blood picture variations. Accelerated erythrocyte sedimentation rate was noted in 16%, the highest values being 39/64 according to Westergreen. Leukocytosis above 9000 was established in 7% of the cases. In no case DFA was above 280 pu, the highest level being 234 pu. Lymphocytosis was present in 1%, and lymphopenia in 0%; eosinopenia was recorded only in one case. In none of the patients a leftside shift of the leukocytes was observed.

67 focal infections were cured during treatment. Tonsillectomy - 47, out of them 35 in chronic and 12 in acute injuries, sinusitis - 13 cases, of the 11 in chronic and 2 in acute injuries, 4 focal infections of dental origin in chronic injuries and 3 appendectomies also in chronic injuries.

Treatment was carried out according to the following schemes.

1. Curing of focal infection - operative or conservative - tonsillectomy, toothextraction, appendectomy, and in operated cases - broad spectrum antibiotics.

2. Drug therapy: antibiotics, antiinflammatory and analgesics such as rheosolone, metindol, tanderil, butadion, local use of hydrocortisone, depot medrol, volon A, etc. Vasodilators - most often vasolate. Vitamins A, B<sub>1</sub>, B<sub>6</sub>, B<sub>12</sub>, E, C.

3. Physiotherapy: paraffin or ozocerite with ultrasound and hydrocortisone ointment - before noon, warm bath with or without submarine massage - afternoon. Ichthyol, kinetol or heparoid compresses - in the evening.

4. Exercise therapy and remedial athletic training.

After the treatment the patients were followed up for one year. The results show that out of 109 infections, 100 were checked up: cured - 61, improved - 22, without change - 17. As cured we considered the patients without exacerbation throughout the follow-up period despite the regular training regimen. Improved - those with exacerbation of the chronic athletic injury during maximum training loads, but without interruption of the training, and without change - those with periods of remission and ensuing exacerbation after even rather considerable exertion causing the cessation of training activities, and undergoing additional treatment.

After tonsillectomy 41 patients (87%) recovered, 3 were with improvement (7.2%) and 3 were without change - 6.38%. In medically treated chronic tonsillitis, healing of the lesion was obtained in one case (6.25%), improvement in 11 (68.75%), without change 4 (25%). 5 patients did not come in for check-up examination, and are not included in the analysis. After tonsillectomy recovery was obtained in 100% of the acute injuries, and in 82.85%

of the chronic. The questioning of patients with improvement or not responding to treatment showed that it was a matter of focal infections of long standing.

The results of treating injuries with concomitant sinusitis were: 13 recoveries - 56.16%, 5 /20,87%/ - with improvement, and 6 /25%/ without change. 3 did not come in for check-up examination, and are not considered in the percentage analysis. In both acute injuries with the same combination - recovery in 100%.

Four patients /50%/ with injury and dental infection recovered after tooth sanitation, 2 had an improvement /25%/ and 2 were unchanged /25%/.

6 cases were with athletic injuries combined with other focal infections: 3 appendicitis, 2 - adnexitis, and 1 - abscess, with the following therapeutic results: recovery after appendectomy - in all 3 cases, improvement after incision of the abscess, the athletic injuries remained unchanged in the two patients with adnexitis.

#### DISCUSSION

The author has been prompted to this investigation by his observation that athletes suffering from proved focal infection often sustain acute injuries such as muscle-fiber tears hardly lending themselves to treatment, traumatic arthritis, synovitis, etc. This applies to a still greater extent to chronic injuries. Most common are tendinitis, retropatellar chondropathy, meniscopathy, chronic synovitis. The healing process is particularly protracted in tendinitis. Here it must be pointed out right away that in cases with infection of long duration, following focus removal only improvement is obtained, or else the disease does not respond at all. This fact is explained by Prof. Tsontchev /page 261, Rheumatology/. The

clinical picture of allergic diseases shows persuasively that insofar as relation between allergen and pathological reaction is concerned, three basic possibilities exist.

1. Strictly specific relation between allergen and allergic reaction. This is the phase of monoallergic specificity. Allergen removal in this phase leads to cessation of the allergic process.

2. In the later periods of the disease, changes set in which are characterized by specificity loss. The allergens which act initially strictly specifically no more determine the course of the disease. The pathological process is dependent on the effect of various stimuli deprived of allergen properties /n.a. overload, colds, intercurrent diseases, etc./. In these cases the allergic reactions are determined by the pathological dominant produced by conditioned reflexes' mechanism /cit.Prof.Tsontchev/.

The above mentioned clarifies in a comprehensive way the exposed facts.

We failed to come across literature reports on a method of reliable focal infection activity determination and for this reason we have accepted as a conclusive evidence the radiological finding in sinusitis and dental granuloma, and the presence of purulent secretion and chronically inflamed tonsils and sinus.

We cannot determine the ratio between chronic athletic injuries with and without focal infection, because this is not purpose of our study, but if we judge from the tendinitis cases observed and treated in the hospital for the said period, the ratio would be approximately 1:1. Naturally, at the hospital were treated only cases in whom the out-patient treatment failed.

We are greatly impressed by the protracted therapeutic course of some acute injuries combined with focal infection, as well as

by the susceptibility of allergized muscles and joints to frequent ruptures of muscle and tendon fibers, traumatic arthralgia, meniscopathy, etc. A noteworthy fact is that recovery was obtained in 100% following focal infection cure in acute injuries. According to the inquired competitors, they no more sustained acute injuries as before the treatment.

#### CONCLUSIONS

The presence of focal infection renders allergic muscles tendons and cartilage. The curative process of acute and chronic injuries in athletes with established focal infection is protracted. There is no available method to prove reliably the focal infection activity. As a reliable evidence is considered the presence of purulent secretion /tonsils, sinus/ and the positive X-ray finding in the perinassal cavities and teeth. It is necessary to develop a laboratory test for the purpose. From the blood examination it can be concluded that acute and chronic athletic injuries do not have rheumatic genesis, since it is a matter of an infection with latent course affecting the tissues through allergy. Because of the absence of a laboratory method to prove focal infection activity we suggest the therapeutic result to be estimated a year after the sanitation of the infectious focus.

It is hardly necessary to add sympatholytics /metroman/ and vegetative hormonal agents /diaepin, relenium, elenium/ to the drug therapy of young athletes, but anyway, a definite statement on the issue will be made only after comparison of the duration of treatment in a control group in which the above drugs were included.

We consider the therapeutic effect of focal infection treatment for proved, and therefore it should be carried out in the earliest stages of monoallergic specificity. In this phase focus re-

moval discontinues the morbid process. Focal infections detected during periodical examinations of athletes should be promptly cured. For this purpose they must be taken under dispensary observation in the consulting rooms for ORL and dental diseases.

Focal infections contribute to the increase of incidence and prolongation of the treatment term in acute and chronic athletic injuries.

The results of operative treatment of the infectious focus are superior as compared to conservative methods.

#### THERAPEUTIC-ATHLETIC TRAINING AFTER MENISCECTOMY IN WRESTLERS

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Therapeutic-athletic training is a specialized remedial gymnastics destined to restore the sports functional possibilities of the ill or injured athlete, as well as to maintain his athletic form during treatment.

After its introduction in 1958 by Karanov and Degerov, it was included in the rehabilitation program of athletes undergoing treatment in the Republican centre of sports medicine.

The purpose is, as far as possible, to use the elements of athletic training in the pre- and postoperative rehabilitation.

In addition to its basic tasks, TAT fulfils also secondary ones: increase of the general tone of the organism, emotional stability, confidence in the complete and rapid recovery, etc.

A permanent and operative collaboration, based on confidence between the attending physician, Kinesitherapist-trainer, team physician, coach and team manager is necessary in order to organize

properly and carry out effectively TAT. Adequate facilities and equipment are required both for remedial gymnastics and for the specific sports discipline.

Improved conditions for TAT for all sports have been created in the RSCSM, especially after the foundation of the Hospital for sports traumatology at the Centre.

We shall describe the method and results of therapeutic-athletic training after meniscectomy in wrestling competitors.

We observed 8 wrestlers after meniscectomy over the period 1973-1974; 3 of them with lateral meniscus operation, and 5 - with medial one. The duration of the meniscus lesion was 20 days in one case, from 3 to 10 months - in 6, and 20 months in one. In this period all but the first patient have been subjected to treatment, and have participated in training and competitive activities with interruptions and limitations caused by pains, blocks, hydrops and other complications of the knee joint. Because of the partial weightbearing of the affected leg in every day and sports activities before the operation four of them had a marked hypotrophy, mainly of the femoral muscles, and diminished muscular force. The patients were without or with insignificant lesions of the knee ligaments. Three of them are wrestlers - classic style and 5 - free style, with age ranging from 16-27 years. They are members of club, national and junior teams and students in sports schools, with athletic training history of 3-11 years. All of them had an uneventful postoperative period. Only physical therapy was resorted to in addition to the complex rehabilitation.

The therapeutic-athletic training of the operated wrestlers passed through four basic periods: preoperative /1-2 weeks/, early postoperative /1-20 days after operation/, late postoperative