

Measures for Achieving Recruits' Enhanced Fitness – A Transversal Study

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ABSTRACT

Because of 10.94% frequency in obese recruits in Rijeka in 2005 occupational medicine decided to study causality of that and other most frequent diagnoses: pedes plani, myopia and astigmatism, kyphosis and scoliosis, asthma, hypertension and branch block. Double monitoring of 1,311 recruits was carried out by a transversal study during 2005, 2000 and 1995 and within each year according to location: city, suburbs, islands. The differences in the three periods in the city were obesity ($p < 0.05$) with highest frequency in 2005, asthenia ($p < 0.05$) with lowest frequency 0.99% in 2005, and pedes plani ($p < 0.05$) with highest frequency in 1995. Suburbs showed ($p < 0.05$) for pedes plani, $p = 0.054$ for obesity, and the islands obesity ($p < 0.05$). Myopia and astigmatism frequency went up to 25%, kyphosis to 14.13% and asthma to 5.43%. Hypertension frequency was negligible. Occupational medicine decided to react by measures increasing recruit fitness cooperating with school medicine, teachers and parents, by check-ups, corrections, dieting and physical activities.

Key words: recruits, diagnoses, occupational medicine

Introduction

Unhealthy diet, lack of exercise and physical activities in the young presents a problem not only in Croatia but also in many West-European countries¹, and particularly in the USA². Western life-style leads significantly to high prevalence of coronary arterial disease. Smoking, diet rich in fat, inactivity, obesity, alcohol abuse are conventional factors for 80% of cardiovascular incidences. Obesity is a lingering metabolic imbalance characterized by positive energy balance which leads to excessive fat deposits as compared to a normal organism³. The roots of the problem are multiple, from environmental, cultural, hormonal to physiological. Excessive weight predisposes developing diabetes type II and coronary heart diseases⁴. Obesity and sedentary life-style are increasingly becoming pandemic nationally and globally causing early death, invalidity and enormous expenses for health insurance⁵. Exposed to increased physical strain obese people react more rapidly to stress factors, dehydration, warming up, fatigue. This can be intensified by non-acclimatization, lack of practice, humidity, medication, respiratory and gastrointestinal diseases⁶. The lack of physical activities appears already in childhood and it progresses in adolescence⁷. Creating a healthy environment, which inclu-

des increased physical activity, would probably be the best intervention strategy to prevent weight gain in adolescents⁸. Visual impairment, besides obesity, may also be considered a major problem in the young. Modern civilization brings about many amenities, but it also causes damage to our health, particularly to most subtle eye structures. Exposure to microwaves, from those emitted by microwave ovens to professional exposure, may cause blurred lens, cataract⁹. The increase in illuminated signs especially in cities, too strong street lights but also increased daylight lead to phototoxic visual impairment in the young¹⁰. Radiofrequency energies may also cause various eye effects, primarily cataracts, but changes in retina and cornea as well¹¹. We also witness bad posture of the young that grow quickly. Enchondral spinal growth of the vertebral column does not stop after puberty. Although spinal growth is genetically determined the proper posture during puberty is very important for the right development of spine¹². Environment and work place are becoming increasingly polluted and the populations most sensitive to such conditions are the young who often develop asthma and chronic bronchitis and who in big cities rather stay at home than go in

for physical activities in cities in the open polluted environment¹³.

When an occupational medicine specialist examines recruits, i.e. the youth exposed to present-day environmental stressful factors and who in most cases consequently develop diagnoses mentioned in this study: obesity, asthenia, myopia and astigmatism, pedes plani, kyphosis and scoliosis vertebrae, asthma and chronic bronchitis, hypertension, ECG registered branch blocks, he can only assess their fitness for military service on the basis of the army book of rules.

To enhance such fitness occupational medicine, as a preventive branch of medicine, must co-ordinate emergency measures and programs in co-operation with vocational guidance teams, teachers of physical training and educators, school medicine, but also with parents of future recruits in order to prevent these diagnoses, particularly obesity as an internationally growing problem of public health^{14,15}.

Materials and Methods

The total of 1,311 recruits have been examined by double monitoring criterion at the occupational medicine in Rijeka, Croatia, at the Center for Prevention, Diagnostics and Assessment of Work Ability. The first criterion was grouping the recruits according to the time period of examination, that is grouping them as examinees in the year 2005, 2000 and 1995 so as to obtain a transversal study in order to monitor some of their somatotypic characteristics and most frequent somatic diagnoses to observe the expected changes and develop preventive medical measures to alleviate or eliminate them completely. The second criterion was grouping the recruits according to their residence within each analyzed year, i.e. grouping the recruits from the city, suburbs and islands.

In order to obtain a more precise comparison in all three years, in five-year intervals, the same number of

437 recruits were examined, i.e. 201 from the city, 144 from suburbs and 92 from islands.

In the course of the year 2005 in 437 recruits, aged 18.07 ± 1.54 (17–27 range), the mean height was 179.59 ± 6.66 cm (157.00–199.00 range). The mean weight was 75.00 ± 13.69 kg (50.00–130.00 range).

In the same number of recruits, five years before, i.e. in the year 2000, aged 18.59 ± 1.58 (18–27 range), the determined mean height was 178.23 ± 6.62 cm (158.00–199.00 range). The mean weight was 73.06 ± 12.49 kg (49.00–124.00 range).

The earliest examined recruits, in the year 1995, aged 18.59 ± 1.38 (18–27 range), showed the mean height of 178.13 ± 7.00 cm (152.00–201 range). The mean weight was 70.99 ± 11.41 kg (49.00–119.00 range).

Stat Soft statistical program was used, Statistics 6.0. Parameters besides height and weight were monitored and in that connection diagnoses Obesity and Asthenia, the most frequent somatic diagnoses in recruits Myopia and Astigmatism (simplex and mixtus), Pedes Plani, Kyphosis and Scoliosis, Asthma and Chronic Bronchitis, Hypertension and Incomplete and Complete Branch Block as ECG diagnoses.

To show relations between specific results Pearson Chi Square test and Kruskal-Wallis test were used as well as correlation matrices and single stream variance analysis, One-way ANOVA analysis.

Results

Recruits from the city

In the course of the years 2005, 2000 and 1995 were examined 603 recruits from the city (transversal analysis, N=603, Table 1). The obtained result shows that by diagnosis obesity, i.e. overweight 30% above normal, the recruits statistically differ significantly ($p < 0.05$) in the city of Rijeka in the three different time periods. So in the year 2005 there were considerably more obese re-

TABLE 1
TRANSVERSAL SURVEY OF RECRUITS IN THE 2005, 2000 AND 1995 YEARS ON THE BASIS OF THE DIAGNOSES

Area	N	Year of examination	Age (years) \bar{x}	H (cm) \bar{x}	W (kg) \bar{x}	Ob N	As N	Pp. N	M N	KS N	A N	H N	RBB N
1 City	201	2005	18.20	179.86	76.58	22	2	31	48	20	9	3	10
2 Suburb	144	2005	18.08	179.29	75.15	14	6	7	31	8	2	0	11
3 Island	92	2005	17.91	179.46	71.28	4	8	9	21	12	5	1	5
4 City	201	2000	18.67	179.06	73.00	11	3	15	41	12	9	4	4
5 Suburb	144	2000	18.49	177.02	71.98	10	2	22	32	9	4	2	1
6 Island	92	2000	18.59	178.31	74.86	11	2	18	21	2	1	4	1
7 City	201	1995	18.50	179.30	72.41	10	10	34	51	24	7	2	9
8 Suburb	144	1995	18.43	176.82	68.93	4	6	20	36	14	4	3	10
9 Island	92	1995	19.06	177.61	71.09	3	4	18	24	13	2	2	3

N – number of examinees, H – height, W – weight, Ob – obesity, As – asthenia, Pp. – pedes plani, M – myopia and astigmatism simplex and combined, KS – kyphosis and scoliosis vertebrae, A – asthma and bronchitis, H – high blood pressure, RBB – right branch block

recruits, 22 (10.94%), compared to the year 2000 when there were 11 (5.47%), and particularly in relation to the year 1995 when there were only 10 (4.97%) obese recruits (Figure 1). By asthenia, statistically recruits also differ significantly ($p < 0.05$), but here the situation is reverse, in 2005 there were few asthenic recruits in the city, 2 (0.99%), while in 1995 there were 10 (4.97%). At the level $p < 0.05$ the recruits differ also by diagnosis pedes plani. The most frequent diagnosis with city recruits is myopia and astigmatism. In all three examined years the diagnosis reaches high percentage from 20.39% to 25.37% and there are no significant differences in the time of occurrence. By the presence of kyphosis and

scoliosis recruits in the three time periods statistically do not differ considerably. That diagnosis occurs in 5.97% of the year 2000 recruits, 9.95% in 2005 and 11.94% in 1995. Asthma and chronic bronchitis range from 3.48% in 1995 to 4.47% in 2000 and 2005.

By right branch block ECG diagnosis recruits also do not differ significantly. The lowest frequency was in the year 2000 – 4 recruits (1.99%), while in 1995 and 2005 the frequency was much the same, 4.47% and 4.97%. There were few hypertensive recruits, 2 (0.99%) in 1995, 4 (1.99%) in 2000 and 3 (1.49%) in 2005. In the city the average height of recruits in the course of the analyzed years was 179.41 cm (158–201 range), while the average weight was 74.00 kg (49–130 range), (Figure 2 and 3). One-way ANOVA analysis showed that recruits do not differ significantly by height (Figure 4), while the weight shows considerable difference with the highest variability in the year 2005 (Figure 5). Generally, with age the recruits gain weight (Figure 6).

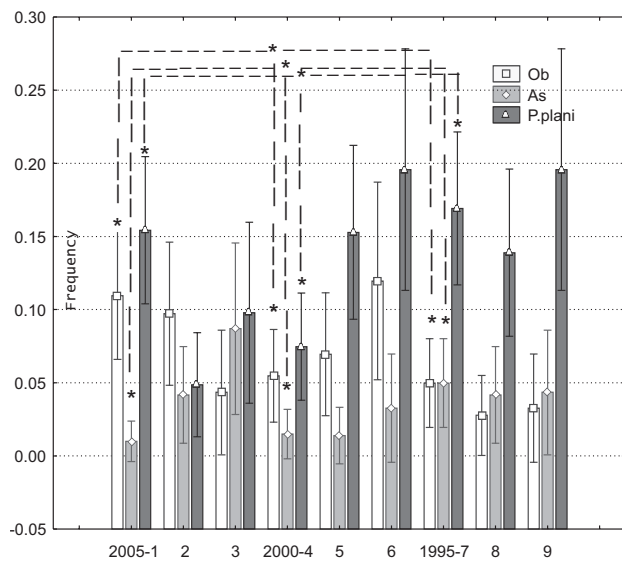


Fig. 1. Changes in frequencies of obesity, asthenia and pedes plani in examinees from the city in the years 2005, 2000 and 1995. Years (2005: 1–city, 2 – suburb, 3 – islands; 2000: 4 – city, 5 – suburb, 6 – islands, 1995: 7 – city, 8 – suburb, 9 – islands). Abbreviations: Ob – obesity, As – asthenia, P.plani – pedes plani. * $p < 0.05$.

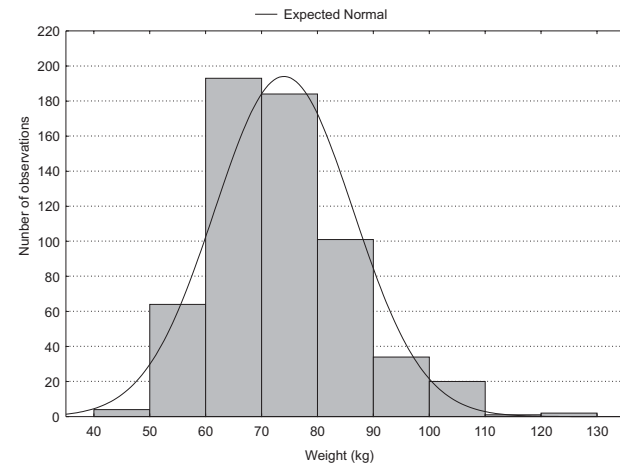


Fig. 3. Changes in the body weight of city recruits examined in the years 2005, 2000 and 1995.

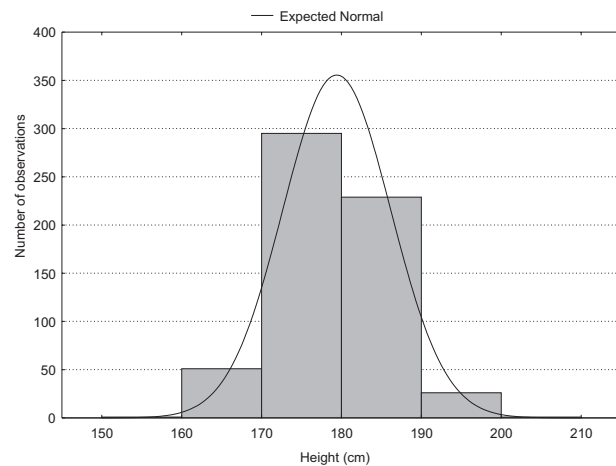


Fig. 2. Changes in the mean height of city recruits examined in the years 2005, 2000 and 1995.

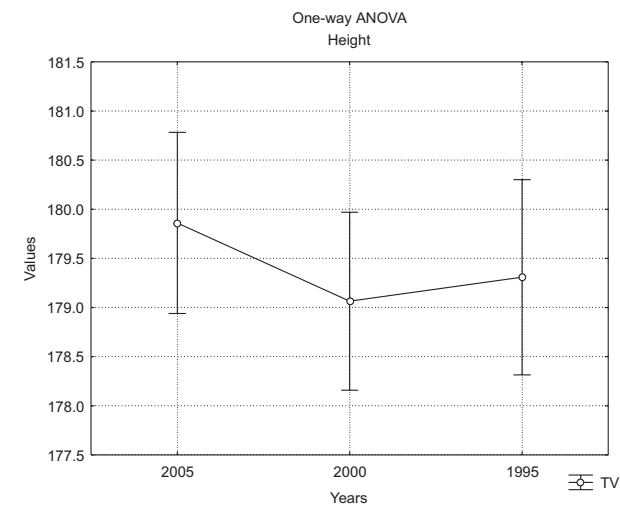


Fig. 4. Comparison in heights measured in different years in all recruits.

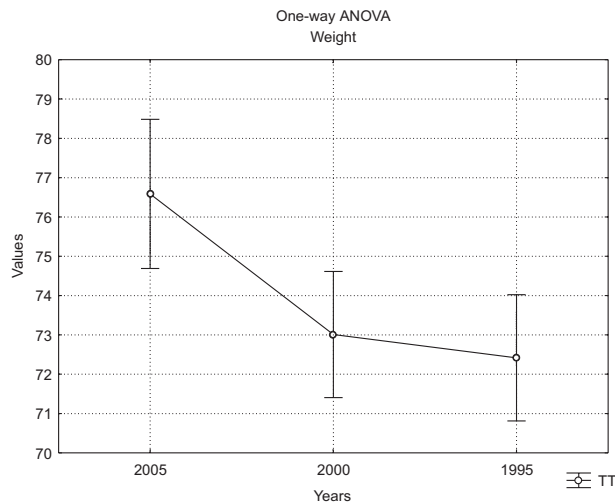


Fig. 5. Comparison in weights measured in different years in all recruits..

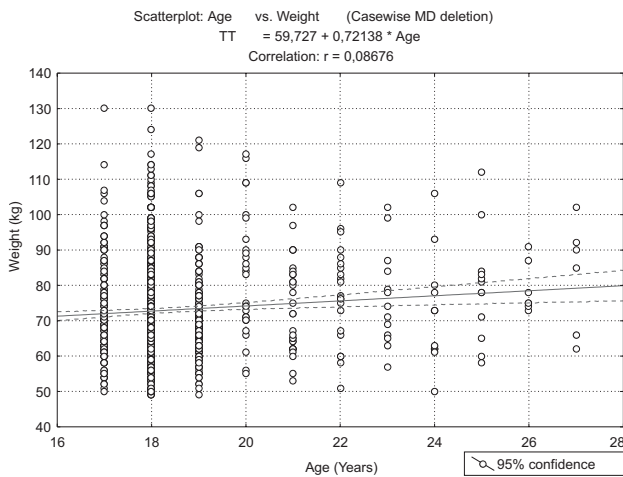


Fig. 6. Linear regression analysis and correlation coefficient between the age and weight of examinees.

Recruits from suburbs

During the years 2005, 2000 and 1995 we examined also 432 recruits from suburbs (transversal analysis, N=432, Table 1). Although the difference in recruits in the mentioned years is not statistically significant, the tendency of obesity increase is noticeable ranging from 2.77% in 1995, to 6.94% in 2000 and 9.72% in 2005. By asthenia the suburban recruits did not differ significantly. The year 1995 and 2005 showed the same frequency of 4.16%, while the lowest was in the year 2000 – 1.38%. The recruits from suburbs showed the highest percentage of pedes plani in the year 2000 – 15.27%, the lowest in 2005 – 4.86%, and the frequency of recruits with pedes plani in 1995 was 13.88%, which all shows a considerable statistical significance. Myopia and astigmatism are also the most frequent diagnoses in the recruits from suburbs, which with the frequency from

20-25% do not differ considerably when the years of occurrence are compared. With kyphosis and scoliosis when the years are compared there are no significant differences as the diagnoses show frequencies from 9.72 in 1995, 6.25% in 2000 to 5.55% in 2005. There were fewer cases of asthma and bronchitis in suburban recruits than in city recruits, from 2.77% in 1995 and 2000 to 1.38% in 2005.

The frequency of hypertension diagnoses was insignificant: from 0% in 2005 to 2.08% in 1995 and there were no major differences. The situation with right block branch diagnosis was different where the difference was considerable with highest frequency of 7.63% in 2005.

Recruits from islands

In the course of the years 2005, 2000 and 1995 were examined 186 recruits from the islands (transversal analysis, N=186). Recruits originated from islands by diagnosis obesity statistically differ significantly ($p < 0.05$), the lowest frequency of the obese being 3.26% in 1995. Asthenia diagnoses increase considerably in 2005 so that frequency of very thin recruits grows to 8.69%. By diagnosis pedes plani in the three examined time periods islanders do not differ significantly. The diagnosis frequency was 19.56% for 1995 and 2000, and it diminished to 9.78% for the year 2005. By diagnosis kyphosis and scoliosis islanders differ significantly. The presence of the diagnosis with the year 2000 recruits was 2.17%, much higher in 1995 – 13.04%, and even higher in 2005 – 14.13%. Although the recruits do not differ considerably by diagnosis asthma and bronchitis, 2005 showed the increase of the diagnosis to 5.43% compared to 2.17% in 1995, and especially to 1.08% in 2000. The frequency of hypertension in island recruits is insignificant, while the presence of branch block is somewhat higher, reaching the highest frequency of 5.43% in 2005, so that by this diagnosis islanders do not differ statistically significantly.

Results comparing 437 recruits within the year 2005 regarding residence (city, suburb, islands)

Within the year 2005 the same parameters were examined in 201 city recruits, 144 suburban and 92 island recruits. They do not differ significantly by obesity, though the frequency of the obese in the city of 5.04% is noticeably higher than obesity frequency in the islands of 0.92% the same year. The percentage of thin recruits is the lowest in the city – 0.45%, while in the islands it is 1.83%, which makes a considerable statistical difference. Islanders have only 2.05% of pedes plani, which differs them notably from city youth with 7.09% of such diagnoses (Figure 7). By other somatic diagnoses the young regarding residence within the same year do not differ significantly.

Results comparing 437 recruits within the year 2000 regarding residence (city, suburb, islands)

Within the year 2000 recruits by the place of residence show fewer differences. As for obesity there are hardly any differences among islanders, suburban and

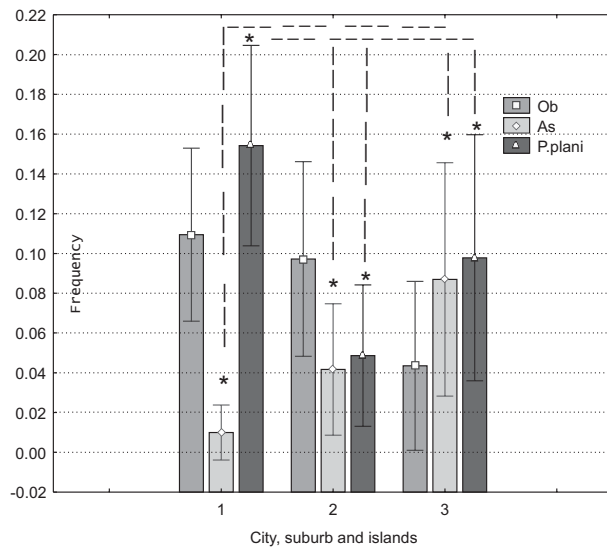


Fig. 7. Changes in frequencies within of the year 2005 according to the diagnoses of asthenia and pedes plani showed significant difference, $*p < 0.05$. Abbreviations: Ob – obesity, As – asthenia, P.plani – pedes plani.

city recruits, and with asthenia the situation is similar. Only by pedes plani the examinees show statistical difference, the highest percentage of pedes plani – 5.04% show the recruits in suburbs.

Results comparing 437 recruits within the year 1995 regarding residence (city, suburb, islands)

Within the year 1995 there were no statistically significant differences in the examined parameters in recruits. Nevertheless, there was the highest percentage of obese recruits in the city – 2.28%, which is much higher but not statistically significant than in those from the islands – 0.4%).

Discussion

The study results have been almost identical by some parameters to the latest results obtained in developed West-European countries¹⁶. In our country since 1995 when the city examinee sample showed 4.97% of obese recruits till the year 2005 when it was 10.94% obesity has more than doubled. The Center for Disease Control and Prevention in USA published the results of their study, which reached back somewhat more than ours, and it found that the number of obese teenagers trebled in the last 20 years. Obesity is obviously becoming pandemic and the health system must oppose it first of all by introducing intensified physical activities, which will prevail over the sedentary life routine of the young¹⁷. Increased physical activity influences considerably diminishing of BMI and adiposity¹⁸. According to our study the largest number of obese recruits come from the city, beginning with 1995, then also in 2000, to the final analyzed year 2005 when their number is the largest and they statistically differ significantly from their peers within the same

year, but also from those in suburbs and on the islands. It is hard to say why it is so. Namely, one can suppose that the young in the city have less physical activities than their peers in suburbs and islands, and it has been proved that the young who are physically more active in the city than their inactive city peers have substantially fewer obesity diagnoses¹⁹. Furthermore, »educational immigration« from small places and islands into city must also be considered. The young come to the city to school or university. That leads to changes in their life, discontinuation of physical activities, the new, unfortunately unhealthy diet, fried food, diet rich in fat with little vegetables and fruit, which way cause obesity, similar to the changes in the health of the workers immigrating into cities that had already been described²⁰. On the other hand, neither the city dwellers are spared by obesity, especially in families regularly enjoying abundant dinners²¹. Therefore various programs are being designed in developed western countries instructing the whole families to go on diet, take healthy food, cut down on salt and exercise regularly^{22,23}.

Opposite to obesity, in the examined recruits asthenia, i.e. extreme thinness, 30% bellow normal weight, has almost disappeared as a diagnosis in the city, wit frequency of 0.99% in 2005, while in 1995 it used to be 4.97%. With island recruits the result was surprising. Contrary to our expectations the number of asthenic recruits in 2005 has doubled in comparison to the year 1995. The causes cannot be found in the changed economic status of the islands in 2005 compared to the situation 5 or 10 years back. Namely, the islands Krk, Cres, Lošinj and Rab are not far from the city of Rijeka and it has to be mentioned that there are lots of tourists so people gain from tourism, fishing, sheep farming and catering activities. The most probable cause of asthenia double frequency in island recruits is the increase in the temporary moving into the city for educational reasons. While a part of »educational immigrants« gain weight, the others develop asthenia so it could be commonly termed »eating disorders«. Namely, some people, especially young ones, are sensitive to certain sociodemographic factors like single life and leaving home early²⁴. If some of them go in for a demanding sport, requiring intensive exercise and training, it may result in a considerable loss of weight^{25,26}.

Also the highest frequency of foot fallen arches occurs in city recruits, while the lowest is shown in islanders. It must be pointed out that the diagnosis pedes plani was the only one made approximately, i.e. on the basis of physician's experience, without the criterion of exact measurement, unlike all other diagnoses, so minor mistakes may appear but they do not influence the assessment of military fitness. That refers to pedes plani grades II, i.e. noticeably fallen, flat feet. It is supposed that the youth in the islands spend a lot of summertime on pebble beaches and they are ideal for forming young feet. The most dominating diagnoses in the examined recruits are myopia and astigmatism. The frequency of the said diagnosis in all three-time periods is above 20% without ma-

for deviation in occurrence. Again, the high frequency of refractory anomalies in the young occurs in the city. Many of the performed studies found out that myopia is among the leading refractory anomalies and its frequency runs up to 87%²⁷. Only a small number of high myopias are hereditary, connected to specific chromosomes²⁸ and gene mutations²⁹. Majority of refractory anomalies may be influenced by preventive medical measures, like the early detection, prescribing optical aids, regular ophthalmologic checkup, the right lighting of classrooms, working premises and dwellings that are often not lit enough, while city streets are increasingly illuminated which is damaging and unnecessary. From ultraviolet radiation, which is also ever more present because of the damaged ozone layer and may harm the lens back pole, one can be best protected by less exposure³⁰. Wearing sunglasses is also a preventive measure and as it is trendy the youth will accept it more readily than physical activities to fight obesity³¹. What the army really wants are the soldiers that are good marksmen, so what matters are not the degree and type of eye refractory anomaly but keen sight which can be attained by eye aids.

The transversal study of kyphosis and scoliosis frequency has shown that there are no statistically significant differences among city and suburb recruits, and the frequency of vertebral column deformations is relatively high especially in city recruits. Although spine deformations in recruits are not striking, and are not the cause for unfitness for the army, it is possible to prevent it by early detecting, education on proper posture, corrective exercise and in some cases by temporary wearing of spine correctors and fixators. The exceptions are serious spine deformations connected with neuromuscular disorders³² and Scheuermann-like changes of the spine³³.

Asthma and bronchitis are not significantly widespread among recruits regardless of their residence and the examined time periods, and their frequency is always under 5%, with the exception of the year 2005 island recruits whose diagnosis frequency is 5.43%, which is surprising. The increased asthma frequency is a great surprise since the islands are known for pleasant Mediterranean climate, settlements by the sea etc. On the island of Lošinj there is also a health resort with hydroclimatothalassotherapy intended mainly for treating respiratory diseases. On the other hand, asthma increased frequency in island recruits is surprising because the results for the year 2005 show the highest number of asthenic youth on the islands, while it is known that asthma is in positive correlation with obesity and increased body mass index (BMI)^{34,35}. The rise in asthma frequency in the islands in 2005 may be easily explained by the targeted health migrations of atopics from hinterland to the islands for the treatment of respiratory diseases. In spite of the favorable economic status of the islanders that had been mentioned, the migrations of inlanders to the islands causes if only temporary changes, crowdedness, looking for employment, newcomers' socio-economic problems, which may aggravate the exist-

ing atopy with asthma symptoms³⁶. Crowded schools, dirty and unpainted classrooms and inadequate hygiene without measures for prevention of atopy bring about occurrence of asthma³⁷. At recruits' examinations if a person complains of asthmatic or bronchial difficulties it is necessary to perform spirometry, paying particular attention to FEV₁ and FVC values which indicate lung respiratory obstructions³⁸. In recruits with poorer FEV₁ and FVC values a more rapid relapse of respiratory difficulties may be expected³⁹. FEV₁ < 60% may be considered a more severe form of asthma. In unclear cases when assessing fitness for military service radio allergo sorbent testing (RAST) to specific immunoglobuline E (IgE) is recommended⁴⁰. By performing spirometry atopics could be identified during pupils' regular check-ups. By additional tests like allergy and immunotest, performing hypo sensitization, medicament therapy and climatological treatment, the number of recruits with asthmatic symptoms would surely be diminished. Very rarely asthma may be lethal or trigger acute metabolic illnesses⁴¹. Therefore extreme caution is required when assessing an asthmatics' fitness for military service.

As it was the young who were examined, hypertension as a diagnosis appeared in a small percentage of recruits, up to 1.99%, by a transversal analysis and the analysis of the relations within the years. Nevertheless, it takes a longer period of risk factors activity, among which is obesity, for the diagnosis to prevail. By incomplete and complete right branch block diagnosis the recruits also do not differ significantly. In our experience, right branch block is usually only a »cosmetic mistake«, and it is hardly ever that additional cardiology examinations find septal defect or other heart defect, so that such recruits free of subjective impediments and difficulties are completely fit for military service.

On the basis of the analyzed results of the most frequent diagnoses in examinees at occupational medicine, we suggest a set of preventive national and international measures to achieve recruits' enhanced ability for military service. Naturally, medical selection criteria depend on socio-demographic situation in the society, Ministry of Defense and health status of young generations⁴². Furthermore, books of rules for assessing military fitness must be such as not to exclude healthy people from military service. The importance of preventive examinations before joining the army is unquestionable, no matter whether it refers to conscripts or professional units⁴³. Depending on financial means such examinations can be comprehensive or less so. Obviously, some diagnoses are possible only if additional diagnostic instruments are used. Particularly RTG spine examinations are needed when spondylolsthesis, knee disorders and back pains are suspected. Cycle ergometry estimation, Astrand oxygen uptake (VO₂ max) are recommended in all recruits, besides spirometry, but that requires more financial means⁴⁴.

Generally, books of rules should become stricter. Namely, if a recruit had overcome a serious disease, or even a malignant one, primarily in early childhood, and at the

time of recruitment there are neither consequences nor traces of illness nor possibilities of relapse, he should be declared fit for the army⁴⁵.

Then there is a question we will attempt to answer: why should a recruit be refused if his weight is somewhat below or above 30% of ideal body weight? It is known that good military training increases weight, decreases body mass and enhances locomotive performances of anaerobic depending activities⁴⁶. So the answer and recommendation would be, if healthy, regardless of deviation in weight such recruits should be drafted. Some armies have military specialists and nutritionists who are to take care of adequate, energetic but at the same time dietetic food for their soldiers. Only the extremely obese recruits should be refused who because of their weight are prone to injuries but also to illnesses⁴⁷. On the other side, at the professional selection for special services in the army, as in pilots and cadets, candidates must be of specific personal appearance and body built⁴⁸.

Finally, measures for achieving recruits' enhanced fitness for military service have to begin at the end of elementary education. In the final year of elementary

school particular attention should be paid to the diagnoses mentioned in this study. Each youngster should be given his health card to be taken to vocational guidance before starting secondary education. Detailed medical check-ups every year of secondary education would monitor possible diagnoses, correct them by medical measures and they would be entered in the future recruit's health card. In such a program activities of many people have to be coordinated: from occupational medicine specialist (who at the very end of the process examines the recruit), school medicine specialists, gym and other schoolteachers, to parents responsible for their children's diet, control of habits, spare time and recreation. In that way the occupational medicine specialist, as head of recruiting board, would by means of a health card and case history get an insight into what had been done regarding the possible diagnoses. With little financial means, but by stricter monitoring of certain health parameters and timely corrections, a lot could be done at the national but also international level in view of enhancing recruits' fitness for military service.

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MJERE ZA POSTIZANJE VEĆE SPOSOBNOSTI REGRUTA NA PREGLEDIMA ZA VOJNU SLUŽBU – TRANSVERZALNA STUDIJA

S A Ž E T A K

S obzirom na 10.94% pretilih novaka u Rijeci 2005. godine na medicini rada odlučeno je ispitati uzročnost te i drugih najčešćih dijagnoza: spuštenih stopala, miopije i astigmatizma, kifoze i skolioze, astme, hipertenzije i bloka grane. To je učinjeno dvostrukim praćenjem 1311 novaka transverzalnom analizom kroz 2005, 2000 i 1995 godinu i unutar svake godine prema boravištu na: grad, okolna mjesta, otoke. Razlike u tri vremenska intervala u gradu su bile za pretilost ($p < 0.05$) s najvećom učestalosti 2005. godine, za asteniju ($p < 0.05$) s najmanjom učestalosti 0.99% 2005. godine i za spuštenu stopala ($p < 0.05$) s najvećom učestalosti 1995. godine. Kod novaka iz okolnih mjesta nađeno je ($p < 0.05$) za spuštenu stopala, $p = 0.054$ za pretilost, te kod novaka s otoka ($p < 0.05$) za pretilost. Učestalost miopije i astigmatizma bila je iznad 25%, kifoze do 14.13% i astme 5.43%. Učestalost hipertenzije bila je zanemariva. Medicina rada odlučila je reagirati mjerama za povećanje sposobnosti novaka surađujući sa školskom medicinom, nastavnicima i roditeljima, provođenjem pregleda, korekcija, dijeta i fizičkim aktivnostima.