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Effects of Sociopsychological Factors on the Development of Occupational Stress

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Abstract—Materials of the study of sociopsychological factors contributing to the development of occupational stresses are presented. The data show a relationship between the level of work motivation and its physiological cost. Characteristics of stress formation determined by psychoemotional strain related to nonphysical jobs of varying intensities have been determined, and the issue of biological age has been investigated. A faster aging of employees working under emotional loads (direct or indirect responsibility for the safety of other persons) has been found. The study allows some prospective areas for prevention of occupational stress to be developed.

Keywords: sociopsychological factors, job motivation, occupational stress, emotional load, aging rate, prophylactic measures

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One of the most important problems for occupational medicine is the issue of sociopsychological effects on a working individual, and numerous specialists in Russia and abroad focus their efforts to the study of these problems. According to WHO experts, psychosocial factors may contribute to the formation of occupational stress, lead to the worsening of health condition in employees, and decrease the efficiency of occupational performance. Globalization and changes in the nature of labor, i.e., in the relationships within the employer–employee system, have led, in developing countries, to the emergence of certain psychosocial conditions, including occupational requirements, management control, and social support. The contemporary forms of labor that are not infrequently characterized by elevated emotional loads on the neuropsychic sphere carry in their very structure a potential risk of occupational stresses with all negative consequences for an employee's health together with higher risks of faster aging [1].

One of the first monographs on the psychosocial factors and their association with health disorders was that by Kalimo and coworkers [2]. According to literature data, some consequences of high job requirements, low levels of occupational safety, and a low degree of support for employees are reflected in higher risks of developing health disorders [2–6]. In the Russian literature, we can meet studies on psychosocial risk factors for some individual groups of employees in production and nonproduction spheres [7–9].

Recent years have seen attempts to identify the significance of some psychosocial characteristics, such as job motivation and job satisfaction, and offer optimal solutions for the work process organization and reasonable adaptation of the workplace, as well as the harmonization of interpersonal relationships. However, we have insufficient data on the correlation of sociopsychological indicators and the degree of labor process intensity with the physiological characteristics and biological age indicators. It is this correlation that constitutes the subject of this study.

This study was aimed at estimating the significance of psychosocial factors and their contribution to the development of occupational stresses in employees exposed to different types of neuroemotional loads, as well as to offer a system of prophylactic measures.

METHODS

The sociopsychological study was based on two questionnaires developed by WHO experts, which was adjusted to our tasks.

The studies included the professiographic characterization of job intensity for employees and the categorization of hazard classes (using Guidelines R-2.2.2006-05) by analyzing the structure of working activity and scoring each type of workloads [10].

Psychophysiological indicators were recorded three times during a working shift. We evaluated the strength of work motivation using the wellbeing, activity, and mood (WAM) test; the speed of visual and auditory information perception, using chronoreflexometry, and attention concentration using the Landolt broken ring test, subsequently calculating the volume of the information perceived; the condition of short-term memory by testing digital memories; the personality structure by the Mini–Mult, Spielberger, and Eysenck tests. To determine the type of interpersonal corporative behavior, we used the sociometric methodology.

The physiological status of the cardiovascular system (CVS) was evaluated by the heart rate, systolic and diastolic blood pressures, and the Baevsky index for functional changes. The biological age was assessed using the generally accepted methodology suggested by the Institute of Gerontology (Kyiv, Ukraine). The aging rate was assessed as the difference between the actual biological age and the reference biological age.

The sample of subjects of the study belonged to six occupational groups ; they were analyzed and selected with neuroemotional loads taken into account. The significance of psychosocial factors, including work motivation, for the formation of functional condition was evaluated in middle-level managers in the mining industry, trainers from Olympic reserve sports schools, and engineering working in office, as well as engineers and technicians from a military enterprise and couriers from a tourist agency. Analysis of the sample structure allowed us to conclude that the main age category comprised subjects aged 43.80 ± 2.91 years with a professional work record of 17.69 ± 2.19 years. We examined 190 subjects in total.

The results of the study were processed using the Statistica for Windows 6.0 software. The significance of measurements was evaluated using Student's *t* test.

RESULTS AND DISCUSSION

Hygienic assessments showed that, according to the regulation [10] classifying industrial environmental factors according to their level of expression, the working conditions at workplaces correspond to the admissible category, and this gives us grounds to regard shifts in the functional condition of employees as a result of effects of some factors associated with their jobs. The professiographic analysis allowed us to assign the work of engineering and technical personnel of modern offices to class 3 degree 3 (class 3.3) according to the intensity indicators of their work process, that of mining engineers to class 3.2, that of trainers to class 3.1, that of couriers to admissible class 2, that of technicians to class 3.1, and that of engineers to class 3.2.

The results of the survey were aimed to evaluate the frequency of psychosocial factors causing stresses at work. The spread of job stress factors at work associated with expressed neuroemotional loads appeared to be independent of the hazard class based on the corresponding work intensity indicators (Fig. 1).

Job requirements, such as high intensity work and the absence of freedom in actions (i.e., control over work methods, the work intensity and rate, and the order of task performance), while independent decisions on unforeseen tasks were recorded in engineers and technicians in 20.0 ± 10.33% of cases (class 3.3), in mining engineers in 38.20 ± 8.33% of cases (class 3.2), and in teacher trainers in 36.70 ± 8.27% of cases (class 3.1).

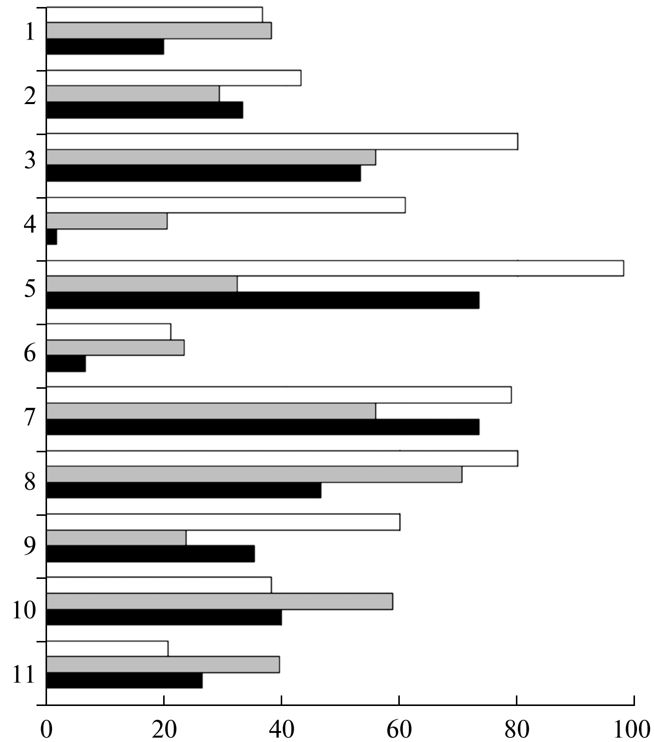

Fig. 1. Distribution of job stress factors. White columns, employees with class 3.1 work intensity indicators; gray columns, employees with class 3.2; black columns, employees with class 3.3. Ordinate shows job stress factors: (1) absence of the freedom for actions; (2) absence of decision-making freedom; (3) absence of the possibility of perfection; (4) absence of support; (5) absence of career promotion; (6) absence of skill development; (7) probability for long-term employment with the same employer; (8) long workday; (9) insufficient information; (10) absence of material interest; (11) unsatisfactory interlink of work and family relationships. Abscissa shows distribution, in percentage.

The exposure to unfavorable factors due to the work process and environment is typical of mining engineers: 50.0% versus 26.6% in engineering and technical office personnel. The employees had much freedom in choosing the time of breaks. However, the employees were not involved in making decisions in 33.40 ± 12.18% of cases in the group of engineering and technical personnel (group I), in 29.40 ± 7.81% of cases in the group of mining engineers (group II), and in 43.30 ± 8.50% in the group of trainers (group III). The possibility of updating and improving unfavorable factors in the work process was absent, respectively, in 53.40 ± 12.88%, 55.90 ± 8.52%, and 80.0 ± 6.86% of cases in groups I, II, and III.

A long working day was noted in the answers as characteristic of work of subjects from groups III, II, and I in 80.0 ± 6.86%, 70.60 ± 7.81%, and 46.60 ± 12.88% of cases, respectively.

A limited support from the curator, higher administration, and colleagues was noted to a greater degree in trainers, which was an obvious shortcoming in the work organization in the given team. Weakly expressed communicability and isolation of workplaces and the inefficient occupational safety system were most distinct at mining enterprises, which predetermined an increased level of direct responsibility for the safety of other persons in mining engineers.

Insufficient career promotion prospects were most expressed in trainers (98.0 ± 2.4%) and engineering and technical office personnel (73.40 ± 11.41% versus 32.40 ± 8.03% in mining engineers and 9.8 ± 1.8% in couriers). The intergroup differences were statistically significant.

Insufficient access to information about personal work contributions, the administration's plans, successes and difficulties, and other corporative news mostly characterized the trainers and the engineering and technical personnel. The absence of financial incentive and satisfaction was mentioned quite frequently by mining engineers (58.80 ± 8.44%) and less frequently by trainers and engineering and technical personnel (38.30 ± 8.34% and 40.0 ± 12.65%, respectively). The difference in the frequency of this psychosocial factor between employees from the professional groups in question may be explained by differences in the nature of emotional loads: their direct or indirect responsibility for the safety of other persons. The unsatisfactory interrelation of job-related and familial relationships was noted mostly by mining engineers. A strained situation in the work team led to a worsening in the relationships in the family, and vice versa. The correlation coefficient in this group between conflicts in the family and the level of emotional load was $r = 0.74$ ($p < 0.05$), whereas the correlation between familial conflicts and the direct responsibility that characterized the job of mining engineers was $r = 0.72$ ($p < 0.05$).

Answering the questionnaire, engineering and technical personnel and mining engineers (groups I and II), whose work was accompanied by high neuroemotional loads, noted the necessity of attention concentration (in 31.8 and 38.55% of cases, respectively), quick and correct perception of information (25.0 and 20.5%), memorizing a large volume of auditory (12.5 and 23.1%) and visual (12.5 and 20.5%) information, and performing simultaneous activities (28.2 and 43.7%). Working under the conditions of interfering noises (25%), erratic work load (43.8%), quick adaptation to changing situations (25.0% of positive answers) appeared to be the most characteristic of the engineering and technical personnel. Trainers (group III), whose work is associated with lower neuroemotional loads, noted, among all work constraints, only the necessity of quick and accurate perception of information (in 28.6%) and simultaneous performance of several activities (in 42.9% of cases).

According to the survey results, the proportion of persons complaining about job-related stress grew with increasing work intensity. Stress situations used to emerge weekly and several times a week in 28.6% of trainers, in 38.4% of mining engineers, and in 56.2% of engineering and technical personnel; i.e., a highest frequency in the development of stress situations corresponded to a higher hazard class according to the work intensity indicators.

The parametric correlational analysis of interrelations between work stress factors and work motivation has shown that the dependence on work motivation in the majority of the studied signs was stronger than their interrelation with work satisfaction. The work motivation proved to be interrelated with almost all job stress factors, and the correlation was, as a rule, negative (Fig. 2).

The work motivation indicator is significantly related with occupational constraints ($r = -0.79$; $p < 0.05$), the degree of control over the work process management ($r = -0.78$; $p < 0.05$), specificities of interpersonal relationships ($r = -0.49$; $p < 0.05$), the possibilities of career promotion ($r = -0.74$; $p < 0.05$), the working schedule organization ($r = -0.81$; $p < 0.05$), the role of the company and information ($r = -0.94$; $p < 0.05$), the financial incentive ($r = -0.69$; $p < 0.05$), and the specificities of interrelations between work and family duties ($r = -0.91$; $p < 0.05$). Analyzing the interrelations between psychosocial factors and work satisfaction, we revealed a reduced number of significant pairwise correlations (29.2% versus 79.2%) and a decrease in their values ($r = 0.21$ versus $r = -0.79$; $p < 0.05$).

The level of work motivation decreases when the work is associated with neuroemotional loads. The lowest prior-to-work values of motivation were exhibited by the engineering and technical personnel. The weekly dynamics of the indicator for work motivation was as follows, depending on the level of work intensity (WI): 5.10 ± 0.22 points in the engineering and technical personnel (class 3.3); 5.50 ± 0.17 points in the mining engineers (class 3.2); 5.54 ± 0.21 points in teacher trainers (class 3.1); 6.04 ± 0.15 points in couriers (class 2). The differences between the motivation indicators in engineering and technical personnel and couriers are statistically significant ($p < 0.05$). The shift average indicator level was also lower: 4.81 ± 0.21 points in engineering and technical personnel; 5.14 ± 0.18 points in mining engineers; 5.31 ± 0.16 and 6.05 ± 0.19 points in teacher trainers and in couriers, respectively (the differences are significant, $p < 0.001$). The shift dynamics showed a 9.1% decrease in the work motivation in mining engineers (class 3.2) after 4 h and a 10.6% decrease ($p < 0.05$) after 8 h; in engineering technical personnel (class 3.3), this decrease was 13.3% after 8 h of work ($p < 0.05$). At the same time, worsening of the work motivation was nearly absent in couriers (class 2).

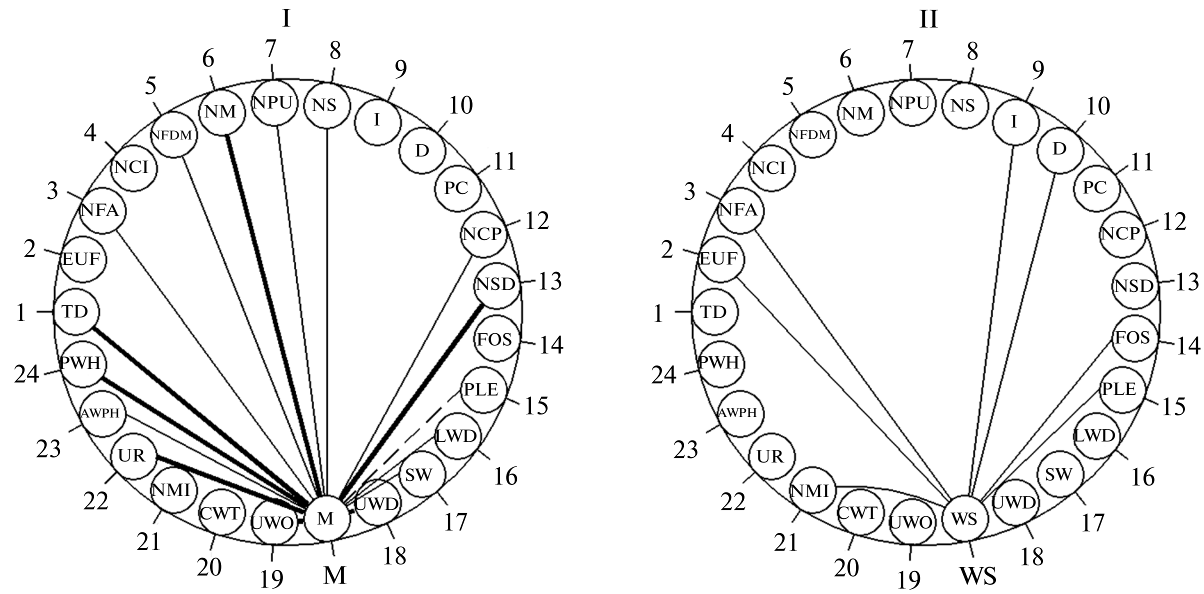

Fig. 2. Correlations of work motivation (M) (I) and work satisfaction (WS) (II) with the frequency of job stress factors. Continuous thin line, negative correlation with $-0.44 < r < -0.80$; continuous thick line, negative correlation with $r > -0.80$; dashed line, positive correlation with $0.44 < r < 0.80$. The figures along the perimeter designate the ordinal numbers of the factors. TD, time deficit; EUF, effect of unfavorable factors of work process; NFA, no freedom of actions; NCI, no free choice for setting time intervals between shifts; NFDM, no freedom in decision making; NM, no meetings; NPU, no possibility of upgrading and improving your workplace; NS, no support; I, isolation and weak communication; D, discrimination; PC, pressure of customer; NCP, no career promotion; NSD, no skills development; FOS, failures in operational safety; PLE, probability of long-term employment at the same place; LWD, Long working day; SW, shift work; UWD, unfixed working day; UWO, unclear work orders; CWT, contradictory work tasks; NMI, no material interest; UR, unsatisfactory work–family relationships; AWPH, available workplace at home; PWH, preference of working at home.

Comparative analysis of the motivation dynamics in employees with different levels of work intensity allowed us to conclude the following: the lower the class of operational conditions as estimated by the indicators of work intensity, the more expressed the motivation for achieving success ($p < 0.05$); and the higher the hazard class, the more expressed is the motivation for avoiding a failure ($p < 0.05$). This relationship is evidenced by the calculated correlation coefficients: for the first case, $r = 0.85$; ($p < 0.05$); for the second case, $r = 0.64$; ($p < 0.05$) (Fig. 3).

Among the factors determining a low work motivation are unfavorable interpersonal relationships in the team. Sociometric data allowed us to establish that the motivation was low in those teams where the official structure was partitioned into a considerable number of microgroups (two or three persons in each); the communications consisted, in general, of dyads and triads; unilateral choices were more than 45–60%, while mutual positive choices were less than 15–20% of the total number; the percentage of employees chosen by nobody exceeded 10–15% of the total membership of the team.

It has also been established that work motivation was lower in the teams directed by unpopular official team leaders. Employees with high motivation were less inclined to collaborate, more rarely helped to colleagues and clients, did not feel any need to upgrade their qualification, considered their work uninteresting and more often applied complaints.

The results of physiological investigations showed that at the level of work intensity corresponding to class 3.1 the employees exposed to neuroemotional work intensity associated with indirect responsibility for the security of others used to develop a state of job-related stress. This is characterized by steady levels of the main functions of the central nervous system (CNS) defined by three elements: efficiency, stability, and reliability. For example, the pre-workday efficiency of short-term memory (the number of figures remembered) in trainers was 6.40 ± 0.21 versus 6.55 ± 0.22 at the end of work. The stability of the function ranged within 3.2%. The levels of another indicator of the function of short-term memory, reliability, were also sufficiently steady. Similar data were obtained on the function of attention and perception of common information. As noted above, the state of strain of the body was characterized by a small number of intra- and intersystem (CNS–CVS) correlations. A subsequent increase in the number of significant correlation coefficients (66.7% versus 25.0%) between the CNS indicators was revealed at the second degree of work intensity in mining engineers. This is accompanied by a growth in the quantitative values of work intensity: 0.59 points for class 3.2; 0.46 points for class 3.1; and 0.38 points for class 2. The results confirm a higher

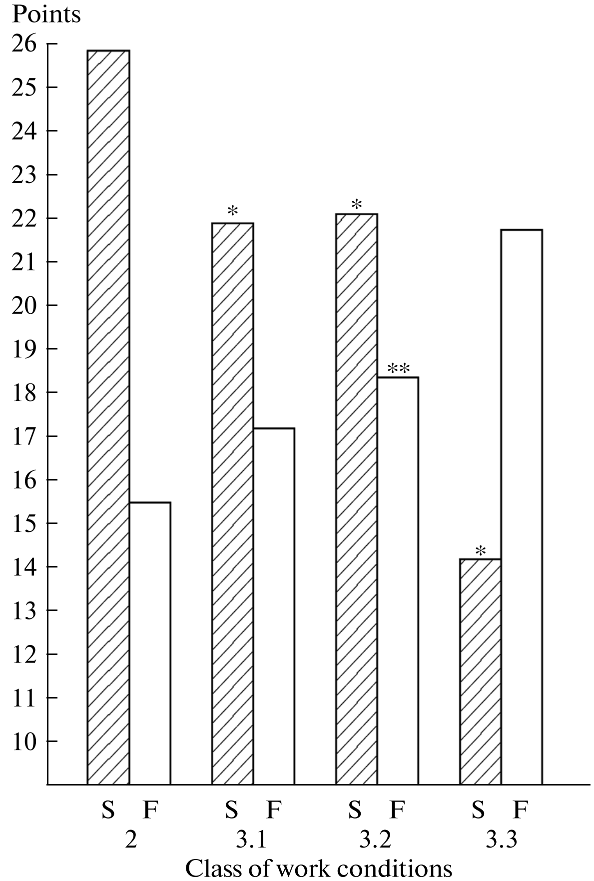

Fig. 3. Correlation between success motivation (S) and failure avoidance (F) in employees with work conditions described by different classes of intensity indicators. Abscissa shows the class of work conditions: (2) couriers; (3.1) trainers; (3.2) mining engineers; (3.3) engineering and technical personnel. * and ** Statistically significant ($p < 0.05$) differences from class 2.

psychological stress in mining engineers and reflect the adaptation of the body to changing conditions and its transition to a new level of functioning through intensifying integrative processes. At the same time, we observed growth of intersystem links (from 37.5% to 62.5%), which is interpreted as an increase in the degree of job strain [11].

The accumulation of job strain is accompanied by growing quantitative values of strain and leads to the formation of the second-degree strain at work, which we observed in mining engineers (class 3.2). The second-degree job strain is more manifested in the prevalence of activation processes in the autonomic functions. For example, the level of diastolic blood pressure in the group of mining engineers during their workday usually increased from 87.30 ± 1.15 to 93.80 ± 1.66 mmHg ($p < 0.05$). At the same time, we found a significant number of persons with marginal arterial hypertension, whose blood pressure was determined within the "danger zone" (140/90–159/94 mmHg) in relatively young age groups ranging from 30–39 to 40–49 years.

The study of specific psychological traits has revealed among mining engineers the prevalence of persons with elevated levels of trait or state anxieties (52.6 and 73.7% of the total number of the subjects, respectively) compared with the engineering and technical personnel (42.8 and 21.4%). The manifestation of such a personal specificity at work associated with direct responsibility for the security of controlled personnel may play a negative role in developing arterial hypertension in mining engineers.

In the case of high-strain jobs (class 3.3), the CNS functional activity was found to decrease towards the shift end against a background of relatively high shift average and pre-workday levels of the indicators. The initial values of physiological indicators with the degree of job strain corresponding to class 3.3 were at the same level or even higher than for classes 3.2 and 3.1. For example, the pre-workday attention concentration indicator, defined as the volume of perceived information, in the engineering and technical personnel was 1.50 ± 0.10 bit/s and was higher than in mining engineers and trainers (1.35 ± 0.11 bit/s and 1.40 ± 0.14 bit/s, respectively). Their shift average indicator was also higher: in the engineering and technical personnel, it was 1.46 ± 0.11 bit/s, while the attention performance of mining engineers and trainers was, respectively, 1.31 ± 0.10 and 1.38 ± 0.14 bit/s.

The shift dynamics showed a 5.2% reduction in the attention concentration of mining engineers (class 3.2) and a 20.0% reduction ($p < 0.05$) in the attention of engineering and technical personnel (class 3.3), which exceeds physiological norms for standard human strain values and points to a substantial reduction in mental workability.

Unfavorable changes were also revealed by the functional indicators for short-term memory and the latent period in ordinary visuomotor and auditory–motor responses. The dynamics of changes in the main CNS functions in "passing" from class 3.2 to class 3.3 points to the formation of condition, such as the overstrain, which was accompanied by a pathologically elevated level of excitation linked to a weakening in conditional inhibition, on the one hand, and a quick breakdown of nervous excitation, on the other hand.

The increased degree of job strain and developing the state of overstrain in engineering technical personnel (class 3.3) are manifested in decreases in the functional capacities of the blood circulatory system (estimated by the index of functional changes) and in developing unsatisfactory adaptation of the body to workloads. An increase in the physiological cost of work is reflected in worsened subjective health assessment towards the shift end (a 18.2% decrease in self-assessed health state, 15.8% in activity, and a 15.6% decrease in mood compared to the baseline) and growth of the number of general tiredness complaints

(90.0% versus 40.0%), compared to the admissible loads in the group of couriers.

The outcomes of physiological investigation and their correlation with psychosomatic factors have shown that among the analyzed professions the highest correlation was found in work motivation and work satisfaction. The quantity of significant coefficients and their values increased with the degree of work intensity. The results revealed links between work motivation ($r = -0.92$; $p < 0.05$ for class 3.3 versus $r = -0.18$; $p < 0.05$ for 3.1) and the efficiency of short-term memory ($r = 0.66$; $p < 0.05$ in the former case; and $r = 0.21$; $p < 0.05$ in the latter case). According to the regression analysis data, the contribution of work motivation to the state of the index of functional changes in the circulatory system in extremely intensive labor (class 3.3) was 83.9%, and only 13.7% was related to work satisfaction, while the state of short-term memory efficiency was 43.7 and 1.0%, respectively. The growing effect of work motivation on changes in physiological indicators in the process of labor activity reveals its role in the formation of the physiological condition and its possible pressure on the development of occupational stress.

Discrepancies between an individual's chronological and biological ages (BA) were used to evaluate the physiological capacities of the body and assess the occupational risk of faster aging [12]. The main BA indices allowed one to evaluate the effect of intensified working process on the aging rate in different occupational groups and identify the specificity of the workloads that reduced occupational longevity. As a result, quantitative assessment was obtained for the dependence of aging rate on the specificity of a given working activity.

The analysis of group mean values for the reference biological age (RBA) has not revealed any statistically significant differences in the level of this index among persons with different degrees of job strain. The RBA in trainers (class 3.1) and mining engineers (class 3.2) was 48.90 ± 3.84 and 43.03 ± 1.01 conventional years (conv. yrs.), respectively. The expected population average BA in both trainers and mining engineers did not significantly differ from the corresponding group mean calendar age. The trainers and mining engineers were, on average, of the same calendar age (45.67 ± 4.66 yrs. and 41.92 ± 1.16 yrs. ($p > 0.05$)), and their work experience did not statistically significantly differ (20.33 ± 3.08 yrs. and 15.05 ± 1.29 yrs. ($p > 0.05$)). The group of couriers whose work corresponded to the second admissible class was younger, with a calendar age of 23.18 ± 0.73 yrs. The subjects of this group had also a substantially shorter work experience (6.27 ± 0.38 yrs.). Therefore, the main chronological indicators were compared within the group, excluding the aging rate dynamics.

The analysis of the obtained data showed a substantial excess of aging rate in mining engineers compared with trainers and couriers (table). The aging rate was 10.91 ± 0.75 conv. years in the first group, 3.19 ± 1.17 conv. years ($p < 0.05$) in the second group, and 4.90 ± 0.86 conv. years ($p < 0.05$) in the third group. The critical threshold for aging rate between the norm and pathologies, which was equal to 6.1 ± 1.2 conv. years, according to the previously established criteria, was excessed in the group of mining engineers.

As we see from Fig. 4, the statistically significant differences for the aging rates of mining engineers and teacher trainers appeared to find themselves within the age categories of 40–49 and more years ($p < 0.05$). In the age group of 20–29 years the aging rates in mining engineers substantially exceeded the analogous indicators in teacher trainers (11.56 ± 2.47 conv. years and 6.64 ± 0.07 conv. years, respectively), although the differences between the groups were nonsignificant ($p > 0.05$) In the group of teacher trainers (class 3.1) the greatest divergences between BA and ABA were found in the age category of 20–29 years, which is explained by the adaptation to new working conditions and nature of activity. The aging rate indicators decreased in subsequent age periods: they were 0.73 ± 0.18 conv. years at the age of 40–49 years and 3.58 ± 0.65 conv. years at the age over 50 years. The highest aging rates were revealed in mining engineers in the age group of 20–29 years (11.56 ± 2.47 conv. years). However, no noticeable decrease in aging rate has been found in subsequent age periods. The indicator in question was 11.18 ± 1.60 conv. years in the age period of 30–39 years, 10.58 ± 1.08 conv. years in 40–49 years, and 11.21 ± 2.19 conv. years in the age group over 50 years (Fig. 4).

A sufficiently high and steady aging rate in mining engineers that exceeded the critical threshold might be caused by their exposure to heavy neuroemotional loads associated with direct responsibility for the safety of other persons.

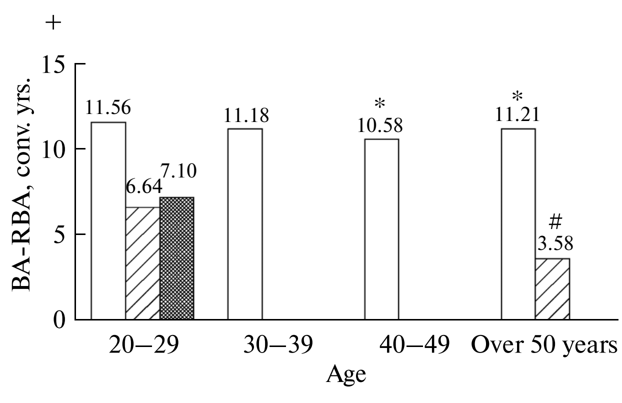

Fig. 4. Correlation between the aging rate and the chronological age of the studied professional groups. BA, biological age; RBA, reference biological age. Light columns, mining engineers; hatched columns, trainers; dark columns, couriers. # Significant difference from the previous age category ($p < 0.05$); * Significant difference from the group of trainers ($p < 0.05$).

The main and derivative indicators for the biological age of employees with different degrees in the nervous and emotional job strain

Indicators	Mining engineers	Trainers	Couriers
Calendar age, years	41.92 ± 1.16	45.67 ± 4.66	23.18 ± 0.73
Work experience, yrs.	15.05 ± 1.29	20.33 ± 3.08	6.27 ± 0.38
Biological age, conv. yrs.	53.94 ± 1.26	44.05 ± 3.76	33.23 ± 0.62
Reference biological age, conv. yrs.	43.03 ± 1.01	48.90 ± 3.84	28.32 ± 0.46
Aging rate, conv. yrs.	10.91 ± 0.75*	3.19 ± 1.17*	4.90 ± 0.86*

* $p < 0.05$, compared to the group of mining engineers.

With longer professional employment, the aging rate decreased in the groups of trainers, whose job corresponded to class 3.1, and couriers (the second admissible class). The highest aging rate values were found in trainers within the first five-year employment period and were 6.91 ± 0.25 conv. years, but these indicators significantly decreased to 0.23 ± 0.01 conv. years in the employment period of 20 to 24 years and slightly increased in the period of over 25 years of employment (3.73 ± 0.05 conv. years, $p < 0.05$). The aging rates in couriers within the initial five-year employment period were also the highest, 9.07 ± 0.97 conv. years, and statistically significantly decreased in the subsequent period of 5–9 years (3.24 ± 0.71 conv. years, $p < 0.05$). The aging rate dynamics is almost absent in mining engineers. In the initial five-year period of their employment, this indicator was 11.63 ± 1.41 conv. years, whereas in the 5- to 14-year period this value was 10.26 ± 0.82 conv. years, 13.61 ± 2.32 conv. years in the 15- to 19-year period, and 10.74 ± 1.40 conv. years in the period of 20–24 years. The obtained results evidence accelerated aging in the personnel belonging to the professional group of mining engineers (Fig. 5).

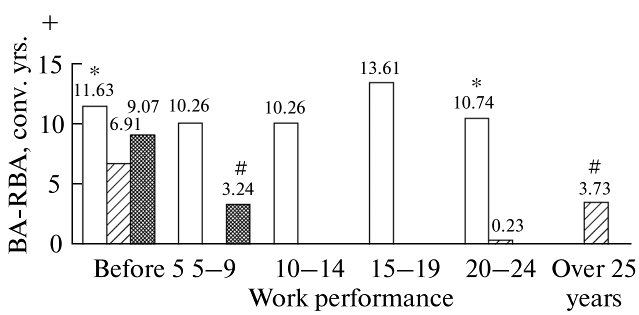

Fig. 5. Aging rate dynamics, depending on the work performance of employees from different professional groups. Abscissa shows the work performance, years. See Fig. 4 for the other designations.

The analysis of correlationals between the indicators of biological age, psychophysiological characteristics, and the factors of work intensity has revealed statistically significant ($p < 0.05$) correlation coefficients (r) for emotional load in 88.2% of cases. The indicator of direct responsibility for the safety of other persons is significantly ($p < 0.05$) interlinked with psychophysiological indicators in 76.5% of cases, while the indirect (mediated) responsibility indicator, in 47.1% of cases. The indicator of direct responsibility for the safety of other persons is significantly ($p < 0.05$) associated with psychophysiological indicators in 76.5% of cases, while the indicator of indirect (mediated) responsibility is associated only in 47.1% of cases. A direct responsibility plays the main role in the majority of cases in the combination of "direct" and "indirect" responsibility factors. Especially interesting is a high level of correlation between the indicator of aging rate in different age periods and the emotional load, a criterion of the integrated value of job strain based on the indicators constituting this value, namely, direct and indirect responsibility for the safety of other persons. The main types of loads (intellectual, sensory, monotonous, and work schedule) were statistically nonsignificantly dependent on aging rate, one of the indicators of biological age.

The obtained results allowed us to reveal the emotional role of job intensity in the premature aging of the personnel belonging to the surveyed category and substantiate the measures for the prevention of occupational stress and the optimization of work in professions with heavy emotional loads.

Preventive measures against an employee's state of stress should be aimed at reducing the work intensity through optimizing interpersonal relationships in order to provide a reasonably high level of labor motivation and its efficient orientation. It is necessary also to consider the issue about the participation of medical psychologists in preliminary and periodical medical checkups of the personnel with high neuroemotional loads and elevated responsibility for the safety of other persons.

CONCLUSIONS

(1) Sociopsychological preconditions for the emergence of occupational stresses at work associated with high emotional loads and high responsibility (direct and indirect) for the safety of other persons are the following: frequent stress situations at work, unfavorable interpersonal relationships in a team, a low level of wok motivation, and specific psychological traits, in particular, anxiety and neuroticism.

(2) The most significant job stress factors are the following: working under the condition of time deficit, insufficient involvement of an employee in the work process management, absence of career prospects, absence of possibilities for upgrading and improving the work process, and the contradictoriness of work tasks and work roles.

The degree of correlation of job stress factors on work motivation is higher than their dependence on work satisfaction.

(3) Work motivation in jobs associated with high neuroemotional loads is characterized by low shift average and prestart levels of indicators, a negative dynamics during working shifts, and the failure-avoidance orientation.

(4) Employees with high levels of emotional loads (direct or indirect responsibility for the safety of other people) develop occupational stresses through a succession of transitions of the body functional states to the first- and second-degree work strain and overstrain against a background of negative dynamics of work motivation and a high dependence on psychosocial factors. The emotional load (direct or indirect responsibility for the safety of other persons) is the leading factor of accelerated aging for employees.

(5) Prospective areas of work optimization in professions with high emotional loads are the following: decreasing the job stress factors as a result of rational work organization, creating a favorable psychological climate in the organization, skill upgrading in employees, and changes in the orientation of work motivation.

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