Original article

The Pre-Nosological Diagnostics of Integral Health of a University Professor

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Abstract:

Objective: In accordance with the WHO, health is defined as integral, consisting of physical, mental, and social components that are closely interrelated and reliably correlated. Thus, the health condition of 168 university professors (39 men and 129 women) was examined. ***Materials and methods***: They were divided by age into 3 groups (group 1 – 23-39 years old, group 2 – 40-59 years old, group 3 – 60 and above). The physiological rates were evaluated during the autumn term, and the questionnaire was conducted during the spring term (2018-2019). Professional motivation was chosen as an indicator of the social health of a professor (the method of K. Zamfir in the modification of A. Rean). The mental health of the survey participants was assessed by the level of occupational burnout (the method of K. Maslach and S. Jackson modified by N.E. Vodopyanova). ***Results and Discussion***: The level of physical health was determined by estimating the biological age (BA) and comparing it with the standard population rate (the express method of V.P. Voitenko). The motivation of the professors is complex and expressed in different ways. It directly depends on gender and work experience. Professors of all ages are more or less susceptible to the syndrome of occupational burnout.***Conclusion***: According to the BA rate, the organism of young men strongly reacts to unfavorable factors of the educational process, but it adapts with age and work experience. The organism of women has a similar dynamic, but less negative reaction. In addition, the male aging is 1.6 times more accelerated than female aging. The methodological approach used provides a big picture of the integral health of a university professor.

Keywords:biological age;burnout; integral health;male and female health;motivation;pre-noso logicaldiagnostics;universityprofessors;university work record.

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Introduction:

The health definition is formulated as integral, consisting of closely interrelated physical, mental, and social components[1]. A coherent and integral assessment of health implies the complex analysis of the organism and an individual [2]. While behind the designation of the World Health Organization (WHO), people can be indicated healthy only when their physical, social and mental condition is within the normal range. It is necessary to take into account

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not only somatic, but also mental characteristics of a person, such as the moral-volitional system and motivative set of values. Studying motivation of the behavior that leads to positive and negative health changes is important as well, since it determines the effectiveness of work.

Motivation plays an essential role for successful professional activity at the university[3]. The motivation process of any human being is an advanced and complex mental function, systematically constructed and carried out both consciously and arbitrarily. The systematic structure of motivation implies the cooperative work of all mental processes (emotional-volitional and cognitive), forming an impulse for an action through internal and external factors. The functional condition of the organism (fatigue, illness) and the emotional state of an individual can play a decisive role in the motivation formation. The level of self-esteem, personal ambitions, the desire to avoid failure or get the highest result can also significantly affect motivation[4]. Occasionally, the behavioral activities of both an individual compelled to conform to the expectations of society and an individual considering their own activity as meaningful are similar. Therefore, it is difficult to evaluate whether the external activity of a person is motivated by inner will or social pressure. This situation can be described in terms of external and internal motivation. Accordingly, the study is aimed to find out the motivational complex which guides a professor[4-6].

As mentioned above, motivation may have a different cause, including emotional tensions, which may be expressed in chronic stress or emotional burnout. WHO describes three symptoms of burnout at work as follows: a feeling of general exhaustion or absence of energy; a feeling of psychological distance from work, negative or cynical attitude towards work; decreased work efficiency [1]. There are many studies devoted to the burnout of office workers [7-9], teachers,[10-12], medical workers[13,14]. Recent studies of universityteachers' burnouts [15-18] prove the presence of these symptoms in a large number of examined patients.

A large study by the American analytics and advisory company Gallup, Inc. states that an occupational burnout syndrome (OBS) can lead to psychosomatic disorders or illness[19]. According to the results of the conducted experiment, professional burnout is the reason for the majority of sick leave among employees (63%). Moreover, 23% of people end up in the emergency room due to stress, fatigue, and work overload [19].It is scientifically proven that the condition of a human organism between health and disease, i.e., the borderline pre-nosological state can be evaluated by measuring the biological age. The relative value of the obtained results reflects the degree of aging of an individual in comparison with the population and, consequently, the level of physical health or pre-illness [20].

Thus, logically, the aim of this study is to determine the level of integral health and identify risk groups of university professors taking into account gender and age. Such an approach to health research has not been used in any previous studies. Although pre-nosological research of education personnel's health by its individual components is quite extensive, it does not frame the concept of integral health of a university professor.

Methods and materials:

Participants

The study population is 168 teachers (39 men and 129 women), who were divided by age into 3 groups. Group 1 consisted of people 23 to 39 years, group 2 – 40-59 years, the group 3 – 60 years and older. The physiological indicators were measured during the autumn term, and the questionnaire was conducted during the spring term, respectively (2018-2019).

Research method

Professional motivation has been chosen as an indicator of the social health of a university professor. The methodology, intended to study the structure of motivation for work, has been developed by K. Zamfir (K. Zamfir in the modification of A. Rean)[20]. According to the methodology, this structure consists of 3 components: internal motivation (IM), external positive motivation (EPM) and external negative motivation (ENM). When the activity itself is important for an individual, it is the internal type of motivation. The opposite in meaning is the concept of external motivation. Here, the driving force is a person's desire to gain both material (salary) and non-material (respect) advantages. For its part, external motivation includes 2 types of motives: external positive (more effectiveone) and external negative.

Procedure

Based on the obtained data, motivational complexes were estimated. The optimal balances are IM > EPM > ENM and IM = EPM > ENM, where IM is high; EPM is equal to internal motivation or lower, but

relatively high; and ENM is very low and approaches 1. Based on the results obtained, the motivational complex of an individual was determined as a ratio of three types of motivation: IM, EPM and ENM.

The level of physical health was determined by calculating the biological age (BA) of a professor, comparing it with the value of the population standard (V.P. Voitenko express method) [20]. The calculation of the BA rate included a mathematical equation using a number of physiological indicators and self-assessment of health by a special questionnaire. Then the individual aging rate was calculated. This approach made it possible to rank people of the same calendar age by the level of "age deterioration" and, consequently, by the "health reserve" (ranks I and II – delayed aging, III – BA corresponds to the population standard, IV and V – accelerated aging).

According to the method used (K. Maslach and S. Jackson, modified by N. E. Vodopyanova[16]), the main criterion for assessing the psychological state of teachers of higher educational institutions was the level of professional burnout. There is even such a concept as the syndrome of mental burnout, which consists of a decrease in personal achievements (low self-esteem, negative attitude towards official duties), depersonalization (negative attitudes or increased dependence on others) and emotional exhaustion as its main element (emotional oversaturation, feelings of indifference).

Ethical Clearance: The authors declare that the work is written with due consideration of ethical standards. The study was conducted in accordance with the ethical principles approved by the Ethics Committee of Federal State Budgetary Educational Establishment of Higher Education "E.A.Buketov Karaganda University" (Protocol № 13 of 27.09.2022).

Results and discussion:

The survey results are displayed in Table 1. IM as the most effective for comprehending and transmitting knowledge to students, was peculiar for 83.5% of professors. The predominance of EPM reflecting the desire for career growth was characteristic of a small number of the survey participants, only 7.85%. At the same time, the predominance of ENM in 8.95% of teachers was noted (Table 1). This type of motivation indicates the necessity to conduct professional work (the need to earn money, the desire to avoid censure, etc.).

Table 1. The professional motivation of university professors considering gender (%).

Dominating type of motivation	Total (n-168)	Men (n-39)	Women (n-129)
IM ≥ EPM >ENM	83.5	93.2	74.1
IM < **EPM** >ENM	7.85	3.12	12.4
ENM> IM > EPM	8.95	3.13	14.8

One of the aims of the study was to find out whether there is a difference between male and female motivation for professional activity among professors. The results are shown in Table 1. Calculations showed that 92.3% of men and 74.1% of women teaching at the university were characterized by equal internal and external positive motivation. Moreover, the predominance of external positive motivation over other options was more common for women (12.4%) than men (3.12%). It can be considered as a desire for career growth and financial incentives, since it is much more difficult for women to get. At the same time, it was found that external negative motivation was 4.7 more likely to appear for female professors (14.8%) than for their male colleagues (Table1).

Next, the data obtained from professors were analyzed considering age. The results showed that the majority of men in the age group 1 (23-39 years) were characterized by the predominance of internal motivation over external positive and external negative motives (Table 2). Thus, for 83.3% of the male subjects, an optimal attitude to the work performed and a sufficiently high motivational force were characteristic.

In the group of women, this factor is common for 55.6% of all respondents. At the same time, the proportion of female professors with EPM, i.e., financial incentives, turned out to be almost twice as large as men (29.7% vs. 16.7%). Social or material motives determine the performance of work and form an attitude towards work. It should be noted that in the higher education industry there are relatively more women than men and, especially at a young age, they are required to make additional effort for career growth. This is displayed in the data obtained.

Table 2. The professional motivation of male and female university professors at the age of 23 to 39 (%)

Dominating type of motivation	Total (%)	
	Men (12)	Women (38)
IM≥ EPM > ENM	83.3	55.6
IM <**EPM**> ENM	16.7	29.7
ENM > EPM > IM	0	15.6

The further survey showed that 15.6% of the female professors had a low level of motivation and a negative attitude towards their professional activity. This may be due to personal characteristics, such as wrong choice of profession, when knowledge, abilities and skills are not implemented sufficiently, tense social environment at work, etc. (Table 2).The results indicate that in the age group of 23 to 39, the male and female motivation vary. Internal motives prevailed for men and external motives, both positive and negative, prevailed for women.

The study of the age group of 40 to 59 years (Table 3) revealed certain similarity with a previous age group. Most male subjects (69.0%) were characterized by the predominance of internal motivation over external positive and external negative motives. For 54.9% of women of this age range, an adequate attitude to the work performed and a sufficiently high motivation were also characteristic. That is, in comparison with the age group of 23 to 39 the predominance of internal motivation for women decreased slightly, but the number of men with this characteristic decreased by 14.3%.

At the same time, as in the age group 1, the proportion of women (29.0%) with external positive motivation is slightly higher than of men (23.9%). In addition, a significant percentage of women (16.1%) and men (14.3%) were identified as having external negative motivation exceeding external positive motivation.

Thus, in group 2, internal motivation continued to be dominating for the majority of men and half of women. A somewhat greater external positive motivation was identified for women. At the same time, the number of women with negative motivation for the profession remained about the same as in group 1, but it increased for male professors (14.3%).

Table 3. The motivation type for professors at the group 2 (40 to 59) (%)

Dominating type of motivation	Total (%)	
	Men (15)	Women (69)
IM ≥ EPM > ENM	69.0	54.9
IM <**EPM**> ENM	23.9	29.0
ENM > EPM > IM	14.3	16.1

Interesting data were obtained when studying the performance motivation of teachers of group 3 (60 years above). Table 4 below shows that 83.3% of men and 54.1% of women had a high level of internal motivation for professional activity. At the same time, the proportion of men with external positive motivation has hardly changed compared to the second group and is 25.0%. The number of women halved (16.6%). Namely, aged women consider the content and social significance of work, its variability, creative opportunities as less important, the awareness of the social significance of their work decreased and external negative motivation for professional activity increased by a third.

Table 4. The motivation type for professors at the group 3 (60 and above) (%)

Dominating type of motivation	Total (%)	
	Men (12)	Women (22)
IM≥ EPM > ENM	83.3	54.1
IM <**EPM**> ENM	25.0	16.6
ENM > EPM > IM	0	29.1

Further calculations showed that a third of older women (29.1%) perform professional activity due to external negative motivation, therefore, they have a low motivational force and a negative attitude to the activity itself. At the same time, this factor equals zero for men. Thus, the studied motivational complex of university professors may be displayed differently. It directly depends on gender and work experience.

The survey showed that ENM was common for men only in the middle age group (40-59 years) and there was no such in the older age group. The picture is completely different for female professors. The number of women with negative motivation for the profession was present in all age groups. Moreover, it increased over time of university work (from 14.8% to 29.1%).The obtained results suggest that negative

motivation for the profession emerged due to the waver between the desire to master and improve in the profession and the inability to do so for various internal and external reasons. This condition causes tension, chronic stress, and, eventually, EBS.

Respectively, the next stage of the study was devoted to the estimation of occupational burnout level. As mentioned above, the syndrome of occupational burnout during the processing of questionnaires could result in three different ways, depending on the personal qualities of the respondents: *emotional exhaustion, depersonalization* and *reduction of personality achievements.* Low, medium and high levels of burnout severity were determined.

Table 5. The burnout syndrome rank among university professors (%)

OBS (89 people)								
Emotional exhaustion			*Depersonalization*			*reduction of personality achievements*		
low	medium	high	low	medium	high	low	medium	high
52.3	40.8	**6.91**	22.4	42.8	**34.7**	16.3	55.7	**28.0**

Table 5 shows that emotional exhaustion as a burnout symptom was revealed only in 6.91% of cases. However, 28% of respondents demonstrated a high level of reduction of personality achievements. The medium level of this parameter in total was 55.7%. A high level of depersonalization was revealed in more than a third of professors (34.7%). The motivation for professional activity has been proven to be determined by the gender and age of university professors. The next aim of the study was to trace whether the occupational burnout syndrome depends on the same characteristics.

The results of the survey and its analysis are displayed in Tables 6,7 and 8. Table 6 shows the distribution of the indicator "emotional exhaustion". The results of group 1 suggest that 33.3% of men and 39.1% of women had a low level of emotional exhaustion; an average level was recorded in cases of 50% of men and 53.7% of women; 16.7% of men and 7.2% of women had a high level of this indicator.

Table 6. Emotional exhaustion rank for male and female university professors of different ages (%)

The rate of OBS	Level	Age group					
		20-39		40-59		60 and above	
		male	female	male	female	male	female
Emotional exhaustion	Low	33.3	39.1	50.0	58.1	66.6	66.4
	Medium	50.0	53.7	50.0	24.4	33.4	33.4
	High	16.7	7.2	0	17.5	0	0

In the group 2 (40-59 years), the indicator of "emotional exhaustion" was at a low level for 50% of men and 58.1% of women; at an average level for 50% of men and 24.4% of women; at a high level for 17.5% of women. The peculiarities of a high level are as follows: unsaturated emotions, indifference, despondency and weakening. The results obtained indicate that although in group 1 there were more men with high rates of emotional exhaustion than women, an adaptation to professional activity occurred. Therefore, high rates of male emotional exhaustion in group 2 were not identified. Women experienced an adaptive period before men, so their rates increased just slightly (Table 6).

The following results were revealed in group 3 (60 years and above): 66.6% of men and 66.6% of women have a low level of emotional exhaustion; 33.4% of men and 33.4% of women are noticed to have a medium level and there was not any participant with a high level. Thus, emotional exhaustion in the

older age group is generally represented at a low and medium levels.

Accordingly, the highest levels of emotional exhaustion were found in 16.7% of male professors in the age of 23-39 and in 17.5% of female professors in the age of 40-59. High levels of depersonalization were characterized by deformation of relationships with other people. Comparative analysis of this indicator (Table 7) shows that in group 1 (23-39 years) it was distributed as follows: a low level for 48.4% of women and 0% of men; a medium level for 50% of men and 18.8% of women; finally, a high level was recorded among 50% of men and 32.8% of women.

Table 7. Depersonalization rank for male and female university professors of different ages (%).

The rate of OBS	Level	Age group					
		20-39		40-59		60 and above	
		male	female	male	female	male	female
Depersonalization	Low	0	48.4	0	52.8	0	33.4
	Medium	50.0	18.8	50.0	38.2	33.4	66.6
	High	**50.0**	**32.8**	**50.0**	**9.0**	**66.6**	**0**

In group 2 (40-59 years old) the following results were obtained: a low level of depersonalization was not detected for men and was revealed for 52.8% of women; a medium level for 50% of men and 38.2% of women; a high level for 50% of men and 9% of women.In the older age group (60 years and above), a low level of depersonalization was determined only for 33.4% of women; the medium level for 33.4% of men and 66.6% of women and a high level for 66.6% of men and for 0% of women.

The highest level of depersonalization results in the deformation of relationships with other people and an increased dependence on others. Such symptoms were recorded in cases of 50% of men in the age of 20-39 and 40-59 years and 66.6% of men in the age of 60 years or above, i.e., aged professors are more likely to experience such conditions (Table 7).

Furthermore, depersonalization can be traced in certain algorithms of a person's actions in communication with others. For instance, the employee can lose interest in a person as a subject of professional action which is considered to be a perfect tool for manipulation.The tool is a burden with its problems and the very fact of its existence is unpleasant.Women had a different pattern. Most of all female university professors with a high level of depersonalization were identified in group 1 (32.8%), there were fewer of them in group 2 (9.0%), and none were in group 3.

The increase in rates of "depersonalization" is caused by the need for rapid learning of computer technology, endless paperwork, current bureaucracy in the educational system, and the developing fear of dismissal. Depersonalization, apparently, is a protective reaction for emotional exhaustion, which is represented mostly among male professors (Table 6).

Table 8 shows that the third component of the emotional burnout syndrome in group 1 was reduction of personality achievements (21-39 years). The following ratios were revealed: a low level of the indicator was not detected for the surveyed men and women; a medium level was detected for 50% of men and 37% women; a high level for 50% of men and 63% of women. High rates of reduction of personality achievements resulted in a tendency to a low self-esteem, negative assessment of professional achievements, underestimation of mental agility and professional capabilities, reducing responsibilities towards others.

Table 8. Reduction of personality achievements rank for male and female university professors of different ages (%)

The rate of OBS	Level	Age group					
		20-39		40-59		60 and above	
		male	female	male	female	male	female
Reduction of personality achievements	Low	0	0	16.7	14.5	33.4	33.4
	Medium	50.0	37.0	66.6	47.3	66.6	66.6
	High	**50.0**	**63.0**	**16.7**	**38.2**	**0**	**0**

In the middle age group, the indicator was at a low level for 16.7% of men and 14.5% of women; an average level was displayed for 66.6% of men and 47.3% of women and a high level for 16.7% of men and 38.2% of women.In the older age group (60 years and above), the studied indicator was detected at a low level for 33.4% of men and the same number of women; at a medium level for 66.6% of men and 66.6% of women. A high level of reduction of personality achievements in this group was not found.

Thus, a high level of this component of emotional burnout can be resulted either in a tendency to underestimate professional and personal achievements and successes, negatively assess official duties, or in downplaying one's own dignity, limiting capabilities and responsibilities towards others. Such conditions were detected for 50% of men and 63% of women in the age of 20-39; for 16.7% of men and 38.2% of women in the age of 40-59 years (Table 8). Thus, the reduction of personality achievements was more typical for the surveyed women. This can be explained by the fact that they were characterized by an internal contradiction between work and family, more frequent cases of low self-esteem, greater self-demands, diligence, combined with increasing professional loads and fewer career opportunities. All this, in general, causes chronic psychological stress and uncertainty about their own successes or achievements.

Moreover, the results of our study suggest that university professors in the age of 20-39 years were most susceptible to EBS, since 63% of women and 50% of men had a high rate of "reduction of personality achievements", 50% of men and 32.8% of women had a high rate of "depersonalization" and more than half of men (66.7%) and about half of women (46.3%) demonstrated medium and high rates of "emotional exhaustion" (Tables 6,7, 8). High levels of EBS indicators may be decreased over work record. However, this occurs less among men, as there are more individuals with a high level of depersonalization.

Some studies confirm the vulnerability of older people to this syndrome. The survey conducted has shown that not only older university professors, but also those in the age of 23 to 39 were the most sensitive to burnout.

Numerous sources [3,4] claim that the presence of EBS leads to negative changes in a professional's personality and destroys a person and their work. If the symptoms of burnout are neglected, it may cause depression, nervous breakdowns, psychosomatic disorders followed by negative impact on the work effectiveness and health of a university worker. A certain number of professors of all ages were somewhat susceptible to occupational burnout syndrome.

Considering the specifics of the influence of gender on the components of burnout, it can be noted that men had higher rates of depersonalization and women were more susceptible to reduction of personality achievements, which indicates that the syndrome of occupational burnout as a psychosocial component of the integral health of university professors clearly depends on the gender.

Violations of mental and social health in the form of demotivation and burnout can eventually affect the physical health of an individual. The measure of systematic disintegration of the organism in the

process of functioning and development of the organism is biological age, since the most important consequences of age-related processes are reduced lifetime (high probability of early death), a violation of the most vital functions and a poor adaptation, the development of unhealthy conditions. In addition, there are syndromes of accelerated (premature) and delayed aging.

When accelerated aging occurs, the biological age exceeds the calendar age. It causes the early development of age-related pathology. Delayed aging is the reverse process, i.e., the vital reserve of an organism is utilized more slowly. The estimation of biological age makes it possible to predict changes in human health and aging velocity and recommend a system of specific prevention means [21].

The estimation of the biological age of university teachers (168 people) combined the measurement of main physiological systems conditions (cardiovascular, respiratory, nervous, metabolic) and the calculation of current and appropriate BA according to mathematical formulas (independently for men and women). Further ranking of these indicators is shown in Table 9.

Half (50%) of the teachers were ranked I and II, indicating a slow aging of the organism compared to the standard sample, a third of the teachers corresponded to the population standard, and only 19.5% of the participants demonstrated accelerated aging (Table 9).

Table 9. BA ranks of the professors (%)

Sex	Ranks				
	I	II	III	IV	V
Male	**14.4**	**18.1**	**43.1**	**16.9**	**8.50**
Female	**47.8**	**19.7**	**18.9**	**8.82**	**4.45**
Average	**31.1**	**18.9**	**31.0**	**12.8**	**6.47**

This table also shows that the biological age of men and women differs significantly. Thus, delayed aging (grades I–II) was identified in 32.5% of male university professors, 43.1% of men correspond to the population standard, and accelerated aging is observed in a quarter (25.4%) of university professors.

As for women, 67.5% had delayed aging of the body, 18.9% were in the population standard and only 13.3% had accelerated aging of the organism (IV-V ranks). The last was 2 times more likely to occur among men (Table 9).It was found that levels of professional motivation and emotional burnout depend on the age and the university work record. Age-related characteristics of the aging of male and female professors are displayed in Table 10.

Table 10. BA rank of university professors considering age and gender (%)

Age(years)	Sex	Ranks				
		I	II	III	IV	V
23-39	Male	10.0	4.50	29.6	32.4	25.6
	Female	**20.9**	**15.6**	**38.1**	**17.5**	**7.8**
40-59	Male	12.6	33.3	35.1	18.6	0
	Female	**48.8**	**29.4**	**10.6**	**5.75**	**5.45**
60 and above	Male	16.6	16.6	67.7	0	0
	Female	**73.9**	**14.2**	**8.68**	**3.12**	**0**

As can be observed from Table 10, in group 1 (23-39 years old), there was about a third of male teachers (29.6%) in the III rank, their biological age corresponded to the population standard, only 14.5% of men in this group had delayed aging. On the contrary, more than half of the respondents were characterized by an accelerated aging (58.0%). Only a quarter of women in this group (25.3%) corresponded to the IV and V ranks.

Interestingly, the number of male teachers with BA corresponding to the standard increased with age and work record. Meanwhile, in group 2 (middle age) there were only 18.6% of respondents with an accelerated aging, in group 3 (60 and above) there were none. With increasing age and length of service in higher education, the number of female teachers with a delayed type of aging increases. However, 11.4% of women in group 2 and a small number of female professors in group 3 aged rapidly (3.12%). Thus, there are gender and age differences in biological age. The organism of young men reacted more strongly to unfavorable production factors and adapted with age and work record. The reaction of female organisms was less explicit, and the accelerated aging occurs 1.6 times less likely among women than men.It should be noted that a reliable correlation between the BA and the psycho-social indicators of integral health of a university professor was revealed [2].

Conclusions:

The studied motivational complex of university professors manifests itself in different ways. Firstly, it directly depends on the gender and work record of a university professor. External negative motivation among men occurs only in group 2 (40-59 years), and there were not any cases in the young and older age groups (groups 1 and 3). As for female teachers, the number of women with negative motivation for the profession was displayed in all three age groups and showed a dynamic for an increase over time (from 14.8% in group 1 to 29.1% in group 3).

A certain number of professors of all ages were somewhat at a high risk for syndrome of occupational burnout. Men tended to have higher levels of depersonalization, and women were more susceptible to reduction of personality achievements, which indicates the gender orientation of this syndrome.

According to the BA indicator, younger organisms significantly react to adverse factors of the educational process but adapt with age. The main difference of this dynamic in female organisms is less explicit reaction to the negative production factors.

The methodological approach used made it possible to obtain a detailed picture of the comprehensive, integral health of a university professor. Since WHO defines health as a complex of physiological and psychological well-being, pre-nosological studies cannot be carried out by assessing only physical or psychosocial factors. A comprehensive analysis should be provided, including the identification of risk groups, followed by the implementation of targeted wellness programs at a university.

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