Executive functions and quality of life of russian scientists

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Abstract

Aim of the study was assessment of executive functions and quality of life (QoL) among scientists aged 22-80 years working in state research centers. The screening test included several questionnairs: "Cognitive screening", "Age is not a barrier", "Geriatric Depression Scale" (GDS) and Social Functioning 36 (SF-36) survey. According to the assessment, the group of scientists showed problems related to physical health disorders and presence of numerous risk factors for professional efficiency decline. High rate of preasthenia (39.62%) and asthenia syndrome (11.32%) was identified. This might be due to high level of stress and informational load that causes depletion of functional organism reserves. The rate of cognitive executive functions decline was low (3.77%), stated in young age and possibly associated with depression and asthenia. In comparison to general population, Russian scientists showed a generally high level of quality of life (more than 70% in all domains), best indicators on the scales of "Body Pain" and "Vitality", but lower indicators of "Role functioning" due to the emotional state. In general, scientists' quality of life decreased with age, especially "Physical Functioning" and "Body Pain" scales. Social skills such as "Role functioning due to emotional state" increased with age. In the scientists group, connection between cognitive functions and the quality of life was observed. Specifically, between "Physical Functioning", "General Health", "Vitality", "Social Functioning" and "Mental Health".

Key Words: Quality of life; cognitive functions; scientists; academics; SF-36 survey; cognitive screening; aging.

Scientist plays an important role in the development of modern world, proving new conceptions and opinions, analyzing large amount of information, investigating new techniques. Scientific work, as well as any intellectual work, differs from physical activities due to great nervous system load, which may cause negative consequences for health.[1] Scientific work is associated with multifunctionality, large amount of information proceessing and great psycho-emotional stress. Especially this refers to medical scientists, who usually also involved in clinical or educational work. This may lead to cognitive overload and formation of different disorders.[2,3] On the opposite side, many authors promote intellectual work, as a protective factor for cognitive decline,[4] Thus, it seems important to determine the influence of scientific work on mental health, to estimate the character of potential disorders and to form a strategy for cognitive decline prevention, as keeping the scientist's cognitive status on the high level is essential for preserving their intellectual potential and work efficiency. Cognitive functions decrease with age,[4,5] a process known as cognitive aging,[6,7] and becomes one of the most actual healthcare agenda of 21st century.[8,9] Previous research specifies significant age decline of such cognitive functions as executive functions,[10,11] short-time memory,[12] reasoning ability,[13] mental processing,[14,15] naming and speech fluency,[16] visual and verbal memory.[17] Literature analysis showed two main trends in the relevant research. Estimation of negative factors for cognitive aging and poor executive functions (influence of arterial hypertension, apolipoprotein E, diabetes mellitus type 2, cardiovascular and cerebrovascular diseases) on the one hand,[18] and detecting protective factors (education level, intellectual activity, physical activity, smoking cessation, diet) on the other hand.[10, 19-21] Some international works mention high quality of life (QoL) as an important protective factor associated with good cognitive status,[22-24] as decent QoL means optimal functioning and maximum professional potential. At the same time little researches around the world deals with executive functioning and QoL of scientists. No data is available concerning Russian population. We find such works essential for the development of preventive and rehabilitation programs aimed for preservation of intellectual potential and

Table 1. *General characteristics of the study group*

Parameter	Results
Age	22-73 years old (average 34.7±11.5)
Gender	28 females, 25 males
Somatic status	28.31% had chronic diseases 43.3% - almost healthy 28.3% - healthy
Scientific activity	from 1 to 50 years (median 10.4 [3.5; 30.7])

prolonging professional scientific career. Aim of the present study was assessment of executive functionnings and quality of life among the scientists working in state research centers.

Materials and Methods

During the perioud January-February 2020 a pilot cross-sectional study was performed, involving scientists, who worked at state medical research centers at Moscow city. We used non-probability purposive sampling method. Inclusion criteria: scientific position, males and females aged from 22 to 80 years old; university degree; ability to fill in the questionnaire. Exclusion criteria: students; verified cognitive decline; significant somatic diseases.

Conformity with the principles of ethics

The study was approved by the local ethics committee at National Research Institute of Public Health n.a. N.A. Semashko on December 24th, 2019 protocol #10. All participants of the study signed an informed consent.

Demography of participants

The study enrolled 53 scientists from 22 to 73 years old, the group included 28 female and 25 male. General health assessment revealed that 28.31% of respondents had chronic diseases, 43.3% were almost healthy (stable remission of chronic disease), and only 28.3% were healthy. In chronic diseases patterns 50% of cases were arterial hypertension, 15% - diabetes and metabolic disorders (2nd place), 10% - oncology (3rd place). 71.7% of workers that passed the screening tests had risk factors of non-communicable diseases (Table 1).

As to the age structure of participants 33.96% respondents were 20-30 years old, 18.87% - 30-40 years old, 21.17% - 40-50 years old, 25.91% - over 50s. Scientific activity duration (working as a research scientist) was from 1 year to 50 years. The largest amount of participants had scientific experience from 1 to 5 years (22.64%) and from 20 to 30 years (18.86%). Others had experience from 5-10 years (16.98%) and from 30 to 40 years (15.09%). Participants who worked as a research scientist for 40-50 years was 7.5% of the total number of the respondents (Table 1). In order to collect the information authors designed a screening card. All participants answered personally the paper version of the questionnaire in Russian language. The card included several assessments forms, standardized and validated for Russia:

1. "Cognitive screening" assessment, for cognitive load and activity estimation. Total score over 42 means possibility of cognitive impairment, total score less than 42 means good cognitive functions;[25]
2. "Age is not a barrier" assessment, for estimation of intellectual activity and senile asthenia screening. Total score over 5 points – asthenia syndrome, 3-4 points - preasthenia, 0-2 points - the absence of senile asthenia syndrome;[26]
3. Geriatric Depression Scale (GDS) assessment for depression screening. Total score 10-15 points means depression, 6 - 9 points: sub-depressive condition, 0 - 5 points: no depression;[27]
4. Russian validated version of non-specific quality of life questionnaire SF-36 with scales (Physical Functioning (PF), Role Functioning due to physical condition (RP), Body Pain (BP), General Heath (GH), Vitality (VT), Social Functioning (SF), Role Functioning due to the emotional condition (RE), Mental Health (MH)). Normal SF-36 values for different ages and general population were taken from "SF-36 Health Survey Manual & Interpretation Guide" by John E. Ware Jr. (1993), which provided the average values of quality of life among people of different age without chronic diseases, but with risk factors (I and II groups of health according to WHO).[28]

Statistical analysis.

The statistical analysis was performed in Microsoft Statistica 10.0 using parametric methods. The indicators are given as the average and standard deviation (M±m) with regular distribution or as the median and 25th and 75th quartiles (Me [Q1; Q3]) with irregular distribution. For pairwise comparisons of group indicators, Student-t was used. The Spearman's rank-order correlation was used to identify the relationship between the two indicators for the final values. The significance level for testing of statistical hypothesis was assumed 0.05.

Results and Discussion

Quality of life

In this group of Russian scientists, analysis of SF-36 survey results revealed high QoL levels for most domains, generally more than 70% (Figure 1).

Average values in the study group were following PF=89.9±15.50%, RP=83.30±31.0%, BP=89.9±17.40%, GH=70.1±22.4%, VT=68.8±19.1%, SF=84.3±22.2%, RE=60.2±19.9%, MH=72.2±22.0%.

Among scientists, as well as in the general population, there was a decrease of QoL level with age. In comparison with 20-29 age group persons of the age 50-59 years had lower indicators of the PF-scale (81.8±22.8% against 95.2±10.2%, p=0.04), BP-scale
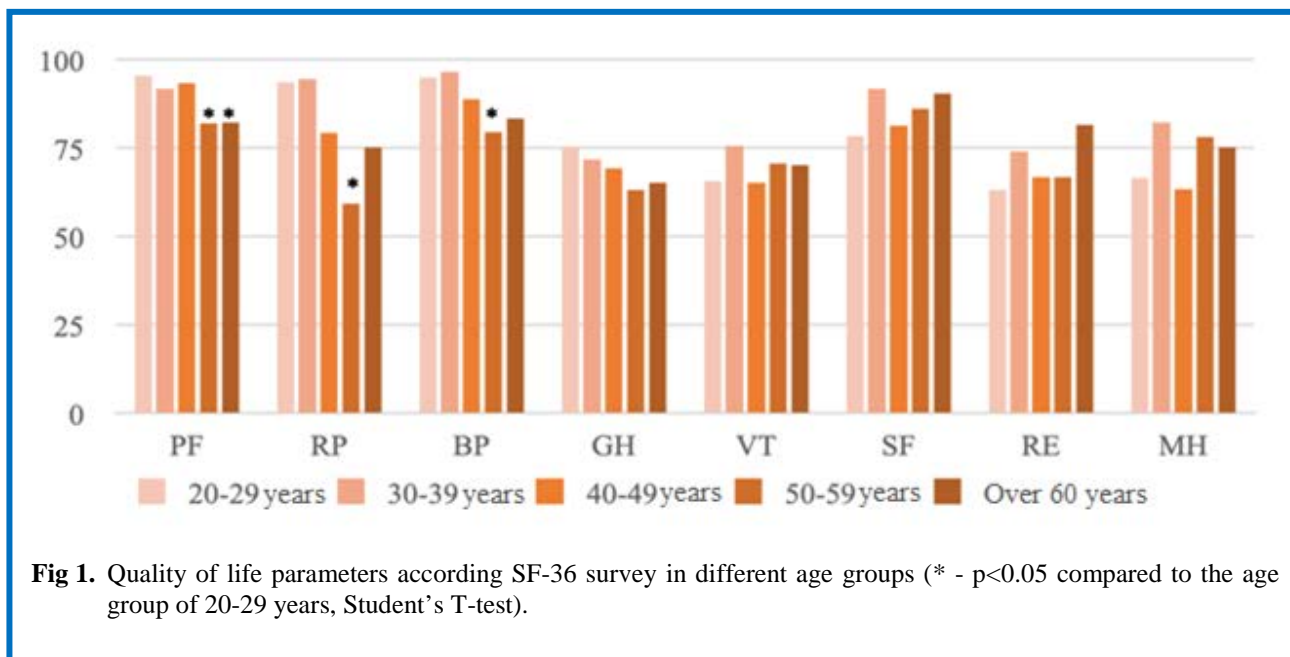
Fig 1. Quality of life parameters according SF-36 survey in different age groups (* - p<0.05 compared to the age group of 20-29 years, Student's T-test).

(79.3±30.9% against 94.8±9.9%, p=0.03) and RP -scale (75.0±43.3% against 93.4±14.0%, p=0,006). Vitality and SF-scale indicators tended to improve with age - the lowest values were observed in 20-29 age group (65.5±22.8% and 78.2±22.3%, respectively), which improved in 30-39 age group (75.5±11.0% and 91.6±10.8%, respectively) and then didn't change significantly with age.

The best mental health indicators were in 30-39 and 50-59 age groups. In the age group over 60 years PF-scale indicators were lower than in 20-29 age group (82.2±17.5%, p=0.02), but RE-scale indicators were higher (81.4±37.6% against 63.1±44.3%). Level of quality of life of scientists with the age over 60 years was generally higher than group with the age 50-59 years (Figure 1). We conducted the analysis of connection between gender and quality of life and revealed the difference in physical functioning – this parameter was higher among men (94.8±10.3%) than women (85.0±18.3%, p=0.006). In average, according to J.E. Ware Jr,[37] the level quality of life among men tended to be higher than among women in terms of vitality and role functioning according to physical condition. (Figure 2). Comparison of QoL levels in scientists group with general population revealed that scientists have better values of BP-indicators (89.9± 17.4% vs 75.1± 23.69%, p=0.008) and vitality indicators (68.8± 19.1% vs 60.8± 20.9%, p=0.04), lower values of RE-scale indicators (60.2± 1.9% vs 81.26± 33.04%, p=0.001), (Figure 3).

Cognitive screening.

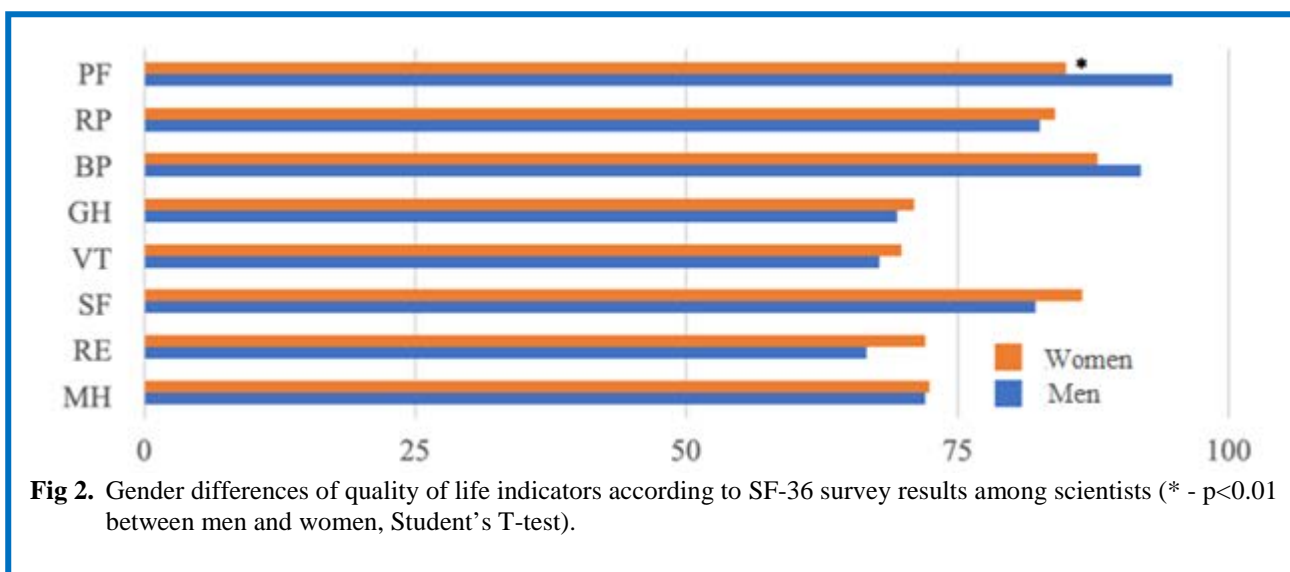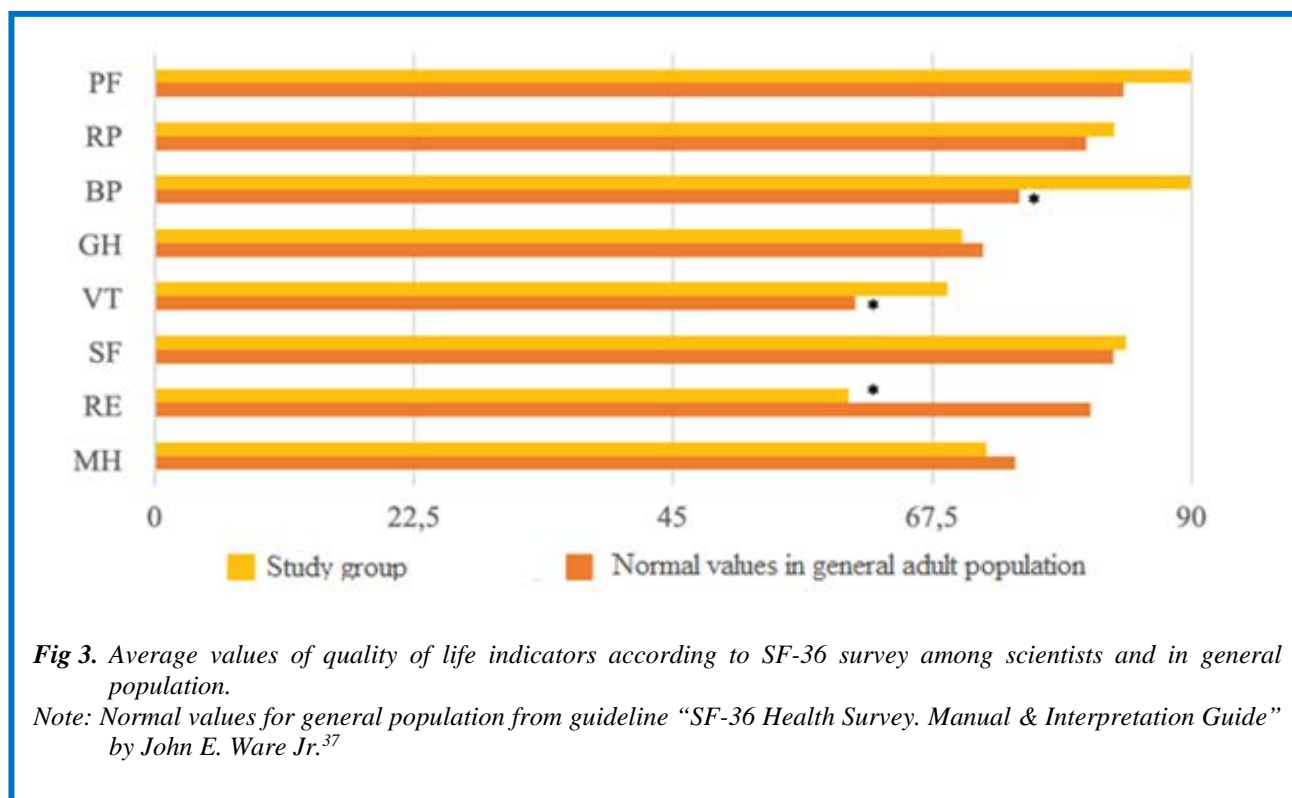According to the survey, 96.23% of scientists aged 22 to 73 years had no cognitive impairment (n=51 from 53

Fig 2. Gender differences of quality of life indicators according to SF-36 survey results among scientists (* - p<0.01 between men and women, Student's T-test).

Fig 3. *Average values of quality of life indicators according to SF-36 survey among scientists and in general population.*

Note: Normal values for general population from guideline "SF-36 Health Survey. Manual & Interpretation Guide" by John E. Ware Jr.[37]

respondents), 3.77% of respondents (n=2, 28-29 years old) had cognitive functions impairment. Total score on the cognitive screening scale positively correlated with the QoL scales: "General Health" (r=0.48, p=0.0032), "Vitality" (r=0.33, p=0.002), "Social functioning" (r=0.61, p=0.0001), "Mental Health" (r=0.59, p=0.0003). No correlations with age was revealed (p>0.05).

Age is not a barrier

According to results of this test, 49.05% of all respondents (aged 22 to 67 years) did not have senile asthenia (n=26 from 53), 39.62% of all respondents (aged 24 to 69, n=21) had "preasthenia", and 11.32% of total group (aged 25-73 years, n=6) had asthenia syndrome. People with aberrant results (n=27, 56.6% of cases) were recommended a consultation of geriatrist and individual rehabilitation plan. In the group of scientists, the total score on the "age is not a barrier" scale was positively correlated with such SF-36 questionnaire parts as "Physical Functioning" (r=0.45, p=0.004) and "Vitality" (r= 0.38, p=0.013).

Geriatric Depression Scale (GDS).

Analysis of the results revealed that 83.01% of respondents (n=44 from 53) aged 22 to 69 years has no depression. In 9.43% of cases (n=5) participants aged 25-49 years has sub-depressive state and in 7.54% (n=4) depression has been stated (27-27 and 73 years) Aberrant results were 16.97%. The total score on the GDS-scale positively correlated with the "Mental Health" (r=0.56, p=0.0002) and "Vitality" (r=0.47, p=0.0037) domains of SF-36 questionnaire.

The ratio between cognitive status, asthenia and depression.

Twentysix respondents (49.05%) have no cognitive impairment, no asthenia syndrome and no depression. This group was also associated with better QoL in comparison with others (n=27), who has aberrant results (for physical health p=0.003, for mental health p=0.001). Cognitive decline has been stated in two participants of a young age (28 and 29 years), than might be due to the presence of depression in both individuals, or asthenic syndrome. Preasthenia and asthenia syndrome has been stated in a half of participants (39.62% and 11.32%, correspondently) that shows high rate of this condition in the group of scientists. All scientist with senile asthenia had depression or sub-depression. No cognitive decline was associated with preasthenia. Only 3 people with depression had preasthenia (Table 2).

Our pilot study intended to highlight the problems of scientists' cognitive health preservation, adequate QoL maintenance and prevention of physical stress among Russian scientists. Traditionally, scientist work is not considered as a "hard work" and didn't associated with risk factors, thus the problem of scientists' health remains "invisible" and underestimated.[29] However, scientific activity is characterized by significant emotional and mental stress, especially when combined with academic and/or clinical work. The state policy for intensifying the scientific work, integration of the new efficiency criteria (number of SCOPUS publications, par example) also increase general stress and require a large amount of internal resources. A literature review shows that

Table 2. *SF-36 quality of life parameters for researchers and normal persons in different age groups*

Age groups	PF	RP	BP	GH	VT	SF	RE	MH
20-29 years	95.2 ±10.2%	93.4 ±14.0%	94.8 ±9.9%	75.2 ±24.1%	65.5 ±22.8%	78.2 ±22.3%	63.1 ±44.3%	66 ±22.8%
Normal values	92.0 ±15.7%	89.2 ±24.8%	81.3 ±19.7%	77.09 ±17.3%	61.3 ±20.2%	84.8 ±20.7%	82.2 ±31.5%	73.2± 17.9%
30-39 years	91.6 ±16.3%	94.4 ±16.6%	96.3 ±7.8%	71.6 ±18.5%	75.5 ±11.0%	91.6 ±10.8%	74.0 ±40.0%	82.2 ±16.9%
Normal values	89.7 ±16.3%	86.6 ±28.9%	77.06 ±22.1%	75.8 ±17.8%	62.4 ±19.4%	85.7 ±21.0%	82.7 ±31.2%	75.1 ±16.6%
40-49 years	93.3 ±6.05%	79.1 ±29.2%	88.7 ±18.8%	69.1 ±19.8%	65.0 ±27.5%	81.2 ±24.6%	66.6 ±36.5%	63.3 ±32.0%
Normal values	84.6 ±21.1%	82.6 ±33.08%	73.1 ±24.0%	71.76 ±19.3%	61.7 ±20.9%	84.07 ±21.8%	83.6± 31.4%	75.3 ±17.86%
50-59 years	81.8 ±22.8%	59.3 ±46.1%	79.3 ±30.9%	63.1 ±24.3%	70.6 ±16.9%	85.9 ±22.5%	66.6 ±39.8%	78.0 ±16.5%
Normal values	76.24 ±26.3%	73.6 ±38.3%	67.5 ±25.6%	64.6 ±23.3%	60.3 ±22.5%	81.3 ±22.5%	80.2 ±34.2%	75.01 ±19.3%
Over 60 years	82.2 ±17.5%	75.0 ±43.3%	83.3 ±17.4%	65.0 ±24.1%	70.0 ±21.5%	90.2 ±17.4%	81.4 ±37.6%	75.1 ±79.9%
Normal values	69.3 ±26.2%	64.5 ±41.3%	68.4 ±26.4%	62.5 ±22.4%	59.9 ±22.1%	80.6 ±25.6%	81.4 ±34.5%	76.8 ±18.08%

Note: Normal values for the general population from the guideline "SF-36 Health Survey. Manual & Interpretation Guide" by John E. Ware Jr.[37]

academic and educational career is closely related to psychological problems such as: depression; anxiety; panic attacks; psychotic crises; and somatic disorders, especially: disorders and loss of voice, pathology of the musculoskeletal system and back pain; the stomach and duodenum ulcers; arterial hypertension and type 2 diabetes mellitus.[30–33]

All of these factors may aggravate the health of scientists and reduce their QoL. New research is essential to specify the problem and to find new solutions.

In studies which included professors from Brazilian and Canadian public institutions,[34-36] the authors noted that there was a direct correlation between stress at work and mental stress, as well as a negative connection between work stress and psychological well-being, which indicates that the negative effect of work-associated stress on the mental state of lecturers. In addition, the researchers noted that physical stress, mental well-being, and gender are factors that account for 55.9% of work-related stress.[34] Another study reported gender differences between men and women in the perception of stress associated with work.[35]

A chapter in the book "Quality of Life and Quality of Working Life" (2017) eds A.A.V. Boas is dedicated to the scientists' QoL. The author states that mental well-being was significantly positively influenced by good work-life balance (0.665; p <0.000), negatively correlates with burnout syndrome symptoms (-0.675; p<0.000) and work-related stress (-0.596; p < 0.000). A

special positive effect to mental well-being contribute personal meaningfulness and high significance of the work (0.505; p < 0.0001).[37] Maarof et al. (2012) present the results of a QoL assessment using the SF-36 questionnaire among staff at universities in Malaysia.[38] The study included 84 men and 177 women aged 18-69 years. The authors concluded that average quality of life indicators for all domains were lower than in the general population of Malaysia. Average values in the study group: PF = 76.25 ± 23.1% 3, RP = 77.04 ± 24.99%, BP = 64.74 ± 26.80%, GH = 61.98 ± 20.89% , VT = 56.8 ± 18.87%, SF = 68.73 ± 29.96%, RE = 76.28 ± 26.13%, MH = 69.20 ± 19.35%. Female lecturers had lower rates of health-related quality of life indicators compared to men.[38] In general, our work shows that the group of Russian scientists is characterized by good QoL. The best results are registered in domains "Physical Functioning", "Body Pain" and "Social Functioning". The lowest scores showed the scale of "Role functioning due to emotional state", which was quite low in the group of young people and improved with age. The score of "Social functioning" scale also tended to improve with age, which can be explained by the strengthening of social and communication skills of scientists during their professional career. With age in the study group, similarly to the general population, the indicators of "Physical Functioning" and "Body Pain" worsened. Compared to the general population, the scientists showed a better tolerance for "Body Pain", higher

"Vitality" and lower "Role functioning due to the emotional state" indicators.

Limitations. Major limitation of this study is its small sample and absence of prospective comparison group. In perspective, we would like to enrich our research and to compare the group of scientists to group of doctors, teachers, and social workers. We plan to estimate successfulness and activity of researches and to find determinant for professional scientific efficiency.

In conclusion, according to our complex assessment, the group of scientists showed problems related to physical health disorders and presence of numerous risk factors for professional efficiency decline. High rate of preasthenia (in 39.62%) and asthenia syndrome (11.32%) in the group of scientist were identifed. This might be due to high level of stress and informational load that causes depletion of functional organism reserves. The rate of cognitive executive functions decline was low (3.77%), stated in young age and possibly associated with depression and asthenia presence. At the same time, Russian scientists showed a generally high quality of life (more than 70% in all domains), the best indicators being on the scales of "Body Pain" and "Vitality", but lower indicators of "Role functioning due to the emotional state", in comparison with the general population. In general, scientists' quality of life decreased with age, especially "Physical Functioning" and "Body Pain" scales. Social skills such as "Role functioning due to emotional state" increased with age. In scientists group connection between cognitive functions and quality of life was identifieded, specifically, between the scales "Physical Functioning", "General Health", "Vitality", "Social Functioning" and "Mental Health".

List of acronyms

BP - Body Pain
GH - General Heath
MH - Mental Health
PF - Physical Functioning
QoL - quality of life
RE - Role Functioning due to the emotional condition
RP - Role Functioning due to physical condition
SF - Social Functioning
VT - Vitality

Authors contributions

TV, idea and concept of work and article text; MY, scientific consultant; EM, article text; PR, bibliographical search and data collection; GS, statistical analyses, MV, informational support.

Conflict of Interest

The authors declare they have no financial, personal, or other conflicts of interest.

Ethical Publication Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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References

1. Roginskaya TI. Mental states, burnout syndrome in social professions. Psychological journal.2002 (3): 95-85.
2. Minnibaev T Sh. Topical issues of university hygiene at the present stage. Health, education of children and young adults in XXI century. Health & Education Millennium World congress; 2004.
3. Ackerman P.L, Kanfer ., Goff M. Cognitive and noncognitive determinants and consequences of complex skill acquisitio*n*. Journal of Experimental Psychology: Applied 1995*;* 1(4): 270–304. doi: 10.1037/1076-898X.1.4.270
4. Tucker AM, Stern Y. Cognitive reserve in aging. Current Alzheimer Research. 2011,8: 354–360. doi:10.2174/ 156720511795745320
5. Dellenbach M, Zimprich D. Typical intellectual engagement and cognition in old age. Neuropsychol Dev Cogn B Aging Neuropsychol Cogn. 2008 Mar;15(2):208-31. doi: 10.1080/13825580701338094.
6. Federal Statistical Office of Switzerland. (2016). At : https://www.bfs.admin.ch/bfs/de/home.html
7. Field AP, Miles J, Field Z. Discovering statistics using R. 2012; London, UK: Sage. ISBN 9781446200469
8. Mõttus R, Johnson W, Deary IJ. Personality traits in old age: measurement and rank-order stability and some mean-level change. Psychol Aging. 2012

Mar;27(1):243-249. doi: 10.1037/a0023690. Epub 2011 May 23

9. Salthouse TA. Theoretical perspectives in cognitive aging. Mahwah, NJ: Erlbaum 1991. Review by: Leah L. Light.The American Journal of Psychology, 1993;106 (4): 601-608.

10. Salthouse TA, Ferrer-Caja E. What needs to be explained to account for age-related effects on multiple cognitive variables? Psychol Aging. 2003 Mar;18(1):91-110. doi: 10.1037/0882-7974.18.1.91.

11. Imlach AR, Ward DD, Stuart KE, Summers MJ, Valenzuela MJ, King AE, Saunders NL, Summers J, Srikanth VK, Robinson A, Vickers JC. Age is no barrier: predictors of academic success in older learners. NPJ Sci Learn. 2017 Nov 15;2:13. doi: 10.1038/s41539-017-0014-5.

12. Aschwanden D, Schumacher V, Zimmermann K, Werner C, Mathias Allemand M, Zimprich D, Martin M. Do Professors Better Maintain Cognitive Functioning in Older Age? Gero Psych. 2019; 32: 5-17. doi: 10.1024/1662-9647/a000201.

13. Salthouse TA. Mental Exercise and Mental Aging: Evaluating the Validity of the "Use It or Lose It" Hypothesis. Perspect Psychol Sci. 2006 Mar;1(1):68-87. doi: 10.1111/j.1745-6916. 2006.00005.x.

14. Head D, Kennedy KM, Rodrigue KM, Raz N. Age differences in perseveration: cognitive and neuroanatomical mediators of performance on the Wisconsin Card Sorting Test. Neuropsychologia. 2009 Mar;47(4):1200-3. doi: 10.1016/j. neuropsychologia.2009.01.003. Epub 2009 Jan 8.

15. Mascherek A, Zimprich D. Stability and change in typical intellectual engagement in old age across 5 years. J Gerontol B Psychol Sci Soc Sci. 2012 May;67(3):309-16. doi: 10.1093/geronb/ gbr101. Epub 2011 Sep 14.

16. Buckner RL. Memory and executive function in aging and AD: multiple factors that cause decline and reserve factors that compensate. Neuron. 2004 Sep 30;44(1):195-208. doi: 10.1016/ j.neuron .2004.09.006.

17. Singh-Manoux A, Kivimaki M, Glymour MM, Elbaz A, Berr C, Ebmeier KP, Ferrie JE, Dugravot A. Timing of onset of cognitive decline: results from Whitehall II prospective cohort study. BMJ. 2012 Jan 5;344:d7622. doi: 10.1136/bmj.d7622.

18. Eckert MA. Slowing down: age-related neurobiological predictors of processing speed. Front Neurosci. 2011 Mar 11;5:25. doi: 10.3389/fnins.2011.00025.

19. Anstey K, Christensen H. Education, activity, health, blood pressure and apolipoprotein E as predictors of cognitive change in old age: a review. Gerontology. 2000 May-Jun;46(3):163-77. doi: 10.1159/000022153.

20. Colsher PL, Wallace RB. Longitudinal application of cognitive function measures in a defined population of community-dwelling elders. Ann Epidemiol. 1991 Feb;1(3):215-30. doi: 10.1016/1047-2797(91)90001-s.

21. Evans DA, Beckett LA, Albert MS, Hebert LE, Scherr PA, Funkenstein HH, Taylor JO. Level of education and change in cognitive function in a community population of older persons. Ann Epidemiol. 1993 Jan;3(1):71-7. doi: 10.1016/1047-2797(93)90012-s.

22. Sharp ES, Reynolds CA, Pedersen NL, Gatz M. Cognitive engagement and cognitive aging: is openness protective? Psychol Aging. 2010 Mar;25(1):60-73. doi: 10.1037/a0018748.

23. Wilson RS, Segawa E, Boyle PA, Bennett DA. Influence of late-life cognitive activity on cognitive health. Neurology. 2012 Apr 10;78(15):1123-9. doi: 10.1212/WNL.0b013e318 24f8c03.

24. Yaffe K, Fiocco AJ, Lindquist K, Vittinghoff E, Simonsick EM, Newman AB, Satterfield S, Rosano C, Rubin SM, Ayonayon HN, Harris TB; Health ABC Study. Predictors of maintaining cognitive function in older adults: the Health ABC study. Neurology. 2009 Jun 9;72(23):2029-35. doi: 10.1212/WNL.0b013e3181a92c36.

25. Shleptsova MV, Frolova EV. The prevalence of the main geriatric syndromes in the practice of an outpatient geriatrician and the possibilities of their correction. Russian Family Doctor; 2018; 22(2): 30-36. doi: 10.17816/RFD2018230-36

26. McCann G. The Use of the Cognitive Status Examination in Detecting Cognitive Impairment in Elderly People. 2000. Avaliable at: https://ro.ecu.edu.au/theses/1538.

27. Yesavage JA. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res. 1983; 17. № 1. P. 37-49

28. Ware JE Jr, Kosinski M, Bayliss MS, McHorney CA, Rogers WH, Raczek A. Comparison of methods for the scoring and statistical analysis of SF-36 health profile and summary measures: summary of results from the Medical Outcomes Study. Med Care. 1995 Apr;33(4 Suppl):AS264-79.

29. Savina AA. Modern features of the health status of Russian scientists and their families in the RAS system. RF HealthCare. 2010;1:29-26.

30. Christensen H., Henderson A.S., Griffiths K., Levings, C. Does ageing inevitably lead to declines in cognitive performance? A longitudinal study of elite academics. Personality and Individual Differences. 1997;23,67–78. doi: 10.1016/S0191-8869(97)00022-6

31. Martinez D, Collazo M, Liss M. Dimensions of teachers' work: A proposal to approach teachers' discomfort and psychic suffering in Argentina. Educação & Sociedade. 2009;30(107)

:389-408. doi: 10.1590/S0101-733020090002000 05.

32. Robalino M, Körner A, UNESCO. Condiciones de trabajo y salud docente: estudios de casos en Argentina, Chile, Ecuador, México, Perú y Uruguay [Internet]. Santiago, Chile: UNESCO Oficina Regional de Educación para América Latina y el Caribe; 2005. 209 p. Available at: http://www.unesco.org/ulis/cgi-bin/ulis.pl?catno= 142551&set=00544FEA 502420&gp=1&lin=1&ll=1

33. Arbex APS, Souza KR, Mendonça ALO. Trabalho docente, readaptação e saúde: A experiência dos professores de uma universidade pública. Physis: Revista de Saúde Coletiva. 2013;23(1):263-284. doi: 10.1590/S0103-733120 13000100015.

34. Massé R, Poulin C, Dassa C, Lambert J, Bélair S, Battaglini A. The structure of mental health: Higher-order confirmatory factor analyses of psychological distress and well-being measures. Social Indicators Research. 1998; 45(1-3):475-504. doi: 10.1023/A:1006992032387.

35. Vilas Boas AA, Morin E. Quality of working life in public higher education institutions: The perception of Brazilian and Canadian professors. International Journal of Business and Social Science. 2013;4(12):67-77. Available from: http://www.ijbssnet.com/journal/ index/2127.

36. VilasBoas AA, Morin EM. Psychological well-being and psychological distress for professors in Brazil and Canada. RAM – Revista de Administração Mackenzie. 2014;15(6):201- 219. doi: 10.1590/1678-69712014/administracao.v15n 6p2 01-219.

37. De Paula A. V. d, Boas A.A.V. Well-being and Quality of Working Life of University Professors in Brazil. Chapter 10 in Quality of Life and Quality of Working Life. 2017 doi:10.5772 /intechopen. 70237.

38. Maarof NNNA, Shamsuddin NR, Razali NM, Hadi AA, Ismail A. A comparative study of health-related quality of life among academician — A case study. 2012 International Conference on Statistics in Science, Business and Engineering (ICSSBE). doi:10.1109/icssbe.2012.6396569.