Psychophysical state and functional features of the population of the Russian Far East in 20-49 age groups

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Abstract

In our modern age, the health of the population is a matter of essential care for the whole state, as well as for a particular person. The psychophysical state and functional features are viewed as one of the objective indexes of its development. The majority of researchers study these indexes at educational and healthcare institutions, which is quite natural, since the selection of the subjects may be more or less consistent. The "adult" age group constitutes such a heterogeneous entity that it is quite difficult to mark any patterns in its psychophysical state. Nonetheless, this article is an attempt to study the physical status of an adult person of the Russian Far East, including his or her physical development and preparation. Influenced by the changing climate-geographic environment, as well as social and economic conditions of living, the physical status of the population is also altering. In accordance with this, there is a need to determine and specify the regional statuses for various age groups, because without these data it is impossible to build a regional system of physical education [1, 2, 3, 4, 5].

Keywords: psychophysical state, functional features, adult population.

INTRODUCTION

The 20-49 age group of the population represents quite a large and inconsistent sample, pertaining, according to different age classifications, to the adult age. Altogether, the adult population is comprised of 20-60-years-old people. In different age classifications, depending on a fundamental criterion, more exact periods may be highlighted. This population group is explored in the developmental psychology to a greater extent [6, 7, 8, 9], which is quite natural, because based on marking different social and psychological criteria, more exact classifications may be compiled. On the whole, the examined age group is characterized by more realistic desires and sober assessments. Moreover, this age is subjectively viewed as the apogee of life. By 40 years, personal self-rating is formed, which reflects the results of the life journey as a whole. Modern developmental psychology, which mainly studies age psychology of a child or a teenager, is focused on the processes of physiological maturation and development of mental functions, adoption of the social and historical experience by an individual and personality development, all of which determine general patterns of mental development of a person. From these positions, adulthood "is just a result of vibrant processes of development and implementation of earlier formed mechanisms, qualities and sentiments, shaped in childhood and adolescence. It will be followed by life decline and the decay of mental functions. Adulthood is considered as some extended steady-state condition, characterized by more or less full stabilization of functions and qualities of a formed personality, shaped intellect, established values and world views" [8, p. 456].

The physical status of a person, belonging to the "adult" age group, due to various reasons may commence to be conceived and realized from a new angle. First of all, one of the reasons for that is a lack in control of physical activity by educational institutions. A person decides independently to do physical exercises or not, and he or she does not get marks for the "physical education" subject. We consider the second reason to be the end of physical maturation of the human organism, its following stabilization and decline. If in the childhood period the health is predominantly determined by biological factors, in adulthood social factors are revealing, among which the way of life and the physical activity of the person become the leading ones [10, 11, 12, 13, 14]. Moreover, illnesses are also accumulated with age, and a person has to make a choice: either to treat it medicamentally or build life strategies in accordance with the concepts of a healthy lifestyle [15, 16, 17].

METHODS

To study physical development and preparation, we have examined males and females in the 20-49 age groups, who do physical exercises more or less regularly. To make the analysis of the data and its interpretation more convenient, we have divided them by 10 years' age range. The age and gender composition of the test audience is presented in Table 1.

Table 1. Test audience, which have participated in the examination

Age group/gender	20-29 age group	30-39 age group	40-49 age group	Total
Female	58	19	17	94
Male	88	27	11	126
Total	143	46	28	220

The physical state of the examined was determined by the length and weight of the body, characteristics of the respiratory system and dynamometry [14, 18].

Earlier held examinations of vital capacity (VC) with a waterless spirometer have shown its insufficient accuracy (error up to ±10%) and little informative value. We used a portable digital spirometer "MicroLoop", which showed a higher accuracy (error does not exceed ±3%) and informative value.

Physical preparation was studied in accordance with the indexes of regular exercises chosen for comparison: 100 m and 1000 m sprint, standing long jump, bending and unbending arms from the lying position – for women, pull-ups – for men. These exercises were chosen due to the fact that they were included in the list of exercises of the All-Russian Sports Complex "Ready for Labor and Defense" (RLD), which is currently a strong motivating factor for the population to exercise [19]. 1000 m sprint is not included in the RLD list; we were considering the data to examine a tendency in accomplishing an exercise, which determines stamina.

The capabilities of the psychophysical complex "NS-PsycheTest" were used to examine the psychophysical development of the psychomotor system of men and women in the 20-29 age group and 30-39 age group (65 persons), who more or less regularly did physical exercises. We examined the indicators of visual and search reaction according to the Shulte-Platonov

tables, simple visual-motor reaction, choice reaction, reaction to a moving object, attention span and volume attention [20].

RESULTS AND DISCUSSION

The study of the physical status of the adult population in late ontogeny is complicated by certain factors. The study of physical development (height and weight of the body, lung capacity and wrist strength) has not caused any difficulties, but there are several problems which have to be faced while determining the physical preparation of the senior and elder age groups.

On the whole, the physical development of the adult population is examined to a lesser degree in comparison with similar studies related to children and adolescents. First of all, it may be explained by the difficulties in organizing the study: production physical culture, which dates back to the existence of large labor force, nowadays has significantly reined in its development due to a change in ideology, organization forms, low-numbered staff groups and other reasons of a social character. A reduced level of health and the population's incidence rate also plays an important role, so adults require exercise therapy and physical recreation to a greater extent. Currently, to attract population to do systematic physical exercises and activities, the complex RLD is implemented. It makes provision for passing control standards set, which reflects the level of development of physical qualities [19].

While processing the results, we set a task to compare the levels of physical development and preparation within the indicated age groups. Table 2 shows the indicators of female physical development in the young and middle age groups. Based on the analysis of the female physical development in three age groups, it can be deduced that there are no major discrepancies in the height parameters. The weight parameters of the body gradually increase with age, although this pattern is reliable only at 10% level of importance. Heart rate frequency does not have verifiable differences in the observed age group among women. Lung capacity gradually decreases with age, although, taking into account the age, gender and weight of the test audience, the percent rate exceeds 100% in all groups. That means that the tested women have good enough indicators of the respiratory system.

The indexes of the maximum pulmonary ventilation did not demonstrate linear dependence on the age. The women in the 30-39 age group, who participated in the studies, had a higher percent of the maximum pulmonary ventilation from the due one than the ones of the senior and young age groups. This fact stipulates that physical exercises can improve the functional indicators at any age.

The indicators of wrist dynamometry do not have proven differences between the first and the second outlined age groups, while 40-49 age group, on the contrary, has the credible reduction in right-hand and left-hand dynamometry results.

Similar tendencies can be traced in men's results (Table 3).

Table 2. Physical development of women in young and middle age groups (M±m)

Indicators/age	Height, cm	Weight, kg	Heart rate frequency, beats per minute	Lung capacity, ml	Lung capacity, % from the due	Maximum pulmonary ventilation, liters/min	Maximum pulmonary ventilation, % from the due	Dynamometry, kg	
								right hand	left hand
20-29 years	165.0±1.33	60.5±2.18	72.2±3	4065.2±112.7	107.67±2.14	418.2±21.47	96.6±4.77	35.2±0.93	33.9±1.04
30-39 years	164.9±1.53	64.9±3	76.9±2.2	3907±155	108.8±3.8	427.5±18.7	101.8±4.7	35.1±1.7	33±1.8
40-49 years	163.1±2.17	67.5±4,26	72.6±2.18	3316.1±245.4	103.7±5.56	384.9±25.71	96.2±6.17	31.77±1.74	28.68±1.73

Table 3. Physical development of men in the young and middle age groups (M±m)

Indicators /age	Height, cm	Weight, kg	Heart rate frequency, beats per minute	Lung capacity, ml	Lung capacity, % from the due	Maximum pulmonary ventilation, liters/min	Maximum pulmonary ventilation, % from the due	Dynamometry, kg	
								right hand	left hand
20-29 years	176.1±0.87	76.15±1.8	78.6±2.7	5181±151.9	98.6±2.7	608.7±30.1	103.7±4.6	58.84±1.47	54.56±1.4
30-39 years	176.96±1.5	76.6±1.8	73.2±2.3	5192.9±189	100.4±2.9	557.9±31.3	97.4±5.2	57.02±2.02	54.3±1.9
40-49 years	178.5±1.1	82.7±2.9	66±4.7	5272.2±165.9	103±2.14	609±33.7	108.14±5.2	63.25±2.9	56.8±4.6

Table 4. Physical preparation of women (M±m)

Control exercises /age	100 m, sec	1000 m, sec	Standing long jump, cm	Bending and unbending arms from lying position, amount
20-29 years (M1)	17.2±0.27	280.86±6.9	198.3±4.6	18.4±1.25
30-39 years (M2)	18.6±0.74	310.66±13.9	185.5±6.3	19.7±2.12
40-49 years (M3)	19.89±1.09	316.8±28.8	177.1±9.4	19.7±3.82
| M2-M1|	1.4	29.8	12.8	1.3
P	>0.05	>0.05	<0.05	>0.05
|M3-M2|	1.29	6.14	8.4	0
P	>0.05	>0.05	>0.05	>0.05
|M1-M3|	2.69	35.94	21.2	1.3
P	<0.05	>0.05	<0.05	>0.05

There are no differences in height indicators between the age groups; the weight of men in the 20-29 age group and the 30-39 age group also does not have proven discrepancies, though after the age of 40, this indicator reliably starts to increase. The heart rate frequencies tend to reduce, but, since this age-specific physiology is not described by the reduction of the heart rate frequencies with age, we are prone to believe that this result can be explained by the peculiarities in the choice of the test audience. The reason is that men, who participated in the research, go in for sports or used to do so and now maintain their athletic shape. The development of the respiratory system to a greater scale reflects the percent indicators from the due ones of the lung capacity, as well as of the maximum pulmonary ventilation. The indicators of the tested are within 100% with minor deviations downwards (% from the due one of the lung capacity for 20-29-years-old men and % from the due one of the maximum pulmonary ventilation for 30-39-years-old men), as well as upwards in both indicators of other age groups. The index of right-hand and left-hand wrist dynamometry in the 40-49 age group is also higher than the one which is possessed by younger men. This fact is explained by the peculiarities in the choice of men for the research, which have been highlighted earlier. Although, it should be mentioned that this indicator does not decrease, but even increases depending on the intensity and targeting of the physical exercises and can be higher than the one possessed by younger people.

Let us turn to the indicators of physical preparation of women (Table 4) and men (Table 5). We will examine the indicators which have proven discrepancies in different age groups.

Proven discrepancies in the development of speed capabilities can be traced only while comparing the 40-49 and 20-29 age groups. The indicators of close groups do not have reliable differences. Thus, there is a tendency to a gradual decrease in speed capabilities. On the other hand, we did not trace any pattern in the stamina development: all age groups do not have proven discrepancies in the results. Speed and power capabilities of the organism, which we determined based on the indicator of the test exercise "Standing long jump", decrease at the age of 30 to 39, and later on they do not noticeably fade. Power capabilities, reflected in the indicators of the test "Bending and unbending arms from the lying position" also did not show any tendency to fading. Based on this, a preliminary conclusion can be drawn that such physical qualities like power and stamina can be maintained at a reasonably high level up to 49 years. Programs of physical education for Far Eastern women belonging to different age groups should focus on the development of these qualities.

Men show similar tendencies of speed capabilities to women: a proven difference is observed between the 20-29 and 40-49 age groups; between close groups, the discrepancy is not valid. Among the indicators, reflecting stamina, reliable differences are observed between the male groups of 20-29 and 30-39 years, a more senior group does not differ from a close-aged group. There is a reduction in speed and power capabilities, comparing each age group of men. Power capabilities fade at the same rate as speed and power ones do. All in all, it can be concluded that men show a more gradual decrease in the indicators of physical qualities; thus the targeting of male physical education of the above-said age group cannot be recommended at this stage.

The analysis of the psychomotor system data of men and women in the 20-29 age group (45 persons) has shown that the indicator of visual and search reaction (sec) according to the Shulte-Platonov tables amounts to 41±1.3 (average level), simple visual-motor reaction (ms) amounts to 211±1.1 (average speed of sensorimotor reaction), choice reaction (ms) amounts to 347±5.0 (average speed of sensorimotor reaction), the number of mistakes

on red light (quantity) in the choice reaction parameter during the research amounts to 0.5±0.07, number of mistakes on green light (quantity) amounts to 0.9±0.07. The indicator of attention span corresponds to 296±2.5 (an intermediary type between the inert and active types of higher nervous activity), the indicator of volume attention (ms) – to 378±3.3 (an intermediary type between the inert and active types of higher nervous activity), quantity of advance reactions (amount) of the volume attention equals to 1±0.07 (average level of the accuracy of the reaction). The indicator of the quantity of accurate reaction (times) to a moving object corresponds to 12.0±0.2 (average level of the accuracy of the reaction), the indicator of the quantity of the advance reaction (times) – to 5.0±0.8 (low level), and the indicator of the quantity of delayed reaction to a moving object amounts to (times) 3.0±0.1 (low level) (Table 6).

Table 5. Physical preparation of men (M±m)

Control exercises /age	100 m, sec	1000 m, sec	Standing long jump, cm	Pull-ups on high bars , amount
20-29 years (M1)	14.6±0.1	217.2±2.8	247.8±2.2	15.3±0.49
30-39 years (M2)	15.2±0.32	232.5±6.04	229.3±4.2	12.6±0.95
40-49 years (M3)	17.0±1.03	240.7±13.5	210.4±5.5	11.6±1.56
|M2-M1|	0.6	15.3	18.5	2.7
P	>0.05	<0.05	<0.05	<0.05
|M3-M2|	1.8	8.2	18.9	1
P	>0.05	>0.05	<0.05	>0.05
|M1-M3|	2.4	23.5	37.4	3.7
P	<0.05	<0.05	<0.05	<0.05

Table 6. Psychomotor indicators of men and women in different age groups (n=65)

Indicators	Male and female age groups	
	20-29 years (45 persons)M±m	30-39 years(20 persons)M±m
Simple visual-motor reaction (ms)	211±1.1	210±5.5
Visual and search reaction (sec)	41±1.3	35±1.8
Choice reaction (ms)	347±5.0	375±14.1
Red light (mistakes)	0.5 ±0.07	0.6±0.1
Green light (mistakes)	0.9±0.07	0.8±0.1
Attention span (concentration, ms)	296±2.5	284±8.2
Volume attention (ms)	378±3.3	368±6.7
Number of advances (times)	1.0±0.07	0.6±0.2
Reaction to a moving object Accurate reaction (times)	12±0.2	12±1.0
Advance reaction (times)	5±0.2	4±0.6
Delayed reaction (times)	3±0.1	4±1.0

The research of the psychomotor system of men and women of the 30-39 age groups (20 people) has shown that the indicator of the visual and search reaction (sec) according to the Shulte-Platonov tables amounts to 35±1.8 (average level), simple visual-motor reaction (ms) amounts to 210±5.5 (average speed of sensorimotor reaction), choice reaction (ms) – 375±14.1 (average speed of sensorimotor reaction), the number of mistakes on red light and green light (times) during the research has amounted to 0.6±0.1 and 0.8±0.1, correspondingly. The indicator of attention

span corresponds to 284±8.2 (an intermediary type between the inert and active types of higher nervous activity), the indicator of volume attention (ms) – to 368±671 (an intermediary type between the inert and active types of higher nervous activity), the quantity of advance reactions (amount) of the volume attention equals to 0.6±0.2. The indicator of the quantity of accurate reaction (times) to a moving object corresponds to 12±1.0 (average level of the accuracy of the reaction), the indicator of the quantity of the advance reaction (times) – to 4.0±0.6 (low level), and the indicator of the quantity of delayed reaction to a moving object amounts to (times) 3.0±0.1 (low level).

CONCLUSION

Summarizing the held research, the following main conclusions can be drawn. The indicators of physical development and preparation of men and women between 20 and 49 years, who live in the Far East, more frequently correspond to the age norms, in some cases are higher or slightly lower than their average values. Having studied the indicators of the male and female psychomotor system in the 20-29 and 30-39 age groups, we can state that in general the indicator of visual and search reaction (sec) definitely decreases in the second group (30-39 years) in comparison with the first group (20-29 years) by 6 seconds (by 17.1%), the indicator of the volume attention (ms) in the second group (30-39 years), comparing to the one of the first group (20-29 years), decreases by 10 ms (by 3.6%). The indicator of the choice reaction provably increases in the second group (30-39 years) in comparison with the first group (20-29 years) by 28 ms (by 8.1%).

ACKNOWLEDGEMENTS

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