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Physical training in patients with chronic heart failure: level of involvement, as well as psychosocial, anamnestic and iatrogenic factors that determine the motivation to practice

Introduction	Physical exercise (PE) is a necessary part in the treatment of patients with chronic heart failure (CHF), which is stated in the European Society of Cardiology guidelines and the Russian Heart Failure Society guidelines. However, this type of non-drug treatment is still not sufficiently used in HF patients in Russia.
Aim	To study the current involvement of HF patients in PT and to describe psychosocial factors that influence the patients' willingness to exercise and potential barriers and motivations for PE.
Methods	This study was designed as an in-moment survey. Patients with CHF who visited clinics in 7 cities of the Russian Federation in 2018 as a part of European Heart Failure Awareness Days were provided with a self-administered questionnaire containing questions about their social and educational status, attitude to PT as a method of treatment, and factors motivating and demotivating them to participation in training sessions. The survey participants were also asked a question about their source of information about exercise in HF. Physicians filled in the items describing HF clinical manifestations (left ventricular ejection fraction (EF) and HF functional class (FC)). Code numbers were used for further identification of the participants and to protect their confidentiality. Statistical analysis was performed with the StatXcat-8 program. Limits of exact confidence intervals (CIs) were provided both for fractions and parameters of polynomial distribution. CI limits for differences and fractions were calculated using MOVER. Age was analyzed using the PAST program.
Results	The study included 560 patients with HF; 52% of them were women (mean age, 64; 95% CI: 63–65 years). Women were 3 years older than men (95% CI: 1.3–4.9 years). 501 (89.5%) patients had FC II–III; 265 (49%) patients had HF with low EF. 350 (62%) patients had comorbidities: 41.4% of patients had diabetes mellitus and 25.4% of patients had arthritis. Only 91 (17%) patients reported exercising. Patients younger than 65 exercised significantly more frequently than older ones (odds ratio (OR), 1.7, 95% CI: 1.0–2.7, p<0.001). Patients with higher education had better chances to be involved in PT or were more anxious to start training (OR, 2.7; 95% CI: 1.6–4.7, p<0.001). The capability for influencing the disease was the major motivation for PT for both sexes. Probability of this answer was 48% (95% CI: 33–61) for men and 46% (95% CI: 29–63) for women. 62% of patients indicated poor health as the major barrier for participation in PT. Only 55% of patients knew that PT could be a method for HF treatment, and only 50% were informed about that by their physician.
Conclusion	The factors that positively influence the willingness to exercise include male sex, higher level of education, younger age, and better perception of the own health condition. 62% of patients indicated poor health as the major barrier for participation in training. On the whole, the awareness of patients about PT benefits for health in HF was low. To our opinion, this was a serious factor of the extremely low involvement of patients in PT. Only 55% of patients knew that PT could be a method for HF treatment, and, furthermore, only 50% of patients received this information from their physicians.

Keywords Physical training; heart failure; motivating factors; barriers

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Patients with heart failure (HF) usually have a low level of physical activity. This is due to various life circumstances and personal traits, their health condition, such as symptoms of chronic heart failure (CHF), that limit physical activity, along with fear of health deterioration and other common depressive symptoms. The low level of physical activity can also be due to physicians not paying enough attention to non-drug aspects of patient management. Evidence has been mounting that gradually and steadily decreasing motor activity in patients with CHF is an essential but often underestimated factor for progression of the disease. The negative effect of low physical activity is driven by progression of skeletal and respiratory muscular disorders resulting in additional activation of the renin-angiotensin-aldosterone system and the sympathetic nervous system, as well as increasing failure in social endeavors and aggravation of depressive symptoms. An additional analysis of the Heart Failure Adherence and Retention Trial (HART) showed that the absence of physical activity (0 min/week) in patients with CHF was associated with a higher risk of all-cause mortality (odds ratio [OR] 2.01; 95% confidence interval [CI]: 1.47–3.00; p<0.001) and cardiovascular mortality (OR 2.01; 95% CI: 1.28–3.17; p=0.002) Even minor physical activity was associated with a better prognosis [1]. Exercise training (ET) is currently recognized as a necessary part of the treatment regimen for patients with CHF. Recommendations include moderate-intensity aerobic ET (category IA), strength training, and high-intensity interval training (category IB) [2–5]. Moreover, the guidelines state that respiratory training is indicated for patients with CHF of any functional class [2]. ET reduces mortality [3], improves functional condition and quality of life, and reduces the number of hospitalizations [4–8]. Unfortunately, ET is very rarely prescribed to patients with HF.

Analysis of the Russian section of the European Cardiac Rehabilitation Database (EuroCaReD) in 2014 found that aortic bypass surgery (35.8%), and myocardial infarction with ST-segment elevation (25.8%) were the most common reasons for referrals of Russian patients for cardiac rehabilitation. However, no patients with CHF were referred for cardiac rehabilitation (0% in the Russian Federation (RF) versus 6.6% in other countries, p<0.01) [9]. The European Survey on Exercise Training in Heart Failure and Left Ventricular Assist Device (ExTraHF and LVAD), which included 76,214 patients with HF at 70 sites (including four Russian sites) in 26 countries, demonstrated that only 49% of patients were referred for physical rehabilitation [10]. Many researchers have shown that motivation to exercise is influenced by a complex of demographic, social, psychological, and anamnestic factors [11]. For example, male gender, higher levels of education, and social status are associated with higher motivation [12, 13]. Female gender and poor health self-assessment were negatively associated with training adherence [14].

This study had the following objectives: 1) Measure the ET involvement of patients with HF. ET is considered to be any type of exercise performed regularly by patients on their own or under specialist supervision; 2) Identify anamnestic and psychosocial factors influencing ET motivation; 3) Assess the frequency of physicians' recommendations for ET to patients with CHF.

Methods

The study was designed as a cross-sectional survey. Patients with HF who visited hospitals in seven Russian cities on Heart Failure Awareness Days in 2018 were asked to complete a questionnaire containing questions about social status, educational level, attitude about ET as a treatment for HF, current involvement in ET, and factors motivating or impeding them from participating in ET. They were also asked about their source of information regarding ET. Questions concerning medical information, e.g., HF functional class (FC), ejection fraction (EF), duration of the disease, and concomitant diseases were answered by the physician. The questionnaire contained no personal information, and the subjects were identified by reference numbers. All patients signed an informed consent form for inclusion in the study. Since the study was designed as a one-time survey, no approval by the ethics committee was required.

Statistical analysis. Confidence intervals (CI) were used for the portions and multinomial distribution parameters (StatXast-8). Confidence limits were calculated for the portion difference and ratios using the MOVER method (MOVER-D and MOVER-R, respectively). An interactive

calculator (Fisher's exact test p-value calculator, 2x2 and 2x3) was used to calculate the exact mid-p value [15]. The results of the statistical analysis are presented in a compact record with the 95% CI limits specified as subscripts on the left and right of point estimates [16].

Patient age was analyzed with PAST software, which implements modern, effective methods of reliable statistical evaluation based on bootstrap and Monte Carlo algorithms. The pie charts were built using interactive Create a Pie Chart software (www.meta-chart.com/pie).

Results

The study included 586 patients with HF, mean age 64 years, 52% female. Females were 3 years older than males. 90% of patients had FC II–III HF. 123 patients had HF with reduced ejection fraction (HFrEF), and 350 patients (62.5%) had concomitant disease. 41% had diabetes mellitus, and 25% had musculoskeletal diseases (Table 1).

527 patients answered the question about ET. Only 17.2% (n=91) reported being involved in ET. Patients under 65 years old exercised significantly more often than did older patients (odds ratio (OR) 1.7, 95% CI: 1.0–2.7; p<0.001). Patients with higher education exercised or were willing to start ET more often (OR 2.7, 95% CI: 1.6–4.7; p<0.001). Attitudes toward exercise training are shown in Table 2, listed according to the patients' age and gender.

The heterogeneity and gender dependence of answers were statistically significant (mid-p=1.9·10–5). This was due to a difference in the rate of negative answers. Patients older than 64 years said «no» 1.5 times more often. The rate of «yes» and «already» answers were statistically independent of gender (p=0.52). Since female respondents were significantly older than males, we also estimated the exercise involvement or willingness to exercise, depending on the median age in the male and female subgroups (Table 3). The heterogeneity of answer rates was statistically significant (p<0.001). The rates of «no» and «yes» answers were not statistically different (p=0.77). The rate of all three answers in male and female respondents under the median age (62 and 65 years old, respectively) was statistically homogenous, as well as, in male and female respondents above the median age (p=0.23). Both male and female respondents above the median age were significantly more often not willing to ET (p<0.001).

Respondents who trained answered questions about their training motivation (n=91; 45 female and 46 male respondents, Figure 1). The ability to influence the course of the disease was the essential training motivation factor for both genders, regardless of age. The probability of this answer was 48.4% for male and 45.6% for female

Table 1. Social, demographic, and clinical characteristics of patients

#	Question	Answer	n	M, 95% CI
1	Age, years	Male	305	$_{61.3}62.5_{63.7}$
		Female	281	$_{64.1}65.6_{66.9}$
				(%)
2	Gender	Male	305	52
		Female	281	48
3	Education	Primary	26	4
		Secondary	150	26
		Vocational	224	38
		Undergraduate	15	3
		Higher	171	29
4	Disability	No	309	53
		Applied for disability benefits	2	0,3
		Group III	144	25
		Group II	129	22
6	Family status	Married	383	66
		Never married	22	4
		Family	20	3
		Divorce	30	5
		Widowed	129	22
34	CHF FC	I	35	7
		II	235	44
		III	244	46
		IV	21	4
36	Classification by EF	HFrEF	123	24
		HFmrEF	144	28
		HFpEF	256	49
37	Other cardiovascular diseases	Myocardial infarction	256	44
		Angina pectoris	144	25
		Hypertension	152	26
		Valvular heart disease	23	4
		Cardiomyopathy	10	2
38	Other diseases	Diabetes mellitus	145	41
		Cancers	17	5
		Chronic obstructive pulmonary disease and asthma	67	19
		History of stroke	32	9
		Musculoskeletal disease	89	25

n, number; f, portion (relative frequency) in percentage; M, mean; HFrEF, heart failure with reduced left ventricular ejection fraction; HFmrEF, heart failure with mid-range left ventricular ejection fraction; HFpEF, heart failure with preserved left ventricular ejection fraction; FC, functional class of heart failure; EF, ejection fraction.

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Table 2. The rate of answers about exercise involvement or willingness to start training in male and female patients older and younger than 65 years

Age		Willingness to train			mid-p
		Already training	Yes	No	
≤64 years old	n	56	105	97	$1.9 \cdot 10^{-5}$
	f (%)	$_{16}22_{28}$	$_{33}41_{48}$	$_{30}38_{45}$	
≥65 years old	n	35	79	155	
	f (%)	$_{9}13_{19}$	$_{23}29_{36}$	$_{50}58_{65}$	
Portion difference	PD (%)	$_{0.7}8.7_{17}$	$_{1.3}11_{21}$	$_{9}20_{30}$	-
Portion ratio	PR	$_{1.0}1.7_{2.7}$	$_{1.0}1.4_{1.9}$	$_{1.2}0.1.5_{2.0}$	
p-value		0.52		-	-

n, number; f, portion (relative frequency) in percentage within 95% confidence interval (CI), PD, portion difference; PR, portion ratio. mid-p, an exact p-value corrected for discreteness.

Table 3. The rate of answers about exercise involvement or willingness to start training in male and female patients according to the median age

Gender	Age above/ below the median (years)		Willingness to train			p-value
			Already training	Yes	No	
Male	≤62	n	27	53	49	0.86
		f (%)	$_{13}21_{31}$	$_{31}41_{52}$	$_{28}38_{49}$	
Female	≤65	n	30	51	45	
		f (%)	$_{15}24_{34}$	$_{30}40_{51}$	$_{26}36_{46}$	
Male	≥63	n	19	46	75	0.23
		f (%)	$_{8}13_{22}$	$_{24}33_{43}$	$_{43}54_{64}$	
Female	≥66	n	15	34	83	
		f (%)	$_{6}11_{19}$	$_{17}26_{36}$	$_{52}63_{73}$	
p-value			0.77			-
			0.00015			-

n, number; f, portion (relative frequency) in percentage within 95% confidence interval (CI).

respondents. Emotional factors, e.g., atmosphere during and a better mood after training, were also important for female respondents, and better mood and health benefits were relevant for male respondents. The rates of the answers to the motivation question were not significantly different between male and female respondents (mid-p=0.67).

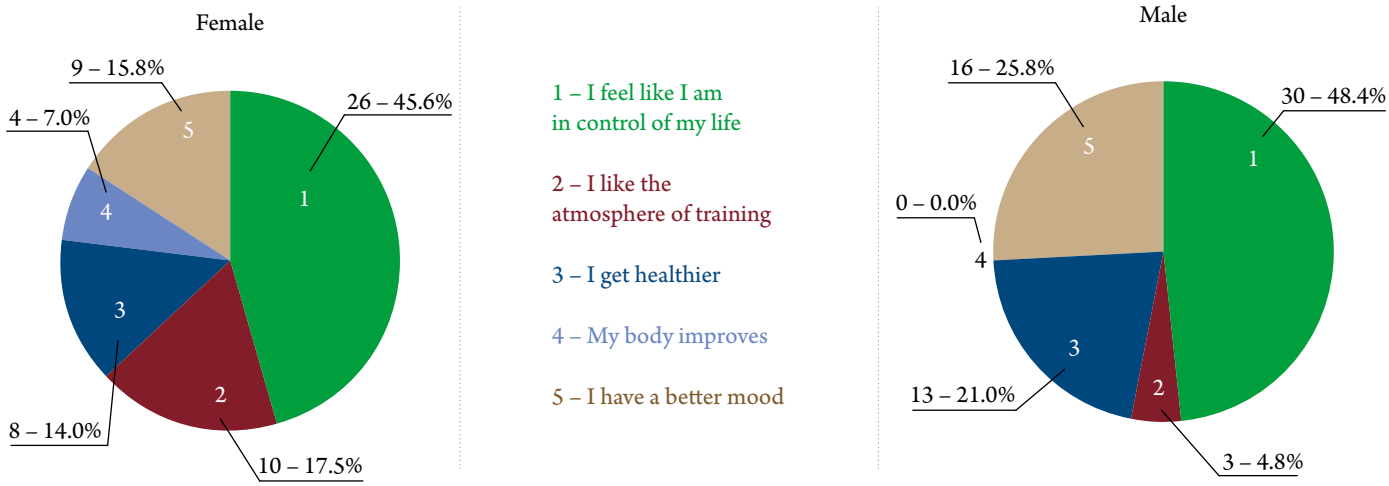
Poor health was indicated by 62% of patients as the major limitation to ET. In general, there was a lack of awareness of the health benefits of ET among patients with HF, and that was a strong factor explaining the extremely low level of patient engagement in ET. Only 55% of patients knew that ET could be a treatment option for HF. At the same time, only 50% of patients received this information from the physician.

Discussion

Our findings concerning the factors contributing to and impeding ET in patients with HF are generally the same as those of foreign studies. Factors that positively influence a patient's willingness to train include male gender, higher education levels, younger age, and higher health self-assessment [17, 18]. At the same time, we found that patients who perceived their health as poor or very poor were less motivated to train. This suggests that these patients did not see ET as a treatment for HF. This was also confirmed by the fact that ET and general physical activity were recommended extremely rarely.

Thus, a catastrophically low level of training recommendations for patients with HF is a complex problem.

Figure 1. Factors motivating to continue training*



*, respondents were allowed to select multiple answers, which is why the absolute number of answers is not equal the number of respondents

In fact, there is almost no ET infrastructure, and physicians do not consider ET a treatment for patients with cardiovascular diseases. This was indirectly demonstrated by the fact that only a quarter of the patients surveyed received information about necessary ET from their consulting physicians. Concerning the above, we wish one more time to highlight the physician's role in the process of developing a correct attitude of the patient toward exercise as a treatment for cardiovascular diseases. A review of studies of the relationship between physicians' physical activity and the frequency and effectiveness of preventive recommendations concerning patients' physical activity showed that physicians and nurses who lived a healthy life and reached the level of physical activity recommended by the World Health Organization more often and persistently recommended that their patients exercise [19]. This is also relevant for other preventive measures, such as quitting smoking, reducing alcohol consumption, improving diet, and having regular medical examinations and vaccinations [20–22]. Thus, reducing behavioral risks, in general, and increasing physical activity, in particular, are real challenges, when in these respects the physician is not a role model for patients. Physicians' attitudes towards a healthy lifestyle and their behaviors are crucial for shaping patients' motivations.

Limitations of the study

Despite the large number of patients surveyed, this sample cannot be considered as representative of the Russian Federation. The mean age of the patient cohort was almost 5 years less than the mean age of patients with HF in the Russian epidemiological study EPOCH [23]. This can be explained by both the small sample and by the fact that older patients less often attend public events such as Heart Failure Awareness Days. Given our findings that younger patients exercised or were willing to exercise significantly more often, we suggest that even fewer patients with HF are involved in ET.

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