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Research on the Fitness Status and Influencing Factors of Fishermen Who have Withdrawn from Fishing in the Yangtze River Basin - A Survey Analysis Based on 331 Individuals in the Chongqing Section

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Abstract: This study conducts a survey and analysis of the fitness status of 331 fishermen who have withdrawn from fishing in the Chongqing section of the Yangtze River Basin. The results indicate that educational level is the most significant factor constraining the participation of these fishermen in fitness activities in the Yangtze River Basin. Gender, place of residence, working hours, and employment status also have a significant impact on their engagement in fitness activities.

A monthly income of 6000 yuan is a key income threshold for their participation in fitness activities. After withdrawing from fishing, the attention to health among these fishermen has continually increased. The forms of fitness activities they engage in primarily involve "simple and feasible" activities such as walking, jogging, and hiking. The locations for these activities are mainly parks, roads, courtyards, or residential areas. There are noticeable differences in the level of exercise among fishermen withdrawing from fishing of different age groups. "Lack of time" is a crucial factor preventing these fishermen from participating in fitness activities. Insufficient skills in sports and lack of necessary equipment also hinder their engagement in fitness. The habit of "staring at screens without moving" poses a significant health risk for fishermen withdrawing from fishing in the current context. Participation in fitness activities has a clear positive effect in alleviating the post-out-of-fishing life pressures for these fishermen. It not only facilitates their transition to alternative livelihoods but also enhances their life adaptation, ultimately increasing their sense of well-being in retirement.

Keywords: Yangtze River Basin; Fishermen who have Withdrawn from Fishing; Fitness Status; Participation in Fitness; Survey Analysis

1. Introduction

The Yangtze River is the mother river of the Chinese nation, and the ecological environment protection in the Yangtze River Basin is a hot topic of high concern from all sectors of society[1]. According to statistics from the Ministry of Agriculture and Rural Affairs, the implementation of a comprehensive fishing ban in the Yangtze River Basin involves 112000 registered and registered fishing boats and 231000 fishermen nationwide[2]. The special group of "retired fishermen" born out of the Yangtze River protection policy has received high attention from the Party and the state[3]. Multiple departments of the State Council and local governments have successively introduced a series of policy measures, such as the "Implementation Plan for the Prohibition of Fishing in Key Waters of the Yangtze River Basin and the Establishment of Compensation System", to promote the transformation of production and employment, resettlement of residences, and compensation for retired fishermen[4]. However, the unique way of homework and living environment have seriously hindered the development of fitness activities among fishermen[5], which directly affects their physical health after retiring from fishing and also restricts their quality of life after landing. Actively promoting participation in national fitness is not only an important part of the resettlement and assistance work for retired fishermen but also an inevitable requirement for the comprehensive implementation of the "Healthy China" strategy.

2. Research Object and Methods

2.1 Research Object

A total of 331 registered retired fishermen from 9 districts and counties in the upper reac hes of the Yangtze River Basin, including Hechuan District, Yubei District, Yunyang County, Shizhu County, Fuling District, Changshou District, Wushan County, Beibei District, and Jian gjin District, were selected as the research subjects.

2.2 Research Methods

2.2.1 Literature Review Method

Search for literature on the resettlement, living conditions, physical health, sports particip ation, and social life of fishermen for research purposes, sort out the research context, and dete rmine the analysis framework.

2.2.2 Questionnaire method

Design a survey form on the fitness status of fishermen returning to the Yangtze River Ba sin and inquire with 7 well-known domestic professors through three rounds of inquiry The fi nal survey form is completed, and the reliability and validity tests meet the basic requirements of sociological surveys. The content covers 18 aspects, including basic information, family in come, health status, fitness concepts, fitness environment, fitness influencing factors, and fitne ss participation behavior. To ensure the size of the research sample and ensure that the target a udience for questionnaire collection is registered fishermen who have returned from fishing, r andom sampling was conducted in the "Ten Provinces, Hundred Counties, and Thousand Hou seholds Tracking Survey Sample Database (Chongqing)" set up by the Yangtze River Fishing Ban and Return Work Special Team. A total of 400 questionnaires were distributed based on t he fishing administration system of the fishermen's respective districts and counties and the m ethod of face-to-face collection by the research group. 365 questionnaires were collected, with a response rate of 91.2%. After removing 34 invalid questionnaires, 331 valid questionnaires were obtained, and the sample size met the research needs.

2.2.3 Field Survey Method

From November 2022 to October 2023, one-year fieldwork was conducted, collecting fie ld materials through participation in observation, structured and unstructured interviews, and t ranscribing through oral organization, cultural writing, and "deep drawing" methods, aiming t o document the investigation process and observations in detail.

2.2.4 Mathematical Statistics

The questionnaire data was analyzed and processed using SPSS 26.0 software, and statist ical analysis methods such as descriptive statistics, analysis of variance, and logistic regressio n analysis were used in the study. The significance level of all parameter indicators was set to $P=0.05$.

3 Results and Analysis

3.1 Fitness Status of Retired Fishermen in the Upper Reaches of the Yangtze River Basin in China

3.1.1 Basic information and fitness status

Table 1 Basic information of research subjects and statistical table of fitness status

	Variable classification	Number of people	Proportion (%)	Variance (F)	significance (P)	Can engage in fitness (person)	Inspection (T; P)
Gender	male	218	65.9	0.474	0.226	120	-0.802 ; 0.423
	female	113	34.1			57	
Age	Under 35 years	17	5.1	0.607	0.369	9	0.993 ; 0.322
	36-45 years old	31	9.4			16	
	46-59 years old	256	77.3			129	
	Over 60 years old	27	8.2				
marital status	unmarried	7	2.1	0.541	0.294	3	1.484 ; 0.044*
	First marriage	90.6	90.6			156	
	Divorce	9	2.7			9	
	remarriage	10	3.0			5	
	Widow	3	1.5				
Educational level	Not attended	14	4.2	0.881	0.777	5	1.678 ; 0.028*
	primary school	136	41.1			73	
	junior high	136	41.1			69	
	high school	28	8.5			19	
	University or	17	5.1				
monthly income	Below 2000 yuan	179	54.1	0.645	0.327	91	0.322 ; 0.747
	2000-4000 yuan	94	28.4			60	
	4000-6000 yuan	26	7.9			8	
	6000-8000 yuan	10	3.0			5	
	8000-10000 yuan	3	0.9			1	
	Over 10000 yuan	15	4.5				
Residence	countryside	117	35.3	0.479	0.231	75	3.335 ; 0.001**
	town	213	64.4			102	
Employment	Employed	238	71.9	0.451	0.203	118	1.923 ;

Note: In the table, * indicates that the P-value<0.05 reaches the significance level, and * * indicates that the P-value<0.01 reaches a very significant level, the same as below.

From Table 1, it can be seen that the basic information of the survey subjects is described, including variables such as gender, age, marital status, education level, monthly income, place of residence, and employment status. The significance of the variance test for each category is greater than 0.05, indicating that there is no significant difference in the distribution of categories for each variable. Therefore, it is considered that the basic information categories of the survey subjects are balanced, and the sampling differences do not have a significant impact on the dependent variable. There is no significant error in the classification level of each variable, and the classification level is reasonable and suitable for statistical analysis.

Using "fitness skills" as the dependent variable for the independent sample t-test, it can be seen that there are significant differences in P values<0.05 among different marital statuses, educational levels, places of residence, and employment status, indicating that the above factors will have a significant impact on the fitness status of retired fishermen. Among them, P values<0.01 in place of residence reach a very significant level, indicating that the influence of place of residence on the fitness status of retired fishermen is very significant. It can be considered that the fitness status of retired fishermen in the Yangtze River Basin is influenced by multiple factors, but it is difficult to determine the specific impact of multiple factors on the dependent variable solely based on the basic situation of the sample. Therefore, further research is needed.

3.1.2 Construction of Multi-factor Effect Model

Based on the above research, it can be concluded that the fitness status of retired fishermen in the Yangtze River Basin is influenced by multiple factors. To identify the key factors that constrain their fitness behavior and seek effective countermeasures, logistic regression analysis is the best choice. The advantages of using this method are: firstly, the dependent variable type can be a categorical variable, and the probability of each classification of the categorical variable can be predicted through a set of predictive variables, which can be interval variables or categorical variables; Secondly, this method has fewer assumptions about the predictive variables and does not necessarily have to satisfy assumptions such as independence and normality[6].

Table 2 Statistical summary of the advantage ratio of the impact of the current living conditions of retired fishermen on their participation in fitness activities

	Variable classification	B	P	Exp(β)
Gender	Male (Kirby)	0.339	0.000**	1.579
	female			
Educational level		0.737	0.000**	1.734
	Never attended school			
	primary school	0.767	0.037*	1.728
	junior high school	1.224	0.000**	2.085
	high school	1.241	0.000**	2.277
	University or above	1.758	0.000**	4.382
monthly income		0.243	0.041*	1.321
	Below 2000 yuan (base	0.465	0.000**	1.232
	2000-4000 yuan	-0.672	0.000**	0.637
	4000-6000 yuan	-0.879	0.047*	0.292
	6000-8000 yuan	0.023	0.778	1.023
	8000-10000 yuan	0.508	0.000**	1.887
	Over 10000 yuan	0.847	0.000**	2.358
Residence	Rural (base ratio)	0.412	0.000**	1.541
	town			
Employment	Unemployed (base ratio)	0.376	0.039*	1.375
	Employed			
Health condition		0.646	0.00	1.387
	Poor (base ratio)	0.448	0.02	1.413
	commonly	0.614	0.00	1.231
	very good	0.796	0.00	1.527
Working hours		0.189	0.00	1.473
Age	P>0.05， excluding	Model goodness of fit test: Chi-square value X2=12.369, P=0.082>0.05; The model has a good fitting effect; Global model validation: Score X2=477.49; P=0.000<0.05; Indicates that the model has statistical		
marital status	P>0.05， excluding			
Occupational	P>0.05， excluding			
Whether there is a part-time job or	P>0.05， excluding			

Table 2 is a statistical summary of the impact of the current living conditions of retired fishermen on their participation in fitness activities. In the research design, "whether they will engage in fitness" is a typical binary multiple-choice question, that is, "yes" or "no". If "yes" is selected, the respondents are required to answer a series of practical questions they face during the process of "participating in physical exercise". If "no" is selected, they are also required to answer a series of practical questions about "not participating in exercise". Now let the dependent variable Y follow a binomial distribution with a value of (1,0), and the overall probability of Y=1 (i.e. choosing "yes") is π (Y=1). In this study, 11 independent variables (i.e. X1, X2,..., X11) were selected, and the constructed binomial logistic regression model is:

$$\pi=p(Y=1)=e\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\ldots+\beta_{11}X_{11}/(1+e\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\ldots+\beta_{11}X_{11})$$

formula（1）

In formula (1), X1 represents gender, X2 represents age, X3 represents marital status, X4 represents education level, X5 represents monthly income, X6 represents place of residence, X7 represents employment status, X8 represents occupational type, X9 represents working hours, X10 represents part-time employment, and X11 represents health status, β 0 is the intercept (or constant term), β J (j=1, 2, 3,..., 11) is the corresponding regression coefficient, which can be solved using the maximum likelihood method. Introducing an overview of "advantages" into the model represents the likelihood of an event occurring, which is the ratio of the expected number (or probability) of events occurring to the expected number (or probability) of nonevents occurring. Advantage: O=p/(1-p)=event probability/nonevent probability, where O represents the advantage of an event occurring. Odds Ratio (OR) is an indicator that reflects the relationship between two binary categorical variables. Taking the natural logarithm of the two sides of the advantage can obtain the definition of the advantage ratio of the regression model, which is the advantage ratio of the event occurrence:

$$\mathbf{logit[\pi(Y=1)]=logitp=ln[\pi(Y=1)/(1-\pi(Y=1))]=ln[p/(1-p)]=lno=\beta_0+\beta_{1X1}+\beta_{2X2}+\beta_{3X3}+\ldots+\beta_{11X11}}$$

formula（2）

Formula (2) can deduce the advantage O=exp（ β 0 β 1X1+ β 2X2+ β 3X3++ β 11X11), exp is an exponent based on natural logarithms. This expression is more similar to the previous regression model, except that the left side is not the dependent variable Y, but the logit transformation value of the probability of Y=1. here β J represents the average change in logarithmic dominance when a certain independent variable Xj changes by one unit while other independent variables remain fixed. Taking X1 as an example, the meaning of the advantage ratio is: when X1 increases by one unit, that is, from the real number a to a+1, the advantage ratio is:

$$\mathbf{OR_1=O_2/O_1=exp[\beta_0+\beta_1(a+1)+\beta_{2X2}+\beta_{3X3}+\ldots+\beta_{11X11})/exp(\beta_0+\beta_{1a}+\beta_{2X2}\beta_{3X3}+\ldots+\beta_{11X11})]}$$

formula（3）

Based on formula (3), it can be considered that ORj>1 indicates that the factor is favorable; ORj<1 indicates that the factor is unfavorable; When ORj=1, it indicates that the factor is independent of the dependent variable.

Table 2 shows the regression model established between the fitness status of retired fishermen in the Yangtze River Basin and 11 influencing factors. From the perspective of the global test effect of the model, after excluding 4 variables with insignificant effects, Score X2=12.369, P=0.000<0.05, indicating that the model has statistical significance. On the other hand, the goodness of fit of the Hosmer and Lemeshow chi-square values X2=14.475, P=0.082>0.05, further indicating that the model has a good fitting effect. Therefore, it is considered feasible to use Table 2 parameters to explore the key factors affecting the fitness status of retired fishermen in the Yangtze River Basin. Seven variables, including gender, education level, monthly income, place of residence, employment status, health status, and working hours, were introduced into the regression model, and a series of parameters were obtained through the Forward Stepwise method. These variables had a significant impact on fitness participation and all reached a significant level (P<0.05); The four variables of age, marital status, occupational type, and the presence or absence of part-time jobs have no statistically significant impact on whether to exercise.

3.1.3 Analysis of Effect Models

From Table 2, it can be seen that cultural level has the greatest impact on the choice of fitness participation, with a total advantage ratio of exp（β)= 1.734, which means that when all other variable values remain unchanged, for every unit increase in the cultural level of fishermen who withdraw from fishing, the number of people participating in fitness will increase by 1.734 times; Through further comparison, it was found that the corresponding advantage ratios for primary school, junior high school, high school, and above were 1.728, 2.085, 2.277, and 4.382, respectively (all based on the reference of "not having attended school"). This means that if the cultural level of fishermen who have retired from fishing increases from "not having attended school" to primary school, junior high school, high school, and above, their frequency of fitness participation will increase to 1.728, 2.085, 2.277, and 4.382 times the original level. It can be considered that continuously improving cultural level has the most important impact on the fitness participation of retired fishermen, or in other words, it is expected to improve the health level of retired fishermen through fitness participation, and improving their education level is the most important factor. Wang JX (male, 46 years old, Hechuan District): *"I have been fishing on the river with my mother and old man since I was 10 years old. I haven't studied much, and it turns out that casting a net and box was just an exercise for me. Now that I'm ashore, I don't know how to exercise."* It can be seen that due to their unique growth environment and work methods, their contact with sports activities has been limited since childhood. Many fishermen have not received systematic education in school, and they don't know much about the most common fitness methods, let alone the acquisition and development of lifelong sports concepts. Therefore, cultural level has become the most important factor restricting the participation of retired fishermen in fitness.

Gender also has a significant impact on the fitness participation of retired fishermen, with an overall advantage ratio of exp（β)= The level of 1.579 is very significant, and the probability of female fishermen returning to fishing and participating in fitness is 1.579 times higher than that of male fishermen returning to fishing. In other words, the main body of retired fishermen participating in fitness is women rather than men. This indicates that: firstly, women have a higher awareness of maintaining or improving physical health through fitness than men, and are more enthusiastic about fitness; Secondly, after retiring from fishing and transitioning to other professions, the division of labor in the family has changed from the original "husband and wife ship" to a "male lead outside, female lead inside" division of labor pattern, allowing women to have more exercise time and opportunities than men. *Wang XL (male, 47 years old, Yubei District) participated in employment skills training organized by the Chongqing Municipal Human Resources and Social Security Bureau after retiring from arrest. After the training, he was recommended by the street work committee to enter a construction site not far from home for forklift driving operations. Wang's wife, Zhai WQ (female, 46 years old, Yubei District), is responsible for taking care of household chores and taking care of her in-laws at home. During the morning break between breakfast and lunch, Zhai WQ will play softball with several enthusiasts in the nearby park for about an hour. According to her introduction, this sport was carried out while walking in the park after retiring from fishing. She felt that this fitness method was very good and believed it was beneficial for the shoulder and neck strain caused by long-term fishing work, so she voluntarily joined in.*

So far, she has been exercising for more than a year, and her previous shoulder and neck strain has been greatly relieved. She told her husband about the benefits of this fitness method, but because she has to work in the morning, Wang XL cannot go to the park with his wife to practice softball.

The advantage ratio of place of residence for fitness participation of retired fishermen is very close to gender factors, and the overall advantage ratio exp（β)= At a very significant level of 1.541, the probability of retired fishermen living in urban areas participating in fitness activities is 1.541 times higher than that living in rural areas. In other words, living in urban areas is more conducive to retired fishermen participating in fitness activities. This phenomenon is closely related to the current urban-rural construction differences. In urban areas, various fitness venues, equipment, and co-enthusiasts are relatively abundant, which can better meet diverse fitness needs. However, the construction of rural fitness venues (sites) is relatively lagging, and the living pattern is also scattered, making it difficult to form a "fitness community", which is even more unfavorable for the development of fitness activities. According to observations, most of the retired fishermen living in rural areas live by the river or build their own houses near the river, exhibiting the characteristic of scattered living by the river. This is influenced by past fishing operations, but this living pattern is even more inconvenient for retired fishermen to participate in collective fitness activities.

The overall advantage ratio of working hours to fitness participation of retired fishermen is exp（β)= 1.473, from the perspective of the advantage ratio, the impact is still significant, which is easy to understand. The longer the working hours of fishermen who have retired from fishing and switched industries, the less leisure time they have left to participate in fitness. In other words, for every unit of reduced working time of retired fishermen, the likelihood of participating in fitness activities increases to 1.473 times the original probability. How to shorten the adaptation period for retired fishermen to switch careers and control their daily working hours is an important issue in promoting their fitness participation.

The impact of employment status on the fitness participation of retired fishermen is exciting, and the advantage ratio of employed to unemployed is exp（β)= 1.375, which means that the probability of fishermen participating in fitness activities after returning to fishing is 1.375 times higher than that of unemployed fishermen. This does not match the impression that unemployed fishermen who return to fishing have more time and can better participate in fitness activities. What is the reason for this phenomenon? An interview case can reflect this situation. Zhou DZ (male, 50 years old, Jiangjin District): *"I am currently working at YH Supermarket. During my break time at work, my colleagues often talk about the number of steps I took yesterday. When I see those who took more steps in my social circle, I give them likes. Every time I receive likes from everyone, I feel more at ease. I used to ride a motorcycle to work every day, but now I have changed to walking. Sometimes, because I walk a few laps downstairs before I get home, I can reach 10000 steps every day. Through this case, we can see why fishermen who quit fishing can improve their fitness participation. Maintaining good health habits requires social support, and employment is a basic form of society."* Activities are an important unit for obtaining social support, which reflects the positive attitude of society towards fitness participation and can help strengthen fitness habits.

The impact of monthly income on the participation of retired fishermen in fitness shows a non-linear relationship, with a total advantage ratio of exp（ β)= 1.321 also reaching a very significant level. When comparing groups based on monthly income levels below 2000 yuan, it was found that the B values of -0.672 and -0.879 were negative when raised to the levels of 2000-4000 yuan and 4000-6000 yuan, indicating a decreasing trend in the probability of retired fishermen participating in fitness. However, as income levels further increased to the levels of 6000-8000 yuan, 8000-10000 yuan, and above 10000 yuan, the B values increased to positive values of 0.023, 0.508, and 0.847, respectively, indicating an increase in the probability of participating in fitness. This phenomenon is worth paying attention to. After the monthly income of retired fishermen reaches 6000 yuan, their probability of participating in fitness will change from negative to positive, that is to say, from "constraint" to "promotion". The monthly income level of 6000 yuan is a key value for retired fishermen to participate in fitness. Why the monthly income trend impacts the fitness participation of retired fishermen needs further exploration. Li DC (male, 54, Jiangjin District): *"After retiring from fishing, I implemented my current job (as a fish protection team member) through a career change. I chose to work on a fish protection team mainly because I am familiar with the environment, but my monthly salary of over 3000 yuan is still much lower than when I was fishing. Currently, my daily expenses are also relatively high, and this income is not enough. In my spare time, I will set up a" motorcycle "nearby to subsidize my family.* Although fishermen generally switch jobs after retiring from fishing, their income varies, which also has different impacts on their way of life after retiring. When the income from the job change is not enough to meet their living needs, they often have insufficient income." Expanding income channels through multiple channels to subsidize household expenses also means taking up more leisure time. However, retired fishermen with higher incomes have more leisure time and more abundant conditions for fitness participation. A monthly income of 6000 yuan is a key level for retired fishermen to participate in fitness.

3.2 Characteristics of fitness participation among retired fishermen

3.2.1 Health concerns and fitness concepts

Table 3 Statistical summary of health concerns of different genders of retired fishermen (unit:%)

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
male	55.0	7.2	5.2	37.5	26.3	18.8	3.1
female	52.0	10.3	7.8	52.5	28.7	16.2	2.3
total	53.5	8.7	6.5	45.0	27.5	18.0	2.7

Note: (1) This question is a multiple-choice question: the total effective sample size is n=331 (218 males and 113 females); Test: The consistency of gender in health concern, Pearson chi-square X2=4.12, P=0.31>0.05. (2) X1: Participate in physical exercise; X2: Taking health supplements; X3: Physical therapy; X4: Pay attention to diet; X5: Adequate rest; X6: Resting; X7 Other.

Table 3 is a statistical summary of the health concerns of fishermen who have retired from fishing by different genders. Health concerns are an important manifestation of health consciousness, directly reflecting individual health awareness and healthy lifestyle views. Positive health concerns are an important part of the construction of a healthy China. With the orderly progress of fishermen's career transition, the level of health concern among retired fishermen is also increasing. Wang XQ (female, 51, Fuling District) said, *"Physical health is the most important now, and I used to buy all my social security. Now, besides the money I earn from work, I can also receive a pension every month, and improving my health is the most worthwhile."* Table 3 shows that the level of health concern among retired fishermen of different genders tends to be consistent (X2=4.12, P=0.31>0.05). In answer to "What do you pay more attention to maintaining physical health?", the top three ranked are "participating in physical exercise" (53.5%) "paying attention to diet". (45.0%), and "adequate rest" (28%), among all methods, retired fishermen maintain their physical health through fitness participation, indicating that the health concept of "life lies in exercise" is widely present and actively practiced among retired fishermen. Meanwhile, "eating well and sleeping well" is also an important way for retired fishermen to maintain their physical health. Although healthcare methods such as taking health supplements (8.7%), physical therapy (6.5%), rest (18.0%), and others (2.7%) are also used, their proportion is not high, and they are not the main ways for retired fishermen to pay attention to their health. Since fitness participation is the most important way for retired fishermen to pay attention to their health, it is necessary to analyze the characteristics of their physical exercise behavior.

3.2.2 Exercise methods, venues, and amount of exercise

Table 4 Statistical List of Characteristics of Fitness Participation Projects for Retired Fishermen (Unit:%)

	Type1	Type2	Type3	Type4	Type5	Type6	Type7
male	44.8	17.6	18.8	4.4	19.8	2.2	12.4
female	42.2	44.2	7.0	2.8	22.6	3.8	10.2
total	43.5	30.9	12.9	3.6	21.2	3	11.3

Note: (1) This question is a multiple-choice question, with a total sample size of n=177 (120 males and 57 females). The test is Pearson chi-square X2=277.22, and P=0.000<0.05. (2) Type 1: Walking, jogging, and mountain climbing; Type 2: Dance and fitness exercises; Type 3: Martial arts and techniques; Type 4: Collective ball games; Type 5: Monosoma ball; Type 6: Swimming, skipping rope, and kicking shuttlecock; Type 7: Local characteristic sports.

The way, place, and amount of exercise are important manifestations of fitness participation, directly related to the effectiveness and quality of fitness activities. Table 4 is a statistical summary of the characteristics of the types of sports activities participated in by retired fishermen.

By analyzing 177 retired fishermen who participated in physical exercise among the survey subjects, it can be seen that there are significant differences in the types of sports activities participated in by retired fishermen of different genders (X2=277.22, P=0.00<0.05), mainly manifested in walking, jogging and mountain climbing (44.8% for males and 42.2% for females), dance and fitness exercises (17.6% for males and 44.2% for females), martial arts and techniques (18.8% for males and 7.0% for females), collective ball games (4.4% for males and 2.8% for females), individual ball games (19.8% for males and 22.6% for females), swimming, and jumping. Rope and shuttlecock kicking (male 2.2%, female 3.8%) and local characteristic sports (male 12.4%, female 12.2%), the selection of project types is similar to the fitness activities of farmers in many parts of China, reflecting the characteristics of folk, spontaneous, easy to carry out, and gender differences in fitness participation[7]. From the perspective of type selection bias, retired fishermen tend to choose exercise forms with lower requirements for sports skills, such as walking, jogging, and mountain climbing, and dance and fitness exercises, which are "simple and easy to do" forms of exercise.

Table 5 Statistical List of Main Venue Characteristics for Fitness Participation of Retired Fishermen

Own courtyard or community		Parks and Highways		Public sports		Unit sports facilities		Paid venues		Other places	
frequen	%	frequenc	%	frequency	%	frequen	%	frequen	%	frequen	%
73	41.	80	45.	44	24.	24	13.	17	9.	14	8

Note: The question type and sample size of this question are the same as Table 4.

Table 5 is a statistical summary of the main venue characteristics for fitness participation of retired fishermen. The selection of exercise venues can reflect the support of spatial conditions for fitness participation. From Table 5, it can be seen that the current fitness venues for retired fishermen are parks and highways (45.2%), followed by their own courtyards or residential areas (41.0%), and public sports facilities (24.7%). Only a small proportion of retired fishermen engage in physical exercise in paid venues (9.6%). It can be seen that the fitness venues for retired fishermen mainly rely on their own living spaces and public infrastructure, and the degree of specialization is not high. Specialized fitness venues that are universal and effective fitness guidance are important links to promote the high-quality development of fitness activities for retired fishermen.

Table 6 Statistical summary of exercise volume characteristics of retired fishermen participating in fitness activities

	Exercise frequency（%）				Exercise duration（%）			
	frequency 1	frequency 2	Frequency 3	frequency 4	Duration 1	Duration 2	Duration 3	Duration 4
male	12.5	13.3	32.5	41.7	16.7	29.1	26.6	27.6
female	24.6	17.5	14.0	43.9	31.6	42.1	26.3	36.3
Under 35 years old	11.1	33.3	22.2	33.3	11.1	22.2	22.2	44.4
36-45 years old	18.8	25.0	37.4	18.8	18.8	18.8	37.4	25.0
46-59 years	20.5	32.3	27.5	19.7	21.3	39.4	27.6	11.8
Over 60	11.8	5.9	29.4	52.9	41.2	23.5	23.5	11.7

Note: This question is a multiple-choice question with a sample size of n=177; Frequency 1=1-2 times per week, frequency 2=3-4 times per week, frequency 3=5-6 times per week, frequency 4=exercise daily, duration 1=less than half an hour, duration 2=half an hour to 1 hour, duration 3=1 hour to 2 hours, duration 4=more than 2 hours. Test: The differences in understanding of exercise frequency between gender and age were tested as Pearson chi-square X2=0.698, P=0.404>0.05, and Pearson chi-square X2=3.574, P=0.038<0.05, respectively; The differences in understanding of exercise duration between gender and age were tested as Pearson chi-square X2=0.623, P=0.646>0.05, and Pearson chi-square X2=5.925, P=0.001<0.05, respectively.

Table 6 is a statistical summary of the exercise volume characteristics of retired fishermen participating in fitness activities. Exercise volume refers to the amount of load borne by the human body during physical exercise, which is closely related to the frequency and duration of exercise[8]. From Table 6, it can be seen that there is no significant difference in the frequency and duration of fitness participation among different genders of retired fishermen (P>0.05). At the same time, there is a significant difference in the frequency and duration of fitness participation among retired fishermen of different age groups (P<0.05), indicating that the amount of exercise participated in by retired fishermen of different age groups exhibits different characteristics. From the perspective of exercise frequency, the largest proportion is 52.9% of retired fishermen over 60 years old who exercise every day, which is much higher than that of those under 35 years old (33.3%), 36-45 years old (18.8%), and 46-59 years old (19.7%). This is mainly because those over 60 years old have reached retirement age and their children have also reached adulthood, and social pressure and economic expenses are much smaller compared to the younger group. Older age makes them pay more attention to their physical health, and they even have some "health anxiety", afraid of causing a financial burden on their families due to illness. Therefore, they pay special attention to maintaining physical health through physical exercise every day. XMC (male, 64 years old): *"At this age, everything is good, especially if you take good care of your body, so as not to cause trouble for your child in the future."* From the perspective of exercise duration, the largest proportion is 44.4% of fishermen under the age of 35 who can reach 2 hours or more, which is easy to understand. The demand for exercise duration among teenagers is higher than that of middle-aged and elderly people, and a shorter exercise duration will make them have an "unpleasant" exercise experience[9].

As they age 60 and above, the proportion of people who exercise for this duration is only 11.7%, while the proportion of people under half an hour will increase to 41.2%. The exercise duration will increase with age. And decrease.

3.2.3 Reasons for not exercising

According to previous research, 53.5% of the surveyed retired fishermen engage in fitness in their daily lives, and nearly half of them (46.5%) do not have the habit of daily fitness. Therefore, the limiting factors of retired fishermen not exercising are important issues that need to be analyzed.

Table 7 Statistical List of Constraints on Fitness Participation of Retired Fishermen (Unit:%)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Male	8.2	47.2	26.5	4.3	19.8	2.2
Female	6.8	31.2	30.1	6.5	22.6	3.8
Total	7.5	42.2	28.3	5.4	21.2	3

Note: (1) This question is a multiple-choice question with a sample size of n=154; Test: The consistency of gender in health concern, Pearson chi-square X2=7.54, P=0.58>0.05. (2) Factor 1: No interest; Factor 2: No time; Factor 3: Not proficient; Factor 4: Believing that it has little effect on health; Factor 5: Lack of equipment and facilities; Factor 6: Other.

Table 7 is a statistical summary of the limiting factors for the fitness participation of retired fishermen. It can be seen from Table 7 that there is no significant difference in the limiting factors for fitness participation among retired fishermen of different genders (X2=7.54, P=0.58>0.05). Among them, the proportion of those who cannot participate in fitness due to "lack of time" is as high as 42.2%, followed by "not good at" and "lack of equipment and facilities" with scores of 28.3% and 21.2%, indicating that "lack of time" is the "first enemy" of retired fishermen's fitness participation[10]. How to make retired fishermen "have time" is the first consideration for their fitness. At the same time, the lack of software for sports skills and hardware for sports equipment and facilities also significantly restricts the fitness participation of retired fishermen. In addition, concepts such as "lack of interest", "belief that it has little effect on health", and "other" can also affect the participation of retired fishermen in fitness. However, the number of people holding such concepts is relatively small, at 7.5%, 5.4%, and 3%, respectively, which are not the main limiting factors for retired fishermen to participate in fitness.

3.3 Fitness participation and daily life of retired fishermen

3.3.1 Fitness participation and daily leisure

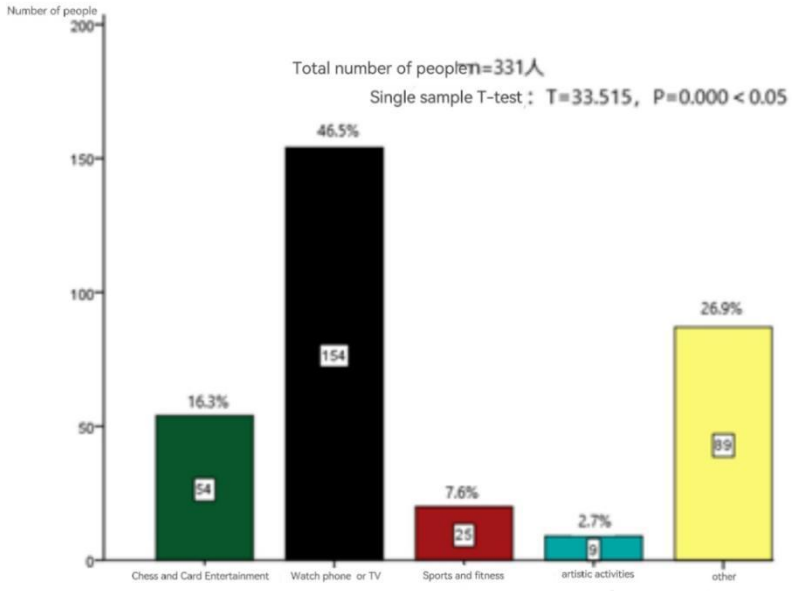

Figure 1 Schematic diagram of the main leisure activities of retired fishermen

Figure 1 shows a schematic diagram of the main leisure habits of retired fishermen. It can be seen that the single sample T-test for the main leisure habits of retired fishermen is T=33.515, and P=0.000<0.05, reaching a very significant level, indicating a significant difference in the main leisure habits of retired fishermen. Among them, 154 fishermen who retired from fishing mainly relied on watching mobile phones or television as their leisure activities, accounting for 46.5% of the total surveyed population, which was the highest. Subsequently, other forms of leisure and chess and card entertainment were the main forms of leisure, with 89 and 54 people respectively, accounting for 26.9% and 16.3%. Fewer retired fishermen use sports and fitness as their main leisure activity, with only 25 people accounting for 7.6%, which is significantly less than the former. Nine people, accounting for 2.7%, mainly engage in cultural activities as their leisure activities. It can be seen that although more than half of the retired fishermen surveyed have the habit of participating in fitness, physical fitness is not the main way of their daily leisure. In other words, physical fitness plays a "supporting role" in the daily life of retired fishermen, and "screen competition" is a dominant issue to promote the fitness participation of retired fishermen and improve their health level[11].

3.3.2 Fitness participation and stress perception

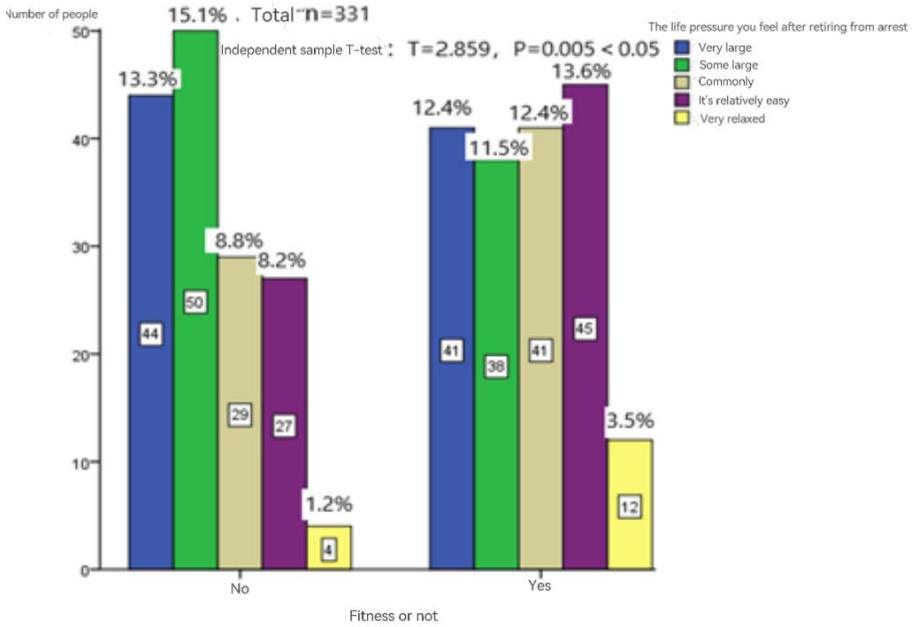

Figure 2 Schematic diagram of the relationship between fitness participation and stress perception among retired fishermen

Figure 2 shows a schematic diagram of the relationship between fitness participation and stress perception among retired fishermen. It can be seen that the independent sample T-test for pressure perception among retired fishermen with or without fitness is T=2.859, P=0.005<0.05, reaching a very significant level. This indicates that there is a significant difference in the life pressure experienced by retired fishermen with or without fitness. Among them, retired fishermen without fitness feel a higher proportion of "very large" and "somewhat large" pressure than those with fitness, while those without fitness feel a lower proportion of "very loose" and "relatively loose" pressure than those with fitness. This indicates that fitness participation can effectively alleviate the life pressure experienced by retired fishermen after "landing", which is important for the resettlement work of retired fishermen. Has positive inspirational significance. Zhang KX (male, 42 years old, Yunyang County): *"When I first switched jobs and landed, I was under a lot of work pressure and had insomnia. Later, I joined a basketball team organized by my company and played two games a week. After playing basketball, I felt very transparent all over and could fall asleep when I lay down. I also thought less about the troubles in work and life. Because I became familiar with playing basketball, my colleagues took good care of me. With their help, I became more and more familiar with the operation of machine tools."* Through this case study, it can be seen that participating in fitness not only reduces the pressure perception of fishermen who have retired from fishing but also promotes the process of transitioning to work and life. Through participating in fitness, I have a promoting effect. Being able to turn a "fitness group" into a "consulting group" helps to obtain technical assistance during the work process, and indirectly alleviates the pressure caused by technological barriers during the process of transitioning from one industry to another[12].

3.3.3 Fitness participation and life adaptation

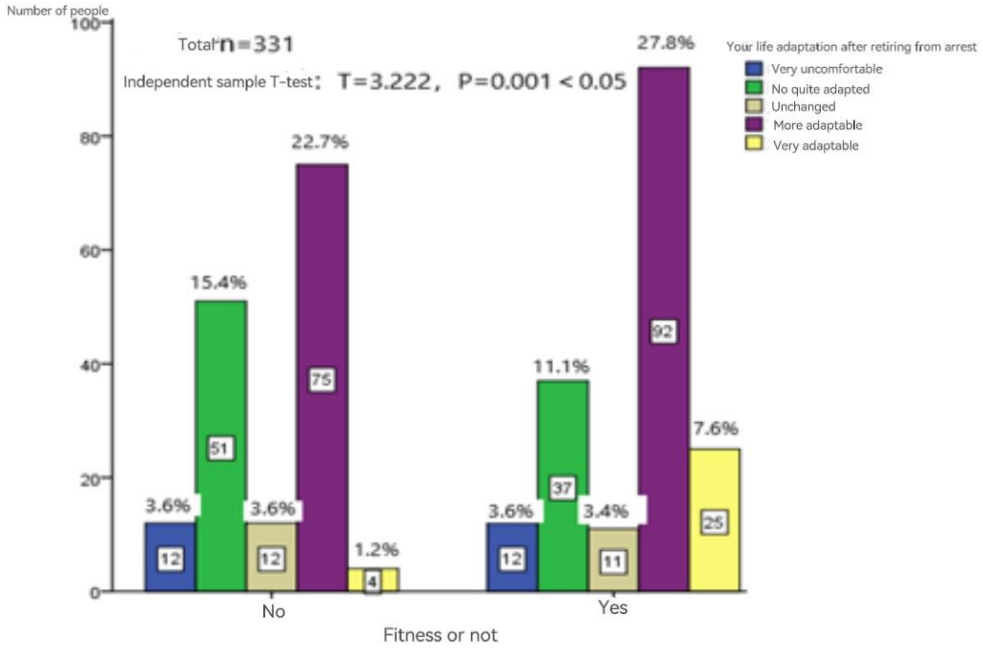

Figure 3 Schematic diagram of the relationship between fitness participation and life adaptation among retired fishermen

Figure 3 shows a schematic diagram of the relationship between fitness participation and life adaptation among retired fishermen. It can be seen that the independent sample T-test for fitness and nonfitness among retired fishermen shows a significant difference in life adaptation, with T=3.222 and P=0.001<0.05. This indicates that there is a significant difference in fitness among retired fishermen. Among them, non-fitness retired fishermen feel "very uncomfortable" and "relatively uncomfortable" with life more than fitness enthusiasts, and the proportion of those who feel "relatively comfortable" or "very comfortable" with life is less than fitness enthusiasts, indicating that fitness has a positive significance for fishermen to adapt to "new life" after retiring[13]. Wang SH (female, 52 years old, Changshou District): *"When I first went ashore, I didn't know what to do at home except for taking care of my grandchildren. Later on, I would go to the doorstep of the dam every night to dance the 'dam dance'. After dancing, sometimes I would set up a 'dragon gate formation' with everyone and even recognize many sisters and friends. Now they would shout at me when they go out to play, which makes my life much happier."* Through this case, it can be seen that fitness participation not only helps fishermen who have retired from fishing establish a new 'social circle', but also extends their 'radius' of life, making their social activities more prosperous after retiring from fishing, which helps to improve their life after "going ashore". "Happiness.

4. Conclusion

1) The cultural level is the most important factor that restricts the fitness participation of retired fishermen in the upper reaches of the Yangtze River Basin in China[14]. With each level of cultural level increase, the frequency of fitness participation by retired fishermen will increase to 1.734 times the original level; Gender has an equally important impact on fitness participation, as women have a higher advantage in participation than men; The fitness participation of retired fishermen shows significant urban-rural differences, with retired fishermen living in urban areas being more active in fitness participation than those living in rural areas; There is an inverse relationship between work hours and fitness participation after job transfer, with retired fishermen having a higher level of fitness participation; The monthly income of 6000 yuan is a key income level for retired fishermen to participate in fitness activities.

2) The attention of fishermen to their health is increasing after retiring from fishing, and fitness participation is the most important way for them to maintain their physical health. The health concept of "life lies in exercise" is widely recognized among the group of retired fishermen; Currently, the main forms of exercise for retired fishermen are walking, jogging, and mountain climbing, which are characterized by simplicity and ease of movement; The main fitness venues are concentrated in parks, highways, courtyards, or residential areas, presenting the characteristic of "fitness scene life oriented"; There is no significant difference in the amount of exercise between men and women, but there is a significant difference in the amount of exercise among different age groups. Among them, those over 60 years old exercise more frequently, while those under 35 years old exercise for longer.

3) Nearly half of the respondents did not have the habit of participating in fitness activities. "Lack of time" is the key factor that prevents retired fishermen from participating in fitness activities. "Seeking health through time" should be an important focus of life support for retired fishermen. At the same time, the lack of sports skills and equipment facilities also restricts the fitness participation of retired fishermen. The phenomenon of "wanting to exercise, lacking skills, and lacking equipment" is more prominent among the group of retired fishermen.

4) Participating in fitness is not the main way for retired fishermen to relax in their daily lives. Watching their phones or TV takes up the majority of their leisure time, and "staring at the screen without stepping on their legs" is a major health hazard for retired fishermen today. Fitness participation has a significant effect on reducing the life pressure of fishermen who have retired from fishing. It helps to switch industries and also promotes adaptation to a new life, enhancing the sense of happiness in their retired life.

Contributions

B.S. and B.J. led the study. All authors conceived and designed the study. B.S acquired the data. B.S. conducted the statistical analysis. B.S. and B.J. drafted the article. All authors made critical revisions to the manuscript for important intellectual content and gave final approval of the manuscript.

Competing interests

The authors declare no competing interests.

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