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Logistic Regression Analysis of Relationship Between Mental Health and Sports Behavior of Foreign Students in Wuhan

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ABSTRACT
The purpose of this study is to know the mental health status of foreign students in Wuhan and the influence of sports behavior. In order to provide the basis for improving the mental health level of foreign students, 253 foreign students from 52 countries were random selected from four affiliated universities in Wuhan. Symptom checklist 90 (SCL90) and self-designed questionnaire of physical exercise were used for foreign students in Wuhan A questionnaire survey was conducted. Logistic regression analysis was used to analyze the factors influencing mental health. The results show that the detection rate of mental health problems of foreign students in Wuhan is 21. 3%. Grade, economic status, exercise frequency, exercise intensity, sports attitude and basketball participation are related to the mental health status of foreign students in Wuhan. Grade, economy, exercise frequency and exercise attitude were included in logistic regression equation. The results show that foreign students in Wuhan have low scores, good economic condition, high frequency of sports, high intensity, good attitude, high participation rate of basketball, and the possibility of mental health problems is small. The level, economy, frequency and attitude of sports can predict mental health.

Keywords: *Foreign students in Wuhan, Mental health, Sports behaviour, Logistic regression analysis.*

1. INTRODUCTION

On March 1, 2017, the Ministry of Education issued the "Introduction to the Work of Studying Abroad since the 18th National Congress of the Communist Party of China", reporting that the total number of international students in china in 2016 has exceeded 440, 000, involving various majors such as engineering, management, economics and western medicine [1]. With the increase number of foreign students coming to china universities, their mental health problems have become an important part of the education management [2,3]. Regular physical activity is thought to be associated with better mental health, although there is a lack of consensus regarding the optimal amount and type of activity to achieve these benefits [4]. Physical exercise can not only keep fit, but also has a good effect on mental health [5]. This article studies the mental health and sports behavior of international students in Wuhan, exploring the relationship between mental health and sports behavior, and provides a basis for improving the mental health of international students.

2. OBJECT AND METHOD

2. 1. Object

Using the random cluster sampling method, we surveyed 52 countries in Asia and Africa (Japan, South Korea, Pakistan, Mongolia, Tanzania, Ghana, Laos, Egypt, etc.) from 4 subordinate universities in Wuhan. A total of 253 international students with an average age of 26. 33±4. 893 years old (minimum 17 years old, maximum 46 years old), male accounted for 60. 16% and female accounted for 39. 84%.

2. 2. Method

2. 2. 1. Questionnaire Survey

On the base of consulting relevant domestic and foreign literature, we compiled the "Wuhan International Students Sports Activity Survey Form", which mainly examines the frequency of sports participation by international students in Wuhan, the duration of sports activities, the intensity of sports activities, sports items, attitudes, and motivations for sports participation. According to the evaluation of 10 university teachers with senior professional titles (8 professors and 2 associate professors), they all believe that the questionnaire can meet the needs of this research; the "Symptom Self-Rating Scale-SCL90" is used as a diagnostic tool for the mental health of international students in Wuhan. The teachers in charge of international students were asked to help distribute 150 paper questionnaires, 148 were returned, and 110 questionnaires were returned through the questionnaire star. The total of 258 questionnaires were returned and 253 valid questionnaires were returned. The effective response rate was 98. 06%.

2.2.2. Mathematical Statistics

According to the test results of the "Symptom Self-rating Scale-SCL90", international students in Wuhan are divided into mental health group and mental sub-health group. The mental health status was used as a binary dependent variable, and gender, grade, economy, region, exercise frequency, exercise duration, exercise intensity, exercise attitude, exercise motivation and exercise items were used as independent variables to perform logistic regression analysis. This study uses excel2007 and SPSS19. 0 to analyze the survey data statistically.

3. RESULTS

3. 1 Detection Rate of Mental Health Problems among International Students in Wuhan

SCL-90 contains 90 evaluation items, each item adopts a 5-level scoring system (0-4 points), and the score is inversely proportional to the level of mental health. This study uses the method of calculating the total score to evaluate the mental health of international students. Those with a score of more than 160 are considered positive symptoms, and those with a total score of ≤160 are considered negative symptoms. In this study, the positive symptoms are collectively referred to as the mental sub-health group, and the negative symptoms are referred to as the mental health group. Among the 253 international students, the detection rate of mental sub-health is 21. 3%.

3. 2. Correlation Analysis of the Factors Influencing the Mental Health of International Students in Wuhan

3.2.1. Demographic and Sociological Factors

3.2.1.1. Gender

The survey results show that the detection rate of mental sub-health between men (21. 6%) and women (21%) is very small. Statistics show that gender differences have no significant impact on the mental health of international students (X2=0. 012, P>0. 05) (Table1).

3.2.1.2. Grade

The study found that with the increase in grades, the incidence of mental sub-health is on the rise, with the rate of undergraduates being 13. 7%, master's 25. 2%, and doctoral degrees 29. 5%. The difference between different grades is statistically significant (X2=6. 464, P<0. 05). The possibility of mental health problems for masters and doctors is 2. 121 times and 2. 636 times that of undergraduates (Table1).

3.2.1.3. Region

The survey results show that the incidence of mental sub-health in different regions ranked from high to low in East Asia (28. 6%), Southeast Asia (25%), South Asia (22. 2%), West Asia (16. 7%) and Africa (16. 5%). The students from East Asia self-evaluation of psychological status are the worst, and Africa is the best. However, statistics show that regional differences have no significant impact on the mental health of international students in Wuhan (X2=4. 54, P>0. 05) (Table 1).

3.2.1.4. Economy

According to the 2017 world GDP ranking published by the World Economic Information Network, this study divides the nationalities of international students into Type A countries (countries with GDP before 100) and Type B countries (countries with GDP after 100) [6]. The survey found that international students from countries with backward economic status (25. 6%) are more likely to have mental health problems than those from countries with better economic status (14%). Statistics show that the incidence of economic and mental sub-health is significantly correlated (X2=4. 988, P<0. 05), and the possibility of mental health problems for international students in B countries is 2. 12 times that of international students in A countries (Table 1).

Table 1. Correlation analysis of mental health and demographic and sociological factors of international students in Wuhan

Variable		Mental health		Mental sub-health		X^2	P	Exp(B)
		Number	%	Number	%			
Gender	Total	199	78. 7	54	21. 3	0. 012	0. 914	
	Male	120	78. 4	33	21. 6			
	Female	79	79. 0	21	21. 0			
Grade	Total	199	78. 7	54	21. 3	6. 464	0. 049	
	Undergraduate	88	86. 3	14	13. 7			1. 000
	Master	80	72. 8	27	25. 2			2. 121
	Doctor	31	70. 5	13	29. 5			2. 636
Region	Total	188	77. 7	54	22. 3	4. 54	0. 467	
	East Asia	20	71. 4	8	28. 6			
	West Asia	25	83. 3	5	16. 7			
	South Asia	49	77. 8	14	22. 2			
	Southeast Asia	18	75. 0	6	25. 0			
	Africa	76	83. 5	15	16. 5			
Economy	Total	199	78. 7	54	21. 3	4. 988	0. 032	
	A	80	86. 0	13	14. 0			1. 000
	B	119	74. 4	41	25. 6			2. 120

3. 2. 2. Sports Behaviour Factors

3. 2. 2. 1. Frequency

The survey found that "in the past two weeks", international students who exercised 0-3, 4-6, and 7 times or more are 29. 4%, 17. 6%, and 10. 7% of mental health problems. Statistics show that the incidence of mental health problems is significantly correlated with the average number of exercise (X2=8. 981, P＜0. 05). The international students who participated in 4-6 exercises and more than 7 exercises in two weeks, compared with those who only participated in 0-3 exercises, the possibility of mental health problems is only 51. 6% and 28. 9% (Table 2).

3. 2. 2. 2. Time

The survey shows that 25%, 22. 9% and 13. 3% of international students who exercise less than 30 minutes, 30 minutes -2 hours and more than 2 hours, and they usually have mental sub-health. This means that with the increase of each exercise time, the mental sub-health The incidence is gradually decreasing, but statistics show that this change is not statistically significant (X2=2. 329, P>0. 05) (Table 2).

3. 2. 2. 3. Intensity

The incidence of mental health problems of international students who reach high (profuse sweating), medium (appropriate sweating) and low intensity (slightly sweating) each exercise is 11. 7%, 22% and 50% respectively. The higher the exercise intensity, the less likely to have mental health problems. Statistics show that the incidence of mental sub-health is significantly correlated with exercise intensity (X2=10. 264, P＜0. 01). Compared to foreign students with low-intensity exercise, the possibility of mental sub-health is only 13. 2% and 28. 3% (Table 2).

3. 2. 2. 4. Attitude

Since only 3% of the foreign students with a sport attitude of negligence, this study only considers the exercise attitude of the international students who are serious and general. The likelihood of them having mental health problems is 13. 8% and 28. 5% respectively, indicating that the better the sports attitude, the better Mental health problems are not prone to occur. Statistics show that the incidence of mental sub-health is significantly correlated with exercise attitude (X2=8. 243, P<0. 01). The incidence of mental sub-health of international students with general exercise attitude is 2. 481 times that of foreign students with good exercise attitude (Table 2).

3. 2. 2. 5. Events

The study found that the risk of mental sub-health among foreign students who did not participate in basketball in Wuhan was 2. 437 times that of foreign students who participated in basketball (X2=4. 85, P<0. 05). Other items had no significant impact on mental health (Table 2). This hint: actively participating in basketball can improve mental health.

3. 2. 2. 6. Motivation

There are differences in the motives of international students participating in sports activities in Wuhan, but different sports motives have a general impact on the incidence of mental health problems. Statistics show that the differences are not statistically significant (P>0. 05) (Table 2).

Table 2. Correlation analysis of mental health and sports factors of international students in Wuhan

Independent variable		Mental health		Mental Sub-health		X^2	P	Exp(B)
		Number	%	Number	%			
Frequency	Total	197	78. 8	53	21. 2	8. 981	0. 016	
	0-3	77	70. 6	32	29. 4			1. 000
	4-6	70	82. 4	15	17. 6			0. 516
	⩾7	50	89. 3	6	10. 7			0. 289
Time	Total	199	78. 7	54	21. 3	2. 329	0. 353	
	＜30min	14	75. 0	5	25. 0			
	30min-2h	145	77. 1	43	22. 9			
	2h⩽	39	86. 7	6	13. 3			
Intensity	Total	199	78. 7	54	21. 3	10. 264	0. 007	
	High	53	88. 3	7	11. 7			0. 132
	Medium	138	78. 0	39	22. 0			0. 283
	Low	8	50. 0	8	50. 0			1. 000
Attitude	Total	199	78. 7	54	21. 3	8. 243	0. 005	
	Value	106	86. 2	17	13. 8			1. 000
	Medium	93	71. 5	37	28. 5			2. 481
Events	Basketball	53	88. 3	7	11. 7	4. 850	0. 041	2. 437
	Football	56	86. 2	9	13. 8	3. 140	0. 091	
	Badminton	41	73. 2	15	26. 8	1. 220	0. 262	
	Run	60	80. 0	15	20. 0	0. 116	0. 735	
	Body building	39	78. 0	11	22. 0	0. 016	0. 899	
Motivation.	Fitness	104	83. 2	21	16. 8	3. 300	0. 072	
	Hobby	83	79. 0	22	21. 0	0. 034	0. 854	
	Loseweight	79	79. 0	21	21. 0	0. 026	0. 872	
	Improve athletic ability	54	77. 1	16	22. 9	0. 103	0. 747	

3. 3. Logistic Regression Analysis of Factors Affecting the Mental Health of International Students in Wuhan

In order to further explore the predictive effect of factors affecting the mental health of international students in Wuhan, through the first round of screening of demographic, sociological and sports behavior factors, the grade, economy, exercise frequency, exercise intensity, exercise attitude, basketball entered the second round of regression models [7].

In the second round of logistic regression model, the independent variable number of exercises, exercise intensity and the Wald test results of basketball are not statistically significant (P>0. 05). Consider the elimination, after eliminating exercises, compare with the original model, -2 pairs number likelihood value change (chi-square) is 11. 516, df (degrees of freedom) is 2. It is found by querying the chi-square distribution table that the difference between the two models is statistically significant (P＜0. 01), which means that the independent variable motion is excluded from the model, the frequency is unreasonable and should be retained. When the exercise intensity is excluded, X2=4. 148, df=2 (P>0. 05), which means that the independent variable exercise intensity can be eliminated from the model. When basketball is eliminated, X2=2. 555, df=1 (P>0. 05), which means that the independent variable basketball can be eliminated from the model. Therefore, the final four variables of grade, economic status, exercise frequency and exercise attitude can effectively predict the mental health of international students (Table 3). Among them, two dummy variables of grade represent the comparison of master's degree and doctoral degree respectively with undergraduates, and the two dummy variables of exercise frequency indicate

the comparison of exercise 4-6 times and more than 7 times compared with 0-3 times.

Table 3. Logistic regression model of factors affecting mental health of international students in Wuhan

Independent variable	B	S. E.	Wald	df	Sig.	Exp(B)
Grade			12. 201	2	0. 002	
Master/Undergraduate	1. 365	0. 409	11. 138	1	0. 001	3. 914
Doctor/ Undergraduate	1. 261	0. 486	6. 747	1	0. 009	3. 530
Economy	-1. 029	0. 390	6. 958	1	0. 008	0. 357
Frequency			6. 596	2	0. 037	
4-6 /0-3	-0. 597	0. 375	2. 540	1	0. 111	0. 550
≥7 /0-3	-1. 206	0. 508	5. 641	1	0. 018	0. 299
Attitude	-1. 012	0. 359	7. 967	1	0. 005	0. 363
Constant	-2. 065	0. 482	18. 373	1	0. 000	0. 127

4. DISCUSSION

4. 1. Incidence Rate of Mental Health Problems of International Students in Wuhan

In this study, among 253 international students from 52 countries, the detection rate of mental sub-health was 21. 3%. In a survey of Chinese college students, Xie Xueni found that the detection rate of physical and mental health problems was 22. 3%, Wang Yueyun et al. 's result was 34. 68%, Luo Jiabing's result was 15%-35%, Sheng Liying et al. 'sresult was 39. 4% [8-11]. The results of this study are close to those of Xie Xueni and Luo Jiabing, but slightly lower than other studies.

The above studies all use the "Symptom Self-Rating Scale-SCL90" as a diagnostic tool. The reasons for the inconsistency of the research results: on the one hand, it may be the error caused by different sampling methods or sample sizes; on the other hand, the foreign students may be different in their home countries. Life and cultural backgrounds have led to a certain difference in mental health from college students in China, which deserves further research.

4. 2. Demographic and Sociological Factors and the Mental Health of International Students in Wuhan

4. 2. 1. Gender and Grade

This study shows that gender has no significant impact on the mental health of international students in Wuhan, while grade has a significant impact on mental health. The higher the grade, the greater the chance of mental health problems. This indicates that the pressure of graduation isan important factor affecting the mental health of international students in Wuhan. Regarding the study of gender and grade differences in mental health, the conclusions are still controversial. For example, Wang Yueyun and Feng Wenjing found that the incidence of physical and mental health disorders among female college students is higher than male college students, and the incidence of psychological problems in lower grades is higher than that in upper grades. Zheng Yanfang et al. found that girls are less likely to have anxiety symptoms than boys, and senior students are facing pressure from employment, so they are prone to psychological problems. This study is consistent with the results of Zheng Yanfang et al. [9, 12, 13].

The inconsistency ofconclusion may be related to the inconsistency of the research groups, and the age, culture and region of different groups may have different effects on mental health. In this study, the living and cultural background and learning mode during their study of Wuhan international students come from 52 countries are different from those of college students in china.

4. 2. 2. Economy

Economic conditions have a significant impact on the mental health of international students in Wuhan. International students from economically backward countries are more likely to have psychological problems than those from economically sound countries. This is consistent with the findings of Wang Haifei and Sheng Liying [11, 14]. The reason is that the gap between the rich and the poor in colleges and universities is the inducing factor of various physical and mental health problems of contemporary college students. The economic comparison in colleges and universities often occurs, which leads to the double pressure of survival and psychology of poor students. The international students in Wuhan may also have these problems during their study in China.

4. 3. Sports Factors and Mental Health of International Students in Wuhan

4. 3. 1. Frequency

This study found that the number of exercises has a significant impact on the mental health of international students in Wuhan. The more exercises per week, the lower the incidence of psychological problems. This is consistent with the research results of Xiong Mingsheng and Zhang Jingbo [15,16]. The reason may be that exercise can bring certain psychological benefits, improve the mental state of exercisers, and the communication between people during exercise can better resolve bad emotions. Ji Liu proposed in the book "Physical Exercise and Mental Health" that exercise behavior can change the relevant amino acids and monoamine neurotransmitters in the body, which can regulate the emotional state and improve the immune function of the body [17].

4. 3. 2. Intensity

Physical activity may enhance psychological well-being, and chronic vigorous exercise and sport activities are effective in promoting improvement of mental health in adolescents [18]. This study found that compared with low- and medium-intensity exercises, international students are less likely to have mental health problems, indicating that high-intensity exercise is better than low and medium intensity exercise. This conclusion is inconsistent with some research conclusions. Huang Zhijian and Fang Min proposed that moderate-intensity exercise can achieve good mental health effects better than high- and low-intensity exercise [19,20]. The reason for the inconsistent conclusions may be that the overseas students are mainly from Africa and Western Asia, their physical fitness is higher than that of Chinese college students, their understanding of exercise intensity is different, and it may also be the error caused by the sample size.

4. 3. 3. Attitude

This study shows that the better the exercise attitude, the lower the incidence of mental health problems, which is consistent with the findings of Zhang Xiaohui and Zhang Zhang, Downs M and Strachan L [21,22]. The reason may be that a good attitude towards sports has improved the enthusiasm for sports participation, while active sports participation has improved the level of mental health. Research by He Zhongkai et al. shows that sports attitudes can affect subjective feelings and motivate people to participate in sports, while insisting on physical exercise is helpful to improve the level of mental health [23, 24]. It can be seen that improving the awareness and attitude of sports is also an important way to improve the mental health of international students.

5. CONCLUSION

Among 253 Wuhan students from 52 countries, the detection rate of mental sub-health is 21. 3%, which is slightly lower than the detection rate of psychological problems among college students in some studies. Grade, economy, exercise frequency, exercise intensity, exercise attitude and basketball exercise are related to the mental health of international students in Wuhan. Doctors and masters are more likely to have mental health problems than undergraduates; international students from economically backward countries are more likely to have mental health problems; the higher the number of exercises, the higher the exercise intensity, the better the exercise attitude, the less likely to have mental health problems; participate in basketball can improve mental health. Logistic regression analysis shows that grade, economy, exercise frequency and exercise attitude are important factors that affect the mental health of international students in Wuhan, and have a predictive effect on mental health.

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