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Correlation Analysis of Physical Exercise and Mental Health of Middle School Students
-- An Empirical Study based on 10 Middle Schools in H Province

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Abstract. Objective: To explore the effects of physical exercise on self-harmony and mental health of middle school students, and to provide basis for improving their mental health. Method: A total of 532 middle school students from H province are surveyed by the "physical exercise rating scale", "Chinese middle school students mental health scale" and "self-harmony scale". Result: 28% to 54% of middle school students have mild psychological problems in different aspects. The difference of physical exercise scale between students of different genders and different grades is statistically significant (all $P < 0.05$). There is a significant negative correlation between physical exercise score and compulsive and depression score (all $P < 0.05$). There is a significant positive correlation between self-harmony and the total score of mental health and each factor (all $P < 0.01$). Self and experience discordance enter into the regression equation for the total score of mental health. Conclusion: physical exercise can promote the mental health and psychological harmony of middle school students. Moderate exercise and long exercise time are beneficial to the mental health and psychological harmony of middle school students.

Keywords: Middle school student, Physical exercise, Self-evaluation (psychology), Mental health.

1. Introduction

The research on the mental health benefits of physical exercise has always been an important field of physical exercise psychology. From the research content, it mainly focuses on the influence of physical exercise on emotion, cognitive function, personality, self-concept and the psychological benefit mechanism of physical exercise [1]. Self-harmony is an important sign of mental health [2], so the study of self-harmony has become a hot spot in the field of psychology. From the perspective of mental health research, research in recent years has mainly focused on the status quo of mental health and related factors investigation [3-4]. From the perspective of research objects, most of the research focuses on college students, the elderly and some people with special diseases, while relatively few studies have been conducted on middle school students with high incidence of psychological problems and mental diseases [5-6].

By exploring the influence of physical exercise on the self-harmony and mental health of middle school students, this study aims to enrich the theory of mental health research in the field of sports, which is of great significance to the improvement of mental health level of middle school students and the perfection of personality traits.

2. Object and Method

2.1 Object

By adopting stratified cluster sampling method, 580 students from 10 middle schools (5 ordinary middle schools and 5 key middle schools) in H province are selected as the objects of the survey. 560 questionnaires are collected, of which 532 questionnaires are valid, and the effective recovery rate is 95%. There are 282 boys, 250 girls, 171 middle school students and 361 high school students.

2.2 Measuring Instrument

2.2.1 Assessment of Physical Exercise

The "physical exercise rating scale" [7], which was revised by Liang deqing et al., Wuhan institute of physical education, is selected to investigate the amount of physical exercise from three aspects: the intensity of physical exercise, the time and frequency of physical exercise, and the participation level of physical exercise is measured by the amount of physical exercise. Each aspect is graded in 5 grades, with a score of 1 to 5 points. Physical activity scores = intensity x (time-1) x frequency, with scores ranging from 0 to 100 points. Among them, scores ≤ 19 are divided into small exercises, scores between 20 and 42 are divided into medium exercises, and scores ≥43 are divided into large exercises. In this study, the retest reliability of the scale is 0.850.

2.2.2 Assessment of Mental Health

The objects are tested with the " Chinese middle school students mental health scale " prepared by Wang jisheng et al. [8]. The scale has 60 items, including 10 subscales of compulsion, paranoia, hostility, interpersonal sensitivity, depression, anxiety, learning pressure, maladjustment, emotional instability and psychological imbalance. Each item has five levels (none, mild, moderate, heavy and severe). The scale is divided into four grades: overall average scores < 2 indicate overall mind is healthy. Scores of 2 ~2.99 indicate mild mental health problems. Scores of 3 ~ 3.99 indicate moderate mental health problems. Scores of 4 ~ 5 indicate severe mental health problems. In this study, Cronbach's α coefficient of the scale is 0.933.

2.2.3 Assessment of Self-harmony

The "self-harmony scale" compiled by Wang dengfeng [9] is adopted to test the self-harmony status of middle school students. The scale includes "incongruity of self and experience", "self-flexibility " and "self-rigidity ". There are 35 items in the scale, and each item has 5 grades, which are respectively 1 to 5 points. The higher the score, the lower the self-harmony, and the "self-flexibility" is scored reversely. In this study, Cronbach's α coefficient of the scale is 0.753.

2.3 Application and Data Processing

The investigation is conducted by the trained members of the research group with the help of the school psychological counselor or the class teacher. Before the survey, we will explain the purpose and significance of the survey to students, read instructions, explain and instruct each scale, and emphasize the anonymous form of the survey, which will not have any negative impact. The results of the survey will also be reported in a timely manner via email. In the data entry stage, the unqualified questionnaires are sorted out, and then each questionnaire number is entered into the data.

SPSS16.0 software logic inspection program is used for data inspection, and abnormal data are found in time, compared with the original data and corrected. All data are collected using SPSS16.0 software for independent sample t test, Pearson correlation analysis and multiple linear stepwise regression analysis.

3. Result

3.1 Mental Health Status of Middle School Students

The results of table 1 show that in the test of each scale, people with normal mental health level account for 29% ~ 64%, people with mild mental problems account for 28% ~ 54%, people with moderate mental problems account for about 6% ~ 19%, and people with severe mental problems are relatively few. Among them, there are more people with moderate or severe mental problems in the aspects of anxiety, learning pressure and emotional instability.

Table 1. Distribution of mental health factor score of middle school student

Item	Normal	Mild	Moderate	Severe
Compulsiveness	170(32)	290(54)	63(12)	9(2)
Paranoid	302(57)	191(36)	33(6)	3(1)
Hostility	340(64)	147(28)	38(7)	7(1)
Interpersonal sensitivity	221(41)	227(43)	76(14)	8(2)
Depression	283(53)	185(35)	51(10)	13(2)
Anxiety	226(43)	198(37)	79(15)	29(5)
Learning pressure	202(38)	221(42)	81(15)	28(5)
Maladjustment	220(41)	240(45)	61(12)	11(2)
Emotional instability	152(29)	261(49)	102(19)	17(3)
Psychological imbalance	245(46)	236(44)	47(9)	4(1)
Total score	244(46)	245(46)	41(8)	2(0)

Note : figure in ( ) is constituent ratio %.

3.2 Physical Exercise Status of Middle School Students

53% of middle school students exercise small amounts, 30 % choose moderate amounts and 17% choose large amounts. It can be seen from table 2 that the difference of physical exercise scale of middle school students between different gender and grade is statistically significant. Among them, the exercise intensity and exercise time of male students are significantly higher than that of female students, and the exercise time and exercise frequency of middle school students are significantly higher than that of high school students, with statistically significant differences (all $P < 0.01$).

Table 2. Comparison of physical exercise scores of middle school students of different genders and different grades ($\bar{x}\pm s$)

Gender and grade		Number of people	Statistical value	Exercise intensity	Exercise time	Exercise frequency	Exercise scale
Gender	Male	282		3.37±0.93	3.38±1.10	3.77±1.02	1.94±0.77
	Female	250		2.66±1.02	2.46±1.04	3.92±1.13	1.30±0.57
			t	8.44	9.85	-1.53	10.83
			P	<0.01	<0.01	>0.05	<0.01
Grade	Middle school	171		3.08±1.11	3.33±1.13	3.96±1.07	1.80±0.79
	High school	361		3.01±0.99	2.77±1.14	3.60±1.05	1.57±0.73
			t	0.73	5.25	3.66	3.27
			P	>0.05	<0.01	<0.01	<0.01

3.3 The Correlation between Physical Exercise and Self-Harmony in Mental Health of Middle School Students

As shown in table 3, physical exercise score has significantly negative correlation with depression in mental health (all $P < 0.05$). There is no statistically significant correlation between the physical exercise score and the score of self-harmony factors and the total score (all $P > 0.05$). The dissonance between self and experience and the total score of self-harmony have significantly positive correlation with each factor of mental health and total score. The self-flexibility and the self-rigidity are also significantly correlated with several factors in mental health (all $P < 0.05$).

3.4 Comparison of Self-harmony in Mental Health of Students with Different Exercise Amount

The total score of students in self-harmony with large, medium and small physical exercise amount is (85.50±12.82), (84.14±12.98), (84.76±12.98) respectively, and the differences are not statistically

significant (F=0.57, P>0.05). The total score of mental health is (2.16±0.59), (2.07±0.54), (2.07±0.75) respectively, and the differences are not statistically significant (F=1.32, P>0.05). Among them, the score of depression factors on three exercise scales is respectively (2.09±0.75), (1.90±0.69), and (1.93±0.70), with statistically significant differences (F=3.85, P<0.05).

Table 3. Correlation coefficient of physical exercise and self-harmony in mental health of middle school students (r value)

Mental health	Physical exercise	Self and experience disharmony	Self-flexibility	Self-rigidity	Total score of self-harmony
Compulsiveness	**-0.074**	**0.394****	**0.020**	**0.029**	**0.299****
Paranoid	**-0.027**	**0.541****	**0.096***	**0.148****	**0.472****
Hostility	**0.009**	**0.419****	**0.130****	**0.201****	**0.414****
Interpersonal sensitivity	**-0.037**	**0.583****	**0.116****	**0.122****	**0.504****
Depression	**-0.103***	**0.609****	**0.148****	**0.143****	**0.543****
Anxiety	**-0.083**	**0.546****	**0.103***	**0.120****	**0.472****
Learning pressure	**-0.079**	**0.376****	**0.060**	**0.166****	**0.342****
Maladjustment	**-0.078**	**0.424****	**0.070**	**0.128****	**0.371****
Emotional instability	**0.014**	**0.528****	**0.065**	**0.186****	**0.458****
Psychological imbalance	**-0.023**	**0.354****	**0.002**	**0.142****	**0.291****
Total score of mental health	**-0.063**	**0.603****	**0.103***	**0.176****	**0.528****

Note: *P<0.05, **P<0.01

3.5 Multiple Regression Analysis of Mental Health of Middle School Students

Take the total score of mental health as the dependent variable ,take gender (male=1,female=2), grade(middle school=1,high school=2),physical exercise scale(intensity: minor=1, small=2, medium=3,large but not persistent =4,large and persistent =5;time: ≤10min=1, 11~20min=2, 21~30min=3,31~59min=4,≥60min=5;frequency: less than 1 time per month =1, 2 ~ 3 times per month =2, 1 ~ 2 times per week =3, 3 ~ 5 times per week =4, about 1 time per day =5;Physical exercise amount as the total score),self-harmony factors and total score (actual score of each scale) as the independent variable, multiple linear stepwise regression analysis is performed, with F test as the screening variable standard (P<0.05 enter into the regression equation, and P > 0.1 is eliminated=. As can be seen from table 4, the self and experience disharmony in self-harmony, the exercise time in physical exercise and gender enter the regression equation of the total score of mental health successively, and the total interpretation of the total score of mental health by the three factors is 37.5%.

Table 4. Multiple regression analysis of influencing factors of mental health of middle school students

Variable	standard regression coefficient	t	R	R^2	Adjusted R^2	F
Self and experience disharmony	0.375	17.420**				
Exercise time	-0.56	-3.001**				
Gender	-0.853	-1.982*	0.613	0.375	0.372	105.75**

Note: *P<0.05, **P<0.01.

4. Conclusion and Discussion

Previous studies have shown that individuals have the function of maintaining the consistency between various self-perceptions and coordinating the relationship between self and experience, and most of their behaviors are consistent with the self-concept. If the unity cannot be achieved, there will be internal contradictions and perplexities, that is, a state of "disharmony" [10]. In order to maintain self-concept, individuals will adopt various defensive responses, which may easily cause the occurrence of psychological barriers. Therefore, self-harmony is closely related to mental health [11].

Research shows that the mental health of middle school students is generally normal, but nearly half of them have mild psychological problems in different aspects, among which the proportion of those with moderate or serious psychological problems in such aspects as anxiety, learning pressure and emotional instability is higher. It is suggested that parents, schools and society should reduce the pressure of study and enrollment, strengthen mental health testing and service education, guide middle school students to establish correct self-consciousness, master methods to solve psychological problems, and cultivate good psychological quality.

The results show that 53% of middle school students do little exercise, indicating that physical exercise needs to be further strengthened. There are statistically significant differences in physical exercise scale between different genders and different grades, among which boys are significantly better than girls and middle school students are significantly better than high school students. Because of gender differences, most girls are more likely to take part in light sports that are less intense, less confrontational, and show off their beauty. Boys, on the other hand, are more likely to take part in intense and persistent sports. In high school, the pressure on students to study and take exams for further study increases, and they don't have more time and energy to participate in physical exercise. It may be the main reason that the scale of physical exercise of high school students is lower than that of middle school students.

Physical exercise has an antidepressant effect, and many meta-analyses studies support this [12]. North et al. [13] showed that both one-time exercise and long-term physical exercise can effectively improve depression. Physical exercise can alleviate both physical and state depression. The duration and frequency of physical activity is associated with a decrease in depression. This study again demonstrates the effect of physical exercise on depression. Moderate exercise is more effective, consistent with previous studies [14-15].

The results show that the mental health of middle school students is positively correlated with self - harmony. Physical exercise helps improve mental health. Although physical exercise has no significant influence on the factors of self-harmony, it still shows a positive effect. Since there are few research results on the relationship between physical exercise and self-harmony at present, it is suggested to expand the sample for further research on college students and other groups.

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