A Study on the Current Situation of Physical Activity Among Senior Intellectuals in Universities and its Relationship with Physical Health

Huang Dan[1,2*], Denise Koh[1,3], Lei Hanyue[2]

[1] Faculty of Education, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
p121713@siswa.ukm.edu.my

[2] School of Physical Education, Hunan University of Science and Technology, Hunan, China
1553945772@qq.com

[3] Obesity-UKM Research Group, University Kembangan Malaysia, Bangi, Malaysia
denise.koh@ukm.edu.my

* Corresponding Author

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Abstract: Objective:To study the relationship between physical activity level and physical health of senior intellectuals in colleges and universities, so as to provide scientific basis for improving physical activity level of senior intellectuals in colleges and universities and formulating specific measures in the future.Methods:The current situation of senior intellectuals' physical activity participation was evaluated by using an internationally accepted physical activity questionnaire. Their physical health status was comprehensively tested, including vital capacity test, step test, grip strength test, and sitting forward bend test. The correlation between physical activity level and physical fitness grade was explored. The physical activity level was analysed using SPSS software, and Pearson correlation analysis was performed on the results of the comprehensive evaluation of the physical fitness test grade and physical activity level.Results:Senior intellectuals were mainly involved in low-intensity physical activities and moderate-intensity physical activities. According to the survey, 74 participants (48.7%) participated in low-intensity physical activities, while 42.8%and 8.5% participated in

moderate- and high-intensity physical activities respectively. Two-sided significance level is P that is less than 0.01 for physical fitness test attainment level score and physical activity level score, and the Person correlation coefficient was 0.437, with a moderate positive correlation between the two. Conclusion:Senior intellectuals were predominantly engaged in low-intensity and moderate-intensity physical activities. Senior intellectuals engaged in high-intensity physical activities showed superior cardiovascular function, flexibility, muscle strength and reaction ability..

Keywords: University senior intellectuals, Physical activities, Physical health

1. **Introduction**

"The competition among countries in the current world is mainly in the field of science and technology(Wen, 2024)". This view is recognized by our party and state leaders. In this era of knowledge-based economization with rapid development of science and technology, it makes a myriad of professional people with high knowledge, high skills, high efficiency and high health literacy very popular. With the modernization of economic and social development and scientific and technological progress, people's daily life and work in physical activity is greatly reduced, poor lifestyle has led to the emergence of a lot of health problems, unhealthy lifestyle is mainly manifested in the lack of physical strength or physical activities to reduce the situation. As the engineers of human souls and the inheritors of human civilization, there are many cases of premature deaths of senior intellectuals in colleges and universities due to insufficient physical activities in recent years(Yule et al., 2020). Therefore, the problems of physical health and lack of physical activities among senior intellectuals in colleges and universities are also of great concern to the society. Through questionnaire survey and physical fitness test, this study explores the current situation of physical activities of senior intellectuals in four colleges and universities in Xiangtan and its relationship with physical health, aiming to draw more attention to the health of senior intellectuals in colleges and universities from the relevant departments and to take a series of measures to urge and guide them to participate in all kinds of physical exercise consciously, to carry out recreational and exercise sports activities at the right time, to invest in their health positively and to build up a healthy and civilised body.

2. **Literature Review**

2.1 Definition of Concepts

2.1.1 **Senior Intellectuals**

The Dictionary of Modern Chinese defines a senior intellectual as: an intellectual who has obtained a senior or deputy senior title an intellectual who has obtained a senior or deputy senior title. Whereas Qin Zhengyu of the Physiology Teaching and Research Department of the Fourth Military Medical University, in collaboration with his scientific research group, conducted a health check on 574 middle-aged and old-aged senior intellectuals above the rank of associate professor in 22 colleges and universities in Shanxi Province in a study published in Sports Science(Zhengyu et al., 1985). In a study published in Sports Science, the characteristics and components of sports participation of senior intellectuals in colleges and universities in Guangdong Province were analysed and researched, and 522 full and associate professors from 24 general colleges and universities in Guangdong Province were also taken as the subjects of the study(Yuelan & Jianxiong, 2006). In this study, senior intellectuals in colleges and universities are defined as those with the title of associate professor or above, or with the degree of doctor or above.

2.1.2 **Physical Activity**

Most current scholars mainly recognize Caspersen's definition as "any bodily movement caused by skeletal muscle contraction that results in energy expenditure". Physical activity is characterised by the following indicators(Caspersen et al., 1985): Frequency: number of activities in a given period of time; Duration: the time it takes to complete a physical activity; Intensity: the level of physiological effort required to complete a physical activity. Analysing the basic concepts of physical activity can be concluded that the completion of physical activity requires a certain amount of energy loss, which in turn comes from the occurrence of physical activities. The higher the intensity of physical activities, the higher the degree of energy loss, and there is a positive correlation between them. The International Physical Activity Questionnaire classifies physical activities into four areas: daily work, daily chores, daily transportation, and leisure time.

2.1.3 **Physical Health**

Physical health is a closely related health factor, differentiated from the study of physique(Caspersen et al., 2000). Its core meaning is still physique. On the one hand, it denotes the quality of the body, characterised by sufficient stability in the body genetically and acquired. On the other hand, it indicates the degree of susceptibility to disease of the physique factors that are closely related to physical health(Craig et al., 2003). Therefore, physical health can be understood as the ability of the individual to adjust and cope with different natural and social environments (life, work, etc.), both physically and psychologically. The essence of the study is to analyse the physical factors that are sensitive to health risks and to strengthen the individual's ability to cope with the risks.

2.2 Related to Physical Activity and Physical Health

High-intensity physical activity can enhance cardiovascular function to some extent. High-intensity physical activity can increase oxygen uptake in a group of people who sit in an office

all the time and rarely get out and about(Jieyu et al., 2019). High-intensity physical activity can increase oxygen uptake. Although both moderate-intensity and high-intensity activities are effective in enhancing cardiovascular fitness, the effects are more pronounced with high-intensity activities. The results also demonstrate that PA energy consumption and cardiopulmonary function are inextricably linked.

"Sport is an investment in people's health(Yue et al., 2009)." Many studies have demonstrated the significant effect of physical activity in the prevention and control of diseases such as high blood pressure, heart disease and depression, among many other conditions(Haiyan et al., 2010). As an essential part of healthy living, physical activities not only relieve back pain caused by osteoporosis, but also reduce the incidence of the "three highs" and stroke(Guoqiang, 2016). Physical activity is good for the body. Therefore, physical activity is conducive to the development of physical health.

The exercise rate of Jilin residents over 55 is twice as high as that of residents under 45, and less than one-tenth of one percent of residents aged 15 and older exercise, which is lower than the national level(Yunjuan et al., 2022). If the intensity of physical activity is not high, the probability of diseases including diabetes, obesity, hypertension, stroke and dyslipidemia will increase accordingly(Lei et al., 2022). In other words, increased physical activity can increase the likelihood of disease. There is a strong relationship between physical activities and chronic diseases(Dingdong et al., 2008). This has long been confirmed by national and international studies. Therefore, people can reduce the probability of chronic diseases and effectively prevent and control the occurrence of chronic diseases through active participation in physical activities.

Lack of physical activities may contribute to the deterioration of coronary atherosclerosis, and sustained physical activity is beneficial to the body(Marques et al., 2017). Studies have shown that sustained physical activity is effective in reducing early mortality in adults and the incidence of chronic diseases such as coronary heart disease, type II diabetes and stroke(Marques et al., 2018). As for children, physical activity promotes healthy physical and mental development and maintains a balanced energy metabolism in the body(Xiaolong, 2014). The physical activity of children can promote the healthy development of their body(Swann et al., 2017) and mind and enable their organism to maintain a balanced energy metabolism(Sember & Morrison, 2018). Appropriate physical activities can reduce the rate of decline in muscle strength, maintain a certain degree of balance, ensure a certain degree of bone health and mental health, reduce the incidence of chronic diseases, and effectively improve the quality of life of adults(Galloway & Jokl, 2000).

In summary, physical activity is an important factor in physical health, and regular physical activities can have an effective effect on physical health. The intensity of physical activities affects the prevalence of many diseases, including diabetes, obesity, hypertension, stroke, dyslipidemia, etc. Therefore, many experiments have shown that there is a link between physical activity and chronic diseases, and that regular participation in physical activities can effectively reduce the risk of diseases such as hypertension, high-fat, high-glycemic cancer, and so on. Reducing the static life and arranging reasonable and scientific physical activities are essential factors to have physical health and to enjoy a high-quality life.

3. **Research Objects and Methods**

3.1 Test Objects

In this study, the snowball sampling method in non-probability sampling method was used to conduct questionnaire surveys in four colleges and universities, namely Xiangtan University, Hunan University of Science and Technology, Hunan Institute of Engineering and Hunan Software Vocational and Technical University. In this research, 10 senior intellectuals from our universities and other institutions were firstly invited through their tutors and faculty members to conduct the questionnaire survey and physical fitness test. And we prepared small gifts and told these 10 senior intellectuals that if they could invite 3 other senior intellectuals to participate in the test, they could get a pair of Unix badminton rackets. A total of 152 valid data were collected through acquaintances leading acquaintances.

Table 1. Distribution of survey respondents by gender, title and degree (n=152)

Title/Degree	Male (persons)	Female (persons)	Total (persons)	percentage
Professor	23	11	34	22.4%
Associate Professor	37	29	66	43.4%
Doctor	32	20	52	34.2%

(Note: The doctor in this context refers to a doctor whose title has not reached the level of professor or associate professor, while a doctor whose title has reached the level of professor or associate professor is assessed by his or her title.)

3.2 Test Content and Methodology

This study investigated the physical activity of senior university intellectuals in five areas of daily work, daily chores, daily transportation, leisure time, and sedentary activities with the help of physical activities grading criteria in International Physical Activity Questionnaire. The respondents answered according to their physical activities, sleep and intensity of activities in the previous seven days. The survey population was categorised into three groups according to the intensity, frequency and duration of physical activities(Galán et al., 2010): High-intensity physical activity, moderate-intensity physical activity, and low-intensity physical activity, as shown in Table 3.1.Each sample was tested for each physical fitness item after the questionnaire was filled out, and the test was conducted from November 7, 2023 to November 24, 2023. The testing place is 319 and 320 laboratories in the office building of the College of Physical Education, University of Hunan University of Science and Technology.

Table 2. Physical Activity Grading Scale

Physical Activity Level Grade	Weekly physical activity time	Health benefits	suggestion

low	Cumulative duration of moderate physical activity <150 minutes or higher Intense physical activity <75 minutes	profitable	benefit from action
medium	Accumulated 150-300 minutes of moderate physical activity or 75-150 minutes of more intense physical activity	More benefits	Do more, get more.
high	Accumulated time in moderate physical activity > 300 minutes or >350 minutes of higher-intensity physical activity	Additional benefits	More benefits, but with increased risks

According to the National Physical Health Standard for Adults issued by the General Administration of Sport of China(Department & Center, 1999). The physical fitness test indicators of the adult physical fitness standard are shown in Table 3. According to the National Physical Fitness Measurement Standard issued by the State Sport General Administration in 2000, the physical health data were scored and comprehensively rated(Chongmin et al., 2004). Individual scores are based on a 5-point scale, which refers to the individual scores for height, weight, vital capacity, etc. The composite rating is based on the sum of the subjects' scores for each individual item and consists of four grades: grade 1 (excellent), grade 2 (good), grade 3 (qualified), and grade 4 (unqualified). See Table 4.

Table 3. Physical Fitness Test Indicators

Form	20-39 years	40-59 years

Body shape	Height, weight	Height, weight
Function	Vital capacity, step test	Vital capacity, step test
	Hand grip force	Hand grip force
	Push-ups (male)	
	One-minute sit-ups (female)	
Physical quality	Vertical jump	Sit-and-reach
	Sit-and-reach	Choice reaction time
	Choice reaction time	Standing on one foot with eyes closed
	Standing on one foot with eyes closed	

Table 4. Statistics on the performance of the composite rating method

hierarchy	20-39 years (score)	40-59 years (score)
Level 1	>30 points	>26 points
Level 2	30-33 points	24-26 points
Level 3	23-29 points	8-23 points
Level 4	<23 points	<18 points

3.3 Data statistics

The data of the recovered questionnaire were organised and classified into Excel table data using EpiData3.1 software double entry method, and the data were subjected to independent sample test and one-way ANOVA using Spss 22.0 software. The Multi-factor Logistic regression method was used to analyse the influencing factors that caused the lack of physical activities of senior intellectuals in colleges and universities. Person correlation analysis was used to derive the correlation coefficients of the content of the survey, and T-test was performed on the grouped data. The significance of P <

0.05 had a significant difference, and P < 0.01 had a highly significant difference. The main statistical methods are independent samples test, one-way ANOVA, and stepwise regression.

4. **Findings**

4.1 The Basic Characteristics of the Levels of Physical Activities of Senior Intellectuals in Colleges and Universities.

Xiangtan is a city cluster in the middle reaches of the Yangtze River Member of the National ChangZhuTan City Cluster and a "Two-Shape Society" Comprehensive Matching Reform Pilot Zone(Chuanglin et al., 2015). This study takes Xiangtan city as an example to investigate the physical strength of senior intellectuals in colleges and universities and its relationship with physical health. Now the distribution of physical activity of senior intellectuals is shown in the following table.

Table 5. Distribution of physical activities of senior intellectuals in Xiangtan (n=152)

Level	Headcount	Percentage %
Low	74	48.7
Medium	65	42.8
High	13	8.5
Sum	152	100

As can be seen from Table 3.1, most of the physical activity levels of senior intellectuals are dominated by low- and medium-intensity physical activity, accounting for 91.5%, while the proportion of high-intensity physical activity is only 8.5%. It can be seen that senior intellectuals in colleges and universities are seriously under-active in their usual work, transportation, household chores and leisure time. Physical activity is at a low level of senior intellectuals may be due to the fact that most of them are in sedentary state at work; transportation is used instead of walking or cycling; household chores use electrical appliances and so on instead of manual labour; and most of them choose to live a static life in their leisure time, while the physical activity is at a high level of this part of the senior intellectuals may be due to the fact that they interest in physical exercise, or may be subjectively aware of the need to have a strong body and focus on improving the level of daily physical activities.

4.2 Relationship between Physical Activities and Physical Health of Senior Intellectuals in Colleges and Universities

4.2.1 Influence of Physical Activities on the Overall Evaluation Results of Physical Fitness test Scores

The statistics of the overall evaluation of the performance of senior intellectuals in the physical fitness test are shown in Table 6.

Table 6. Statistics on overall evaluation of physical fitness test scores at different levels of physical activities (n=152)

		Excellent		Good		Pass		Fail	
		N	%	N	%	N	%	N	%
man	low	1	2.60%	6	15.80%	18	47.40%	13	34.20%
	medium	3	7.00%	23	53.50%	16	37.20%	1	2.30%
	high (honorific)	3	27.30%	5	45.50%	3	27.30%	0	0.00%
women	low head)	2	5.60%	6	16.70%	23	63.90%	5	13.90%
	medium	4	18.20%	6	27.30%	11	50.00%	1	4.50%
	high	0	0.00%	2	100.00%	0	0.00%	0	0.00%

As can be seen from Table 4.2, As can be seen in Table 4.2, there are variations in the attainment of the National Adult Physical Fitness Test among senior intellectuals at different levels of physical activities, and the failure rates of male and female senior intellectuals in the activity levels of low physical level are 34.2% and 13.9% respectively, which account for higher than the failure rate of the same sex in the middle and high physical activity levels. When the physical activity level is increased, the results of the physical fitness failure rate decreases. The study shows that a large proportion of senior intellectuals' physical fitness test scores are not up to the adult physical fitness standard, and there are hidden health risks. The rate of physical fitness test achievement of senior intellectuals with low-intensity physical activity is obviously lower than that of senior intellectuals with medium- and high-intensity physical activity level, which shows that the important reason for the failure of physical fitness test of senior intellectuals in colleges and universities is that most of the senior intellectuals are engaged in low physical activity and lack of exercise in medium and high physical activity.

4.2.2 Correlation Analysis of Overall Evaluation Results of Physical Fitness Test Scores and Physical Activity Levels

The correlation analysis between the overall evaluation results of the physical fitness test scores and the physical activity levels is shown in Table 7.

Table 7. Statistics of correlation analysis between overall evaluation results of physical fitness test scores and physical activity levels

		Physical Activities Level	physical health
Physical Activities Level	Pearson correlation	1	** 0.437
	Significance (bilateral)		0.000
	N	152	152
Physical Health	Pearson correlation	** 0.437	1
	Significance (bilateral)	0.000	
	N	152	152

The data show that the two-sided significance level of physical fitness test performance level score and physical activity level score is $P < 0.01$, and the pearson correlation coefficient is 0.437, so the two are moderately positively correlated. With the increase of the physical activity level, the pass rate of the physical fitness increases, so it is important to study the influence of physical activity level on the performance of single physical fitness.

5. **Conclusion**

The majority of senior intellectuals are at low and medium levels of physical activity (91.5% of the total), indicating that senior intellectuals are severely under-active. There is a moderate positive correlation between physical activity levels and physical fitness test scores.

6. **Suggestions**

In view of the serious shortage of physical activities of senior intellectuals, the government should take positive strategies and measures to improve the existing intellectuals' exercise system comprehensively through the joint cooperation of many administrative departments such as sports and health, so as to help senior intellectuals successfully enhance their physical activities to improve their own bodies. Senior intellectuals to participate in physical activities, and the formation of relevant sports clubs. Leaders in colleges and universities should also strengthen the degree of attention to the physical activities of senior intellectuals, supervise the participation of senior intellectuals in physical activities, and the formation of relevant sports associations to ensure that the daily exercise of senior intellectuals can be fully implemented. Existing sports activities centres in universities should be improved to ameliorate the shortcomings in promoting the level of physical activities among senior intellectuals in colleges and universities.

There is a moderate positive correlation between physical activity levels and physical fitness test scores, and physical activity has a promoting effect on them. Therefore, the sports colleges and hospitals of colleges and universities need to comprehensively strengthen the knowledge of physical activities for senior intellectuals, so as to formulate scientific and reasonable physical activities programs, such as: linking the sports work of senior intellectuals in colleges and universities with the sustainable development of the university; utilising the existing venues and implementing the supporting construction of community sports facilities for the teaching staff; establishing a physical fitness monitoring system; realising the operation of network, and improving the utilisation rate of the resources. The physical condition of senior intellectuals should be tested within a suitable period of time, so that senior intellectuals can fully understand the importance of physical activities, ensure that they have a healthy body to carry out their teaching work, comprehensively supervise and encourage the participation of senior intellectuals in physical activities, and promote the effective enhancement of their physical condition.

7. **Co-Author Contribution**

The authors affirmed that there is no conflict of interest in this article. Huang Dan carried out the field work, prepared the literature review and overlooked the writeup of the whole article. Denise Koh wrote the research methodology and did the data entry. Huang Dan and Lei Hanyue carried out the statistical analysis and interpretation of the results.

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