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# Investigation on the Status of Middle School Students' Health Information Literacy and COVID-19 Infection after the Release of COVID-19

**Yanping Liu [1, *], Tengfei Zhao [2], Jinsheng Huang [3]**

[1] PhD 1 Philippine Christian University International Collgage, Manila, 1004, Philippine
[2] Deputy Chief Physician of Pediatrics, Maternal and Child Health (Hu Zhong Hospital), Huadu District, Guangzhou, Guangdong, 510800, China
[3] Pediatrics Attending Physician, the Second People's Hospital of Huadu District, Guangzhou, Guangdong, 510800, China

*** Corresponding author:** Yanping Liu (Email: baiheyu-12@163.com)

**Abstract:** Through understanding the current situation of middle school students' health information literacy, explore the relationship between middle school students' health information literacy and COVID-19 infection, and provide information for epidemic response and epidemic reflection. [Methods/Process] On the basis of convenient sampling, a cluster questionnaire survey was conducted among 1268 middle school students in a town level middle school in Henan Province. Regression analysis was used to study the relationship between middle school students' health information literacy and COVID-19 infection. [Results/Conclusion] The reporting rates of middle school students who were not "positive", the first "positive", the second "positive", and those who had symptoms but did not undergo COVID-19 nucleic acid monitoring were 32.93% (413), 55.58% (697), 1.99% (25), and 9.49% (119), respectively. After adjusting the factors of grade, whether there are basic diseases, monthly income, parents' educational level, average accumulated daily sleep (including noon nap) time (hours) and daily exercise (including walking) time (hours) after the full liberalization of the COVID-19, it can be concluded that compared with high-level health information literacy, low-level health information literacy is not "positive" (OR=1.676,95% CI=1.038-2.705, and first "positive" symptoms (OR=2.147, 95% CI=1.357-3.399); while medium level of health information literacy had a higher relative risk for "first positive" symptoms (OR= 1.994,95%CI=1.113-3.572). Middle school students' health information literacy is related to COVID-19. Middle school students need to improve their personal health information literacy to achieve health promotion and promote the construction of a healthy power.

**Keywords:** Middle School Students; Health Information Literacy; COVID-19; Health Power Construction.

## 1. Introduction

The level of health information literacy measures the effect of health communication and the level of health status to a certain extent [1], and is internationally recognized as one of the effective strategies to maintain the health and economy of the whole people [2]. In 2003, the concept of "health information literacy" was first proposed by the American Medical library association, which usually refers to the ability of individuals to identify possible information sources, retrieve, evaluate, analyze, understand and use information and make reasonable health decisions on the premise of being aware of health information needs [3]. Ten years later, In China, the National Health Commission carried out an assessment of national health information literacy, and raised the importance of health information literacy at the national level. Then the national health information literacy continued to show a steady improvement: from 8.8% in 2012 to 25.4% in 2021.By further comparing the data in 2021, it is found that the national health literacy level of urban residents is 30.70% higher than that of rural residents, 22.02%[4-6], indicating a significant difference between urban and rural areas.

As a digital Proterozoic group growing with the Internet, modern middle school students have been immersed in the world of electronic products since birth [7-8]. The healthy information literacy of this group will directly affect their health level in adulthood, so the middle school stage is also an important period for cultivating healthy information literacy and establishing health-related habits [9]. The global outbreak of COVID-19 has brought some changes to middle school students' living and learning styles in many countries around the world, such as teaching methods [10-11], exercise [12-13], sleep and mental state [14-15]

Through the search of domestic and foreign literature databases, no studies have been found on the health information behavior of middle school students and the status of COVID-19 infection after the release of the policy. In this study, a town-level middle school in the southeast of Henan Province was selected as the research object to explore the health information literacy level and infection situation of middle school students after the comprehensive liberalization of the COVID-19, and to provide a basis for precise health promotion and scientific intervention.

## 2. Object and Method

### 2.1. Objects in February 2023, This Study Adopted the Method of Cluster Sampling to Carry out a Questionnaire Survey among all Students in Grades One to Three of a Town Level Middle School in the Southeast of Henan Province.

The questionnaire content involved general personal information and the health information literacy questionnaire compiled by Wang Fuzhi et al. [16]. The survey was carried out in the form of questionnaire star, which asked middle

school students to scan the QR code with their parents' (or other caregivers) mobile phones, and all school students filled in the questionnaire. A total of 1268 documents were collected, and 1254 valid questionnaires were collected after the filling time was less than 50 seconds and all the questions were the same. The effective rate of the questionnaires was 98.89%.

## 2.2. Methods and Contents

Personal general information includes grade, gender, body mass index, parental education level, and self-rated health status before and after the COVID-19 pandemic; Health information literacy includes 29 health information items, 5 of which are health information cognition, access, dimension evaluation, application and moral ability. Likert5-level scoring method was used, and all items were naturalized as [0,1].

The higher the score, the better the level of health information literacy. In multiple logistic regression analysis, health information literacy was divided into high, medium and low groups according to the percentile (< P25, P25-p75 and > P75). The reliability analysis of the health information literacy questionnaire in this study shows that the Cronbach's alpha is 0.909; The validity analysis showed that the KMO value was 0.941, the Barthes spherical value was 19376.242, the df index was 378.000, and the P-value was 0.000. Therefore, this questionnaire has a good reliability and validity.

## 2.3. Statistics and Analysis

SPSS26.0 software was used for statistics and analysis of the data. Chi-square test was used to describe the difference of demographic and health information literacy among middle school students. Single-factor ANOVA and independent sample T-test were used to analyze the relationship between different demographic characteristics and whether or not people were infected with COVID-19. Multivariate Logistic regression model was used to analyze the association between health information literacy and COVID-19 infection in middle schools, and the test level was a=0.05.

# 3. Results

## 3.1. Health Information Literacy of Middle School Students with Different Characteristics

The questionnaire shows that the average value of health information literacy of middle school students in this area is (14.0 ± 0.62) points, among which, the third grade students in middle school, those with normal weight, those whose parents have bachelor's degree or above, those with high monthly income, those who exercise more than 2 hours per day on average, those who have no basic diseases when the COVID-19 epidemic is fully liberalized, and those whose parents have relatively healthy information literacy scores are higher. However, according to the single factor ANOVA and independent sample T test of relevant data, those with bachelor's degree or above and those without basic diseases when the COVID-19 was fully liberalized have higher health information literacy, which is significant (P<0.05) (see Table 1 below).

**Table 1.** Comparison of health information literacy scores of middle school students with different characteristics (n=1254)

| group | option | number | Health literacy score | t/F value | p-value | group | option | number | Health literacy score | t/F value | p-value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| gender | schoolboy | 663 | 13.9±0.65 | -0.120 | 0.904 | Per capita monthly household income | <1000 | 172 | 14.4±0.60 | 1.476 | 0.207 |
| | schoolgirl | 591 | 14.0±0.58 | | | | 1001-2000 | 308 | 14.5±0.60 | | |
| grade | first grade | 476 | 13.8±0.64 | 0.305 | 0.737 | | 2000-5000 | 518 | 13.8±0.62 | | |
| | second grade | 397 | 14.0±0.59 | | | | 5001-10000 | 203 | 13.4±0.61 | | |
| | third grade | 381 | 14.1±0.62 | | | | >10000 | 53 | 14.6±0.78 | | |
| weight | Low weight (<18.5) | 83 | 13.8±0.66 | 0.233 | 0.79 | Primary carer | parents | 743 | 13.8±0.66 | 0.233 | 0.797 |
| | Normal weight (18.5-23.9) | 970 | 14.1±0.61 | | | | grandparents | 486 | 14.1±0.61 | | |
| | Overweight (24-27.9) | 179 | 13.8±0.64 | | | | other relatives | 25 | 13.8±0.64 | | |
| Mother's educational background | Technical secondary school, high school below | 1202 | 13.9±0.60 | 8.446* | 0.000 | Average sleep time per day (hours) | <8 | 404 | 14.4±0.65 | 2.053 | 0.129 |
| | College degree or above | 52 | 16.9±1.60 | | | | 8-10 | 697 | 13.7±0.59 | | |
| Father's educational background | Technical secondary school, high school below | 1175 | 13.9±0.60 | 3.352* | 0.035 | | >10 | 153 | 14.4±0.64 | | |
| | College degree or above | 79 | 16.3±0.59 | | | Daily exercise time (hours) | <1 | 349 | 14.3±0.62 | 1.182 | 0.307 |
| registered residence registration | rural area | 1185 | 13.9±0.61 | 0.174 | 0.850 | | 1-2 | 678 | 14.0±0.62 | | |
| | non-agricultural | 69 | 14.0±0.73 | | | | >2 | 227 | 15.7±0.58 | | |
| COVID-19 vaccination status (unit: dose) | ≤1 (0-1) | 57 | 13.8±0.66 | 0.233 | 0.797 | underlying disease | yes | 67 | 12.2±0.68 | -2.473* | 0.014 |
| | 2 | 794 | 14.1±0.61 | | | | no | 1187 | 14.1±0.61 | | |
| | 3 | 403 | 13.8±0.64 | | | Marital status of parents | in marriage | 1174 | 14.0±0.62 | 1.028 | 0.304 |
| | | | | | | | non-marital | 80 | 13.3±0.66 | | |

**Table 2.** Report rate of middle school students infected with COVID-19 with different characteristics (n=1254)

| group | option | number | statistics | uninfected | First-time infection | reinfection | discomfort but not tested |
|---|---|---|---|---|---|---|---|
| gender | schoolboy | 663(52.87%) | | 227(34.2%) | 364(54.9%) | 11(1.7%) | 61(9.2%) |
| | schoolgirl | 591(47.13%) | | 186(31.5%) | 333(56.3%) | 14(2.4%) | 58(9.8%) |
| | | | $\chi2$ | 1.756 | | | |
| | | | P | 0.624 | | | |
| grade | first grade | 476(37.96%) | | 182(38.2%) | 253(53.2%) | 5(1.1%) | 36(7.6%) |
| | second grade | 397(31.66%) | | 135(34.0%) | 216(54.4%) | 8(2.0%) | 38(9.6%) |
| | third grade | 381(30.38%) | | 96(25.2%) | 228(59.8%) | 12(3.1%) | 45(11.8%) |
| | | | $\chi2$ | 21.681 | | | |
| | | | P | 0.001 | | | |
| My registered residence registration | non-agricultural | 69(5.5%) | | 18(26.1%) | 46(66.7%) | 0 | 5(7.2%) |
| | rural area | 1185(94.5%) | | 395(33.3%) | 651(55.6%) | 25(2.0%) | 114(9.5%) |
| | | | $\chi2$ | 4.497 | | | |
| | | | P | 0.213 | | | |
| Marital status of parents | in marriage | 1174(93.62%) | | 383(32.6%) | 655(55.8%) | 24(2.0%) | 112(9.5%) |
| | non-marital | 80(6.38%) | | 30(37.5%) | 42(52.5%) | 1(1.3%) | 7(8.8%) |
| | | | $\chi2$ | 0.973 | | | |
| | | | P | 0.808 | | | |
| weight | Low weight (<18.5) | 83(6.62%) | | 28(33.7%) | 40(48.2%) | 3(3.6%) | 12(14.5%) |
| | Normal weight (18.5-23.9) | 970(77.35%) | | 320(33.0%) | 545(56.2%) | 16(1.6%) | 89(9.2%) |
| | Overweight (24-27.9) | 179(14.27%) | | 65(32.3%) | 112(55.7%) | 6(3.0%) | 18(9.0%) |
| | | | $\chi2$ | 5.900 | | | |
| | | | P | 0.435 | | | |
| COVID-19 vaccination status (unit: dose) | ≤1(0-1) | 57(4.54%) | | 23(40.4%) | 29(50.9%) | 2(3.5%) | 3(5.3%) |
| | 2 | 794(63.32%) | | 261(32.9%) | 444(55.9%) | 17(2.1%) | 72(9.1%) |
| | 3 | 403(32.14%) | | 129(32.0%) | 224(55.6%) | 6(1.5%) | 44(10.9%) |
| | | | $\chi2$ | 4.467 | | | |
| | | | P | 0.590 | | | |
| underlying disease | yes | 67(5.34%) | | 13(19.4%) | 44(65.7%) | 0(%) | 10(14.9%) |
| | no | 1187(94.66%) | | 400(33.7%) | 653(55.0%) | 25(2.1%) | 109(9.5%) |
| | | | $\chi2$ | 8.847 | | | |
| | | | P | 0.031 | | | |
| Per capita monthly household income | <1000 | 172(13.72%) | | 80(46.5%) | 74(43.0%) | 6(3.5%) | 12(7.0%) |
| | 1001-2000 | 308(24.56%) | | 91(29.5%) | 179(58.1%) | 10(3.2%) | 28(9.1%) |
| | 2000-5000 | 518(41.31%) | | 157(30.3%) | 300(57.9%) | 5(1.0%) | 56(10.8%) |
| | 5001-10000 | 203(16.19%) | | 68(33.5%) | 115(56.7%) | 2(1.0%) | 18(8.9%) |
| | >10000 | 53(4.23%) | | 17(32.1%) | 29(54.7%) | 2(3.7%) | 5(9.4%) |
| | | | $\chi2$ | 28.821 | | | |
| | | | P | 0.004 | | | |
| Primary carer | parents | 743(59.25%) | | 240(32.3%) | 417(56.1%) | 15(2.0%) | 71(9.6%) |
| | grandparents | 486(38.76%) | | 163(33.5%) | 270(55.6%) | 8(1.6%) | 45(9.3%) |
| | other relatives | 25(1.99%) | | 10(40.0%) | 10(40.0%) | 2(8.0%) | 3(12.0%) |
| | | | Fisher's | 6.301 | | | |
| | | | P | 0.353 | | | |
| Average sleep time per day (hours) | <8 | 404(32.22%) | | 126(31.2%) | 223(55.2%) | 14(3.5%) | 41(10.1%) |
| | 8-10 | 697(55.58%) | | 225(32.3%) | 399(57.2%) | 7(1.0%) | 66(9.5%) |
| | >10 | 153(12.2%) | | 62(40.5%) | 75(49.0%) | 4(2.6%) | 12(7.8%) |
| | | | $\chi2$ | 13.412 | | | |
| | | | P | 0.037 | | | |
| Daily exercise time (hours) | <1 | 349(27.83%) | | 114(32.7%) | 182(52.1%) | 13(3.7%) | 40(11.5%) |
| | 1-2 | 678(54.07%) | | 214(31.6%) | 394(58.1%) | 9(1.3%) | 61(9.0%) |
| | >2 | 227(18.10%) | | 85(37.4%) | 121(53.3%) | 3(1.3%) | 18(7.9%) |
| | | | $\chi2$ | 12.986 | | | |
| | | | P | 0.043 | | | |
| Mother's educational background | Technical secondary school, high school below | 1202(95.85%) | | 395(32.9%) | 667(55.5%) | 25(2.1%) | 115(9.6%) |
| | College degree or above | 52(4.15%) | | 18(34.6%) | 30(57.7%) | 0 | 4(7.7%) |
| | | | Fisher's | 0.506 | | | |
| | | | P | 0.925 | | | |
| Father's educational background | Technical secondary school, high school below | 1175(93.70%) | | 393(33.4%) | 650(55.3%) | 23(2.0%) | 109(9.3%) |
| | College degree or above | 79(6.30%) | | 20(25.3%) | 47(59.5%) | 2(2.5%) | 10(12.7%) |
| | | | $\chi2$ | 2.732 | | | |
| | | | P | 0.435 | | | |
| Total | | 1254 | | 413(32.93%) | 697(55.58%) | 25(1.99%) | 119(9.49%) |

### 3.2. Comparison of COVID-19 Infection among Middle School Students with Different Characteristics

The number of uninfected middle school students in this region in the global COVID-19 pandemic (hereinafter referred to as "uninfected") is 413, accounting for 32.93%; 697 people were positive for the first time, accounting for 55.58% of the total. 25 people, accounting for 1.99% of the total, were positive for COVID-19 reinfection, and 119 people, accounting for 9.49%, showed discomfort symptoms such as fever, fatigue and sore throat, but did not undergo nucleic acid or antigen monitoring. According to Chi square description statistics, it is found that different grades ($P<0.01$), whether there are basic diseases ($P<0.05$), per capita monthly income of families ($P<0.01$), average accumulated daily sleep (including nap) time (hours) ($P<0.05$), and daily exercise (including walking) time (hours) ($P<0.05$) are related to COVID-19 infection (see Table 2).

### 3.3. Multivariate Logistic Regression Analysis of Health Information Literacy and Infection with COVID-19 among Middle School Students in the Region

The dependent variables are those who are not "positive", the first "positive", the second "positive", and those who are unwell but have not been tested for nucleic acid (the reference category is set as the last category, so the unwell but have not been tested for nucleic acid is 0). With the level of health information literacy (0=high, 1=medium, 2=low) as the independent variable, a multifactor logistic regression model is established to determine whether there are basic diseases, monthly income After the average accumulated daily sleep (including afternoon nap) time (hours) and daily exercise (including walking) time (hours), it can be concluded that compared with high-level health information literacy, low-level health information literacy has a higher risk of non-positive and first positive symptoms; The medium level health information literacy has a higher relative risk in the "first positive" symptoms.

**Table 3.** Multi factor Logistic regression analysis of health information literacy and infection of COVID-19 among middle school students in this area (n=1254)

| Infected with COVID-19 | Level of health information literacy | B-value | Standard error | Wald$\chi$2 | P-value | OR (OR value 95%CI) |
|---|---|---|---|---|---|---|
| not "positive" | High level | | | | | 1.0 |
| | Medium level | 0.396 | 0.312 | 1.61 | 0.204 | 1.486(0.806~2.739) |
| | Low level | 0.516 | 0.244 | 4.461 | 0.035 | 1.676(1.038~2.705) |
| first "positive" | High level | | | | | 1.0 |
| | Medium level | 0.690 | 0.298 | 5.379 | 0.020 | 1.994(1.113~3.572) |
| | Low level | 0.764 | 0.234 | 10.642 | 0.001 | 2.147(1.357~3.399) |
| second "positive" | High level | | | | | 1.0 |
| | Medium level | -0.519 | 0.644 | 0.651 | 0.420 | 0.595(0.169~2.101) |
| | Low level | -0.623 | 0.485 | 1.649 | 0.199 | 0.537(0.207~1.388) |

## 4. Discussion

As a middle school student growing up with the development of the Internet, the Internet has also become the main way for them to obtain health knowledge during the COVID-19 epidemic, accounting for 50.4% of all ways to obtain health knowledge, ranking the top three. The first is traditional media TV, accounting for 57.5%, and the second is daily chat, accounting for 51.99%, which to some extent indicates that traditional media TV still plays a pivotal role in the central inland areas. As a result, the main content of health knowledge acquired by this group mainly focuses on how to prevent COVID-19 and diet nutrition, accounting for 3/5. Furthermore, Baidu dominates the use of online search engines or apps by this group, accounting for 72.25%, with today's headlines accounting for 36.84%, and Xiaohongshu accounting for 20.26%. This indicates that new social and information platforms such as Today's Headlines and Xiaohongshu are also highly favored by the middle school community.

This study shows that after the full liberalization of the COVID-19, about 1/3 of the middle school students in this area are not "positive"; 55.58% of the first "positive" individuals; The number of people with the first "positive" sign accounts for 1.99% of the total population, and the number of people with the first "positive" sign accounts for 3.59%; Approximately 1/10 of the total number of individuals who experience discomfort symptoms such as fever, fatigue, and sore throat but have not undergone nucleic acid or antigen monitoring. Statistical analysis shows that the higher the grade, the lower the proportion of those who are not "positive", while the proportion of those who are the first "positive" and those who are the second "positive", as well as those who experience discomfort symptoms such as fever, fatigue, and sore throat but have not undergone nucleic acid or antigen monitoring, is higher; But at the same time, it was inversely correlated with the health information literacy scores of different grades. To some extent, this also shows that with the approaching of the high school entrance examination, the increase of academic pressure makes this group have no advantage over the lower grades in terms of COVID-19 infection on the basis of higher health information literacy. At the same time, this information also provides a new direction for this study. In terms of basic diseases, people with basic diseases are more likely to be infected with the first COVID-19, while those without basic diseases account for less. In terms of the per capita monthly income of families, the lowest group of people who are not infected with COVID-19 has the highest proportion, and those whose income is between 1001-2000 have the highest proportion of the first "positive" people, showing group differences, which also indicates that the middle school students in this area are mainly rural students,

and some families are mainly agricultural income, so they are relatively less affected by the outside world; Some parents are mostly migrant workers, but the epidemic has also brought a wave of factory closures, which has affected the income of these migrant families and increased the pressure on their daily lives. In terms of sleep, those who exceed 10 hours a day have the highest proportion of not being "positive", while those who first "positive" and those who have discomfort but have not been tested have the lowest proportion; However, those who were less than 8 hours old had the lowest proportion of non "positive" cases, while those who were re "positive" cases and those who felt unwell but not tested had the highest proportion; Those who sleep between 8-10 hours have the highest proportion of the first "yang" and the lowest proportion of the second "yang". On the whole, those who spent more than 10 hours were in good condition in this COVID-19 infection, so the sleep quality of middle school students should also be concerned. In terms of exercise, those who exceed 2 hours a day have the highest proportion of not being "positive", and those who feel unwell but not tested have the lowest proportion; Those who exercise for 1-2 hours have the lowest proportion of non 'yang' and the highest proportion of first 'yang'. The proportion of those who have regained "yang" and those who have discomfort but have not been tested is the highest for those who have less than 1 hour per day. Overall, the quality and effective duration of exercise for middle school students should be improved. In terms of the scores of middle school students' health information literacy with different characteristics, parents' educational background is the two factors that affect middle school students' health information literacy, so it is self-evident that parents' educational background has an important impact on children's health information literacy. Multi factor Logistic regression analysis between health information literacy and COVID-19 infection of middle school students in this area shows that, compared with high level health information literacy, low level health information literacy has a higher risk of non-positive and first positive symptoms; The medium level health information literacy has a higher relative risk in the "first positive" symptoms. Therefore, improving the overall level of health information literacy of middle school students in the COVID-19 can improve the adverse outcome of COVID-19 infection.

According to the research of the National Health Commission, the global pandemic of CONVID-19 has to some extent forced the improvement of residents' health literacy [17], such as the implementation of health habits such as wearing masks in public places, cough etiquette, and scientific hand washing. At the same time, it also promoted residents to actively search for relevant health information about the prevention and control of the COVID-19 epidemic and the progress of the epidemic by using mobile phones. The health information literacy in this study is based on the background of the COVID-19. The data shows that the health information literacy of middle school students in this area is at the middle level during the COVID-19 epidemic, which is not only related to their parents' educational background, but also may be related to the promotion of health education in schools. Different scholars' surveys in different regions found that the health information literacy of residents with chronic diseases was not high [18-19]. Therefore, the improvement of health information literacy should start from the student era. As an important part of the student body, middle school students are at a critical stage of growth and development. Their health information literacy and self-health care awareness are related to the subsequent health level, and also provide reference for the prevention of chronic diseases and the development of evidence-based medicine.

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## References

[1] Huang K, Guo M, Hao XJ, et al. A literature review on health information literacy in public health crises [J]. Library Journal.2020,39(7):59-69,82.

[2] Mancuso J M. Assessment and measurement of health literacy: an integrative review of the literature[J]. Nursing & health sciences, 2009, 11(1): 77-89.

[3] Fu S X, Deng S, Chen X Y. A review of the current situation and development of health information literacy research in foreign countries[J]. Information Resource Management Journal of Information Resources Management, 2016, 6(3): 5-14, 33.

[4] Zhang Shijing, Du Jian. Health information literacy should be the key point of public health literacy promotion in China[J]. Journal of Medical Informatics Journal of Medical Informatics, 2010 (2): 45-49.

[5] Li Chang-Ning, Li Ying-Hua. Current situation and outlook of health literacy promotion[J]. China Health Education, 2015 (2): 233-237.

[6] People's Daily: the level of health literacy among residents has steadily increased [EB/OL]. [2022-06-14]. http://www. gov.cn/ xinwen/ 2022-06/14/content_5695539.htm.

[7] Akcayir M, Dundar H, Akcayir G. What makes you a digital native? Is it enough to be born after 1980? [J]. Computers in Human Behavior, 2016, 60:435-440.

[8] Zhao YX, Liu SH. Analysis of foreign research hotspots and progress in the field of digital youth[J]. Library Forum, 2018(6).138-149.

[9] Inchley J C, Stevens G W J M, Samdal O, et al. Enhancing Understanding of Adolescent Health and Well-Being. The Health Behaviour in School-aged Children Study[J]. Journal of Adolescent Health, 2020, 66(6): S3-S5.

[10] Luo JY, Li HW, Mak POH. Investigation and analysis of secondary school students' mental health status upon resumption of schooling in the context of the new crown pneumonia epidemic[J]. Mental health education in primary and secondary schools,2020,19(22):12-15.

[11] Scarpellini F, Segre G, Cartabia M, et al. Distance learning in Italian Primary and Middle school children during the COVID-19 pandemic: a national survey[J].BMC public health, 2021, 21(1). 1035.

[12] Xiao L,Tang XY. The current situation of secondary school students' physical exercise under the new coronary pneumonia epidemic--a case study of Nanjing Senior High School in Jiangsu Province[J]. Athletics,2021.

[13] Yoo J I, Han J K, Youn H S, et al. Comparison of health awareness in South Korean middle school students according to the type of online physical education classes during the COVID-19 pandemic[J]. International Journal of Environmental Research and Public Health, 2021, 18(15): 7937.

[14] Zhou XW, Zhang QH, Chen YL. Sleep and anxiety among secondary school students under temporary closure of the "new crown" epidemic: the mediating role of positive thinking[J].

The mediating role of positive thinking[J]. Advances in Psychology,2023,13:203.

[15] Ma Z, Idris S, Zhang Y, et al. The impact of COVID-19 pandemic outbreak on education and mental health of Chinese children aged 7-15 years: an online survey[J]. BMC Pediatrics, 2021, 21(1): 1-8.

[16] Wang FZ, Luo AJ, Xie WZ, et al. Development of a health information literacy self-assessment scale and its reliability test[J]. China Journal of Modern Medicine,2013,23(30):89-93.

[17] National Health and Wellness Commission. The national health literacy level will rise to 23.15% by 2020 [EB/OL]. (2021-04-01) [2021-11-23]. http://www.gov.cn/xinwen/2021-04/01/content_5597287.htm.

[18] Yang YG, Shen LJ, Yang KL, et al. Health literacy survey and analysis of influencing factors among residents with chronic diseases in Henan Province [J]. Current Modern preventive medicine,2021,48(14):2580-2584.

[19] Ji Yu, Tai Ping, Jiang Xiaoli. Health literacy level and its influencing factors of chronic disease prevention and treatment among residents in Taizhou City[J]. China Health Industry, 2021, 18(2):160-162.