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Study on the Ideal Matching Mode of Sleep Time and High Academic Performance of High School Students in China and Its Early Warning Mechanism

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***Abstract**. Based on a sample survey of high schools in Province S of China, this study used quantitative statistical analysis to explore the ideal matching mode of sleep time and high academic performance and established a multi-level early warning mechanism for schools that sacrifice student sleep for high academic performance. The results showed that "students achieve the best academic performance when they sleep for eight hours or more." This is an ideal matching mode for schools to ensure the healthy development of students and build a good educational environment. Teachers, schools, education administrators, and parents should hold correct educational values and view comprehensively the relationship between students' sleep time and academic performance. For schools that sacrifice students' sleep time and blindly pursue high grades, a multi-level early warning mechanism should be established and their rectification should be supervised.*

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Question

THE sleep problems of high school students have received extensive attention from educational administration and scholars. China has also successively introduced a series of related policies to ensure students' sleep time, such as the "Compulsory Education School Management Standards" and "Comprehensive Prevention and Control of Myopia in Children and Adolescents Implementation Plan." These documents clearly mention the need to ensure that elementary, middle, and high school students sleep at least 10, 9, and 8 hours a day, respectively. A large number of studies have also confirmed that long-term lack of sleep is harmful to students' learning ability, academic performance, and physical and mental health (Curcio, 2006; Wolfson, 2003; Fallone, 2002).

However, the implementation effects of these policies are not satisfactory. Against the background of increasing pressure for higher education and academic competition, parents and teachers believe in the spirit of "extremely hard study" of the ancient Chinese "tie one's hair on the house beam and jab one's side with a needle to keep oneself awake - painstaking in one's study" and "bore a hole on the wall to make use of the neighbor's light to study" in order to let students pursue high scoring and obtain high rankings. Many students are affected by these kinds of thoughts and remind themselves to invest more time in their studies, but they ignore their own sleep problems (Tong, 2016). The monitoring data of the regional education quality physical examination project team of the Collaborative Innovation Center of Assessment for Basic Education Quality showed that in many areas, the sleep time of high school students has not reached the basic level, and there are many schools and regions that blindly sacrifice sleep time to pursue high performance. Multiple studies have pointed out the problem of insufficient sleep among high school students. Yang et al. (2018) investigated the sleep time of high school students in Shanghai and found that 94.8% of the students slept less than 8 hours; Hou et al. (2015) also found the average sleep time of high school students in Bao'an District, Shenzhen was only 6.2 hours. Studies have shown that the relatively good results brought about by lack of sleep are at the expense of the physical and mental health of the students and cause negative effects. Adequate sleep time, a good development environment, and high-quality academic performance are necessary conditions for a successful education. Based on this, this research will explore the ideal matching model of students' high academic performance and sleep time based on physical and mental development and a good educational environment, and provide multi-level early warning for schools that sacrifice students' sleep time in exchange for high performance, and hope it can provide enlightenment to the educational decision-making and practice.

Literature Review

With the promulgation of relevant policies, a large number of studies have also been carried out on the sleep time of high school students. We have found in existing re-

search that most of the related research focuses on the relationship between sleep time and academic achievement, physical and mental health, and analysis of its influencing factors.

The Relationship between Sleep Time and Students' Academic Performance

Sleep is a spontaneous and reversible resting state, manifested as the reduced responsiveness to external stimuli and temporary interruption of consciousness. Traditionally, as an adaptive and protective activity, sleep is an important way for individuals to restore physical strength. Liu et al. (2015) pointed out that sleep is not only important for restoring physical strength, but also for restoring mental strength. Good sleep is not only an important guarantee for subsequent learning, but also helps to consolidate and maintain memory. Dewald et al. (2010) conducted a meta-analysis of sleep time and academic performance for 15,199 students between the ages of 8 and 18 and showed that the correlation coefficient reached $r = 0.069$ and the correlation between boys were higher than that of girls. Mirghani et al. (2015) also reached a similar conclusion in the study. Jiang et al. (2011) found that school-age children with insufficient sleep time or poor sleep quality do not perform as well as children with a good sleep in language, mathematics, and academic performance. Therefore, the sleep time and the academic performance of the students present a positive correlation. However, as the pace of life accelerates and the pressure of study and work increases, many people try to make up for the lack of study and work time by reducing sleep and hope to improve the efficiency of study and work.

There are two explanations for the relationship between sleep time and academic performance: one is that when sleep is insufficient, the body's sympathetic nerve function is hyperactive and catabolism increases, which affects the mental activities related to memory and attention. This ultimately impairs the maintenance and consolidation of memory and causes a decline in students' academic performance. The other is that lack or interruption of sleep will reduce the nocturnal brain activity required for neurocognitive functions; among them, complex tasks require abstract thinking, creativity, integration, and planning; these tasks represent higher neurocognitive functions and mainly affected by sleep problems (Yang et al., 2018).

The Relationship between Sleep Time and Students' Physical and Mental Health

Liang et al. (2006) pointed out that lack of sleep in adolescents at night will weaken the body's immune function, weaken the body's defenses, and cause diseases; it will also hinder the production and release of growth hormone, leading to growth retardation. Long-term lack of sleep can disrupt the biological clock of adolescents, leading to cerebral cortex dysfunction, neurasthenia, and various neuroses. Knutson (2011) found that insufficient sleep time during adolescence was significantly positively correlated with overweight and obesity. Therefore, sleep is not only an important physical requirement,

but also an important guarantee for students' mental health. Morrison et al. (1992) found that adolescents with chronic sleep deprivation have a significantly higher incidence of depression, anxiety, and behavioral problems than those with adequate sleep, and the more serious the lack of sleep, the higher the anxiety and depression. Zhao et al. (2012) believed that from the perspective of emotional maintenance, long-term lack of sleep in students will show negative emotions such as emotional instability, irritability, anxiety, and other symptoms, which will affect normal life.

Analysis of Influencing Factors of Students' Sleep Time

A number of studies have focused on the related causes of sleep deprivation among Chinese students. He et al. (2007) investigated the sleep conditions of 618 high school students in Beijing and found that personal emotions, study pressure, and test scores are the main factors affecting the sleep time and quality of high school students. Zhao & Xue (2018) found in a survey that middle school students' participation in academic extracurricular tutoring can significantly reduce their sleep time. Participating in intuition is one of the important indicators of students' objective pressure. Liu et al. (2011) found that study stress and test anxiety have a positive predictive effect on students' subjective sleep quality, time to fall asleep, sleep time, sleep disturbance, and daytime dysfunction. Lin et al. (2018) found that the greater the learning pressure, the worse the quality of sleep. With the intensification of competition, all classes of society have to increase learning content and requirements for children, so that children need to invest more time in learning, thereby breaking the normal routine of work and rest and affecting normal sleep. Zheng et al. (2001) found that there is a linear regression relationship between students' learning pressure and willpower, thinking, emotion, and physiological indicators, that is, the greater the learning pressure, the greater the impact of negative emotions on sleep quality. If students are under heavy learning pressure, they will naturally suffer from anxiety and insomnia over the years.

In addition to learning pressure and other factors, Liu et al. (2017) found that the longer students use mobile phones each day, the worse their sleep quality; students who use mobile phones for more than 60 minutes before going to bed each day have a sleep disorder rate significantly higher than less than 10 Minute students, but using the basic functions of mobile phones (phone calls, text messages) has no effect on sleep quality. Demirci et al. (2015) found that excessive use of smartphones has a direct effect on low sleep quality, which directly affects negative emotions such as depression and anxiety, thereby indirectly causing sleep problems; sleep quality is moderately positively correlated with students' mental health and different components of sleep are all related to mental health, especially with somatization, compulsion, depression, and anxiety.

Therefore, students' sleep time is affected by many factors. In order to pursue high academic performance, academic pressure, negative emotions, and the length of mobile phone use are all critical factors that affect students' sleep time.

In sum, the lack of sleep has a negative impact on students' academic performance and physical and mental health. High school students spend most of their time in

the educational environment of the school. The hazards of insufficient sleep to students' physical and mental health and academic achievement will directly or indirectly affect their hobbies, learning quality, social relationships, and frequency of participating in activities inside and outside the school, thereby affecting their subjective well-being. The heavy academic burden caused by the pursuit of higher academic performance is an important cause of insufficient sleep for students. In view of this, it is particularly important to explore and find a balance between ideal sleep time, higher academic performance, and a good physical and mental development environment.

Methods

Data Sources

This research relies on the regional education quality and health examination project team of the Collaborative Innovation Center of Assessment for Basic Education Quality (hereinafter referred to as the project team) for data collection. The project team used a stratified random sampling method to survey 14,021 second-year students from 140 high schools in Province S in an eastern province of China, including 6,569 boys and 7,452 girls. After weighing the sample, there are a total of 205,938 students, including 97,024 boys and 108,914 girls. Boys accounted for 47% of the effective sample, and girls with 53% of the effective sample. The basic information of the survey subjects involved gender, region, parents' occupation, parents' education level, etc.

The project team referred to domestic and foreign assessment projects and related documents and measured the sleep time and academic performance of students every day (except weekends and holidays). Sleep time was divided into six periods of less than 5, 5-6, 6-7, 7-8, 8-9, and 9 hours or more; academic performance was the average score in Chinese language, mathematics, and English language.

In addition, the project team also investigated various variables such as students' interest, academic burden, learning quality, social relationships, and subjective well-being of activity participation, and combined with relevant statistical models to synthesize the above variables into an index of 0-100. The higher the index a school had, the better the students developed in this school. For example, the higher the learning interest index, the higher the learning interest of the students of this school; the higher the interest satisfaction index, the better the curriculum of this school can meet the students' interest development; the higher the homework index, the higher the ratio the school assigned the students homework time less than two hours (excluding weekends); the higher the sleep index, the higher the proportion of students in this school who sleep 8 hours or more per day.

Procedures

We use broader effect size to compare different matching patterns of sleep time and high performance. The effect size represents the size of the standard deviation between the two sets of means. Unlike the significance test, the effect size is not affected by the

sample size, and can more objectively reflect the size of the difference between groups. When the sample size is so large that the variable is easily significant, it is necessary to report the size of the effect. If the absolute value of the effect size is < 0.2, the actual difference is small, 0.2-0.8 is a moderate difference, and > 0.8 indicates the actual difference is large.

Results and Analysis

The High School in Province S Where "Students Have the Best Academic Performance When They Sleep for More Than 9 Hours", and They Had a Higher Interest, Less Pressure, Better Learning Quality, More Participation in Activities, More Harmonious Social Relations, and Higher Well-Being

According to regulations, the sleep time of high school students shall not be less than 8 hours. Therefore, in this study, when the sleep time was 8-9 hours and its two intervals less and more than 8 hours, that is, 7-8 hours and > 9 hours, to explore the sleep time period when the student's highest academic performance occurs, and then observed which group of the students were more interested and stressed less, a better quality of learning, high participation in activities, harmonious social relations and high sense of well-being. From this, we found an ideal matching mode between sleep time and performance. In this study, the "schools with the highest scores in sleep for more than 9 hours" were recorded as the category A; the "schools with the highest scores in 8-9 hours of sleep" were recorded as the category B; "the highest scores were in the 7-8 hours of sleep" were recorded as category C.

In **Table 1**, category A schools performed better than B and C on interest index, burden index, learning quality index, social relationship index, and activity participation index. From the actual difference reflected in the effect size, most of the effect size was ≥ 0.2. This showed that compared with the categories B and C schools, the students' interest in learning, art, and sports have reached a higher level, and the school could also meet the students' interests to a greater extent; sleep time was relatively high, relatively small homework time, a high proportion of students without extracurricular tutoring, and the students felt relatively less pressure; the relationship with teachers, parents and peers were relatively harmonious, participation in a club, charity, independent electives, and research studies were more motivated; learning motivation and self-confidence were stronger, and the subjective well-being was also higher.

Specifically, the indexes with large differences are as follows: In terms of interest, the three categories of schools have the largest differences in the learning interest index and interest satisfaction index, and the learning interest index of students in "category A schools" is higher than that of "category B schools" by 8.0. The score is 24.2 points higher than that of "category C school"; the interest satisfaction index of "A school" is 7.1 points higher than that of "category B school" and 22.1 points higher than

Table 1. Indices of Students in Three Categories of Schools.

		School Category			Effect Size	
		C	B	A		
		Schools with the highest scores with 7-8 hours of sleep	Schools with the highest scores with 8-9 hours of sleep	Schools with the highest scores with >9 hours of sleep	C *vs* A	C *vs* B
Interest Index	To Learning	41.7	57.9	65.9	1.10	0.39
	To Arts	60.6	64.8	66.1	0.64	0.14
	To Sports	69.5	72.9	75.0	0.63	0.22
	Interest Satisfaction	50.5	65.5	72.6	1.05	0.37
Burden Index	Learning Pressure	27.2	30.5	42.2	0.58	0.47
	Sleep	9.2	14.5	16.5	0.48	0.13
	Homework	58.6	59.0	63.1	0.22	0.19
Learning Quality Index	Learning Confidence	53.9	62.9	70.9	0.80	0.41
	Learning Strategy	55.2	59.6	59.3	0.76	0.05
	Learning Motivation	64.0	75.1	79.7	1.03	0.33
Social Relationship Index	With Teachers	58.2	72.1	78.4	1.06	0.35
	With Peers	65.9	73.9	80.7	0.75	0.40
	With Parents	67.3	75.8	81.3	0.71	0.33
Activity Participation Index	Charitable Activities	49.5	60.6	70.9	0.89	0.47
	Research Learning	48.7	60.3	71.7	0.99	0.52
	Independent Elective	36.8	50.3	55.4	0.86	0.23
	Social Activities	30.5	40.1	43.2	0.61	0.14
	Subjective Well-Being	72.4	77.9	83.2	0.87	0.44

"category C school". In terms of burden, students in the three types of schools have the largest difference in the learning pressure index. The learning pressure felt by students in "category A schools" is 11.7 points lower than that of "category B schools" and 15.0 points lower than "category C schools". In terms of social relationship, "category A school" is 20.2 points, 14.8 points and 14.0 points higher than "category C school" in teacher-student relationship index, peer relationship and parent-child relationship index, respectively, higher than "category B school" out of 6.3 points, 6.8 points, and 5.5 points. In terms of participating in activities, the three groups of school students have the biggest differences in participating in public welfare activities and research learning activities. The index of participation in public welfare activities of "category A schools" is higher than that of "category B schools" by 10.3 points and higher than "category C schools" by 21.4 points. On score: the index of "category A school" students participating in research learning activities is 11.4 points higher than that of "category B schools" and 23.0 points higher than "category C schools". In terms of learning quality, the three groups of school students have the largest differences in learning motivation and learning self-confidence index. The "category A school" students have a higher learning confidence index by 17 points than the "category C school" and 8.0 points higher than the

"category B school". The learning motivation index of "category A school" students is 15.7 points higher than that of "category C schools" and 4.6 points higher than "category B schools".

Ideal Matching Model of Sleep Time and High Academic Performance in Different Types of Schools

Classify schools according to their average socioeconomic status (SES), and explore whether schools of different socioeconomic status groups conform to the overall law, that is, compared with categories B and C schools, students in category A schools have higher interest and less pressure, The quality of learning is better, the participation in activities is more, the social relationship is more harmonious, and it has higher well-being. This study ranked all the participating schools. The top 30% of the schools with average socioeconomic status were defined as the high socioeconomic status group, and the lower 30% were defined as the low socioeconomic status group. The specific results are as below:

(1) In the low socioeconomic status group, the students in the low socioeconomic status group "when the sleep time is 8-9 hours, the students have the best performance", the school students have higher interest, less pressure, better learning quality, more participation in activities, and a more harmonious social relationship, and better well-being.

Students from the three categories in the low socioeconomic status group have different learning interests, academic pressure, learning quality, activity participation, social relationship, and subjective well-being. The following table presents the difference between the indexes of the two groups of schools.

It can be seen from **Table 2** that the students in the low socioeconomic status group "students with 8-9 hours of sleep have the best results" had a higher interest, less pressure, better learning quality, more participation in activities, and a more harmonious social relationship and students' subjective well-being was relatively high, showing the following characteristics.

First, in the low socioeconomic status group, the indexes of "category B schools" are higher than "category A schools", but the overall difference was not big, basically staying at about 5 points, which was different from the overall law. This shows that in a school environment with a lower overall socioeconomic background, students need to spend a certain amount of time and effort to achieve good results, but the highest score also needs to be met on the basis of 8 hours of sleep, so that students will have a healthy educational environment, such as participating in more activities, performing better in various aspects such as interest, self-confidence, social relationship, and having more well-being.

Second, in the low socioeconomic status group, the indices of "category C schools" and "category B schools" were quite different. Among them, "category C school" was 14.9 points and 14.8 points lower than "category B school" in learning interest index and interest satisfaction index, respectively; teacher-student relationship

Table 2. Indexes of Students in Three Categories of Schools in the Low Socioeconomic Status Group.

		Low Socioeconomic Status Group				
		Category C	Category B	Category A	Effect Size	
					B *vs* A	B *vs* C
Interest Index	To Learning	36.7	51.6	48.6	0.66	0.15
	To Arts	58.28	66.09	62.85	0.84	0.39
	To Sports	66.54	74.21	72.29	0.85	0.21
	Interest Satisfaction	47.38	62.18	60.29	0.72	0.10
Burden Index	Learning Pressure	14.3	24.4	18.6	0.61	0.37
	Sleep	6.6	17.7	10.4	0.65	0.45
	Homework	60.6	62.1	51.6	0.10	0.67
Learning Quality Index	Learning Confidence	57.8	56.9	55.4	0.05	0.07
	Learning Strategy	54.82	57.88	55.62	0.66	0.54
	Learning Motivation	60.8	69.9	69.6	0.57	0.02
Social Relationship Index	With Teachers	52.8	66.0	63.2	0.69	0.15
	With Peers	66.3	68.7	64.6	0.15	0.21
	With Parents	70.3	70.7	68.2	0.03	0.13
Activity Participation Index	Charitable Activities	37.9	55.9	53.6	0.81	0.13
	Research Learning	35.5	55.4	46.6	0.84	0.49
	Independent Elective	28.9	45.8	38.2	0.82	0.40
	Social Activities	17.0	35.3	28.5	0.86	0.34
	Subjective Well-Being	67.5	75.6	76.8	0.63	0.10

index was 13.2 points, 18.5 points, and 16.0 points lower; public welfare activity participation index, research learning index, the self-selective index, and the community participation index were 17.9, 19.9, 16.8 and 18.3 points lower, respectively. This shows that in a school environment with a low overall socioeconomic status, it is not possible to sacrifice students' sleep in exchange for good performance. Otherwise, children may face increased pressure, decreased interest, disharmony in social relationships, and participation in various activities, and subsequently, the enthusiasm was severely frustrated, and he was unable to feel happiness.

(2) For schools in the high socioeconomic status group, the students in the schools with "the best performance when they sleep more than 8 hours" had a higher interest, lower pressure, better learning quality, higher participation in activities, and social relationship were more harmonious and well-being was higher.

There are also differences in the performance of students in the three categories of schools in the high socioeconomic status group in terms of learning interest, academic pressure, learning quality, activity participation, social relationship, and subjective well-being. **Table 3** presents the difference between the indexes of the two groups of schools.

Table 3. Indexes of Students in Three Categories of Schools in the High Socioeconomic Status Group.

		High Socioeconomic Status Group				
		Category C	Category B	Category A	Effect Size	
					A *vs* C	A *vs* B
Interest Index	To Learning	54.4	72.6	74.0	1.15	0.09
	To Arts	54.99	66.52	66.15	1.30	0.04
	To Sports	64.88	74.36	75.01	1.18	0.06
	Interest Satisfaction	69.05	78.08	79.00	0.70	0.07
Burden Index	Learning Pressure	41.6	45.7	53.1	0.46	0.29
	Sleep	2.0	11.4	19.1	0.80	0.39
	Homework	56.5	64.7	59.5	0.12	0.21
Learning Quality Index	Learning Confidence	69.2	77.7	76.8	0.58	0.08
	Learning Strategy	54.38	64.25	60.27	0.89	0.56
	Learning Motivation	72.3	84.9	84.6	1.27	0.03
Social Relationship Index	With Teachers	82.1	88.2	85.0	0.24	0.29
	With Peers	87.0	87.0	86.9	0.01	0.01
	With Parents	82.0	86.9	85.8	0.39	0.12
Activity Participation Index	Charitable Activities	95.0	76.0	77.0	0.94	0.06
	Research Learning	69.3	74.6	78.5	0.51	0.20
	Independent Elective	47.7	67.5	61.7	0.66	0.25
	Social Activities	28.8	54.2	47.2	0.87	0.30
	Subjective Well-Being	86.0	86.4	87.7	0.21	0.17

In **Table 3**, in the high socioeconomic status group, some indices of category A schools were higher than category B and C schools, and some indices of category B schools were higher than category A schools. Comprehensively, the categories A and B schools were "the schools with the best student performance when the sleep time is more than 8 hours." The specific data presents the following characteristics:

In the context of the overall high socioeconomic background of the school, the indices of "category B schools" and "category A schools" are different from each other, but the overall difference is not big, basically maintaining around 5 points. The indices of "category C schools" are lower than "category A schools" as a whole, and the differences are large. Among them, "category C school" is more than 10 points lower than "category A school" in interest index; learning stress index and sleep index are 11.5 points and 17.1 points lower respectively; autonomous elective index and community participation index are 14.0 points and 18.4 points lower respectively; learning motivation index is 12.4 points lower. As a result, for students with high socioeconomic status, the lack of sleep brings serious consequences. They face increased pressure, decreased interest, disharmony in social relationships, and serious frustration in their enthusiasm for participating in various activities, and no well-being feeling.

Multi-Level Early Warning of High-Performance Sleep Interval in High Schools in Province S

Through the above analysis, no matter what the socioeconomic status of the school is, the achievement of high grades of students cannot be at the cost of reducing sleep time. Students who sleep for at least eight hours are more likely to get the good academic performance and are more conducive to the formation of a healthy and benign educational environment. The following is a multi-level early warning for all sample schools in province S:

- Schools with the highest scores in the student group whose sleep time is < 5 hours are listed as red warnings;
- Schools with the highest score in the student group of 5-6 hours of sleep are listed as a yellow warning;
- Schools with the highest scores in the 6-7 hours of sleep time are listed as orange warnings;
- Schools with the highest scores in the student group with 7-8 hours of sleep are listed as blue warnings.

More than 60% of schools in province S were at the warning level. Among 140 schools, 24 schools were at the red warning level; 18 schools were at the yellow warning level; most schools were at the orange warning level, as many as 34. What's more noteworthy is that province S as a whole was also at the orange warning level; 9 schools were at the green warning level. For these schools that exchange low sleep for high grades, we should pay attention to and supervise them in various ways to create a healthy educational environment for students.

Conclusion and Discussion

"Students Achieve the Highest Scores When They Sleep for Eight Hours or More." This Is an Ideal Matching Mode for the School to Ensure the Healthy Development of Chinese High School Students and Maintain a Good Educational Environment

According to the data, the schools in province S where "students sleep for eight hours or more have the best academic performance" have a good educational environment. Students in these schools actively participated in public welfare activities, research learning activities, independent electives, and club activities. They were confident and motivated to devote themselves to learning; not only were they interested in learning, but they were also interested in art and sports. Such schools could satisfy students' hobbies in all aspects to a greater extent. Ensure adequate sleep and complete homework of appropriate intensity every day; they had a more harmonious relationship with their parents, teachers, and peers, and they could feel more happiness.

For a long time, the spirit of "extremely hard study" reflected in ancient Chinese stories such as "tie one's hair on the house beam and jab one's side with a needle to keep oneself awake - painstaking in one's study" and "bore a hole on the wall to make use of the neighbor's light to study" have been highly praised as the outstanding qualities students should have. Current teachers and parents often use such stories to encourage students and children to concentrate on learning. Many children also use these stories to encourage themselves and remind themselves to study hard. However, the data obtained by the empirical investigation is exactly the opposite of this view. For students with relatively low family socioeconomic status, even if they have to spend more learning time, they must ensure 8-9 hours of sleep, so as to have a healthy educational environment and a healthy state of development. If the pursuit of high grades at the expense of sleep time will often increase the academic pressure of students, students will gradually lose their interest in learning, art, and sports, making students unwilling to participate in various activities, and worsening their relationship with teachers, parents, and peers. Therefore, keeping students' sleep time at 8 hours or more is an ideal matching model for schools to ensure the healthy development of students and create a good educational environment.

The ideal model of the relationship between sleep time and academic performance should be: in certain sleep time, the student's academic performance reaches its peak. The "Elementary and Middle School Health Education Guidelines" issued by the Ministry of Education in 2008 stipulates that students should be guaranteed adequate sleep. Among them, elementary, middle, and high school students should sleep 10, 9, and 8 hours a day, respectively. When the sleep time of high school students in province S is more than 8 hours, their academic performance reaches the highest point. The project team evaluated a high school in a southern coastal city of China and a middle school in the mainland of China in the same way and found that only when the sleep time was 7-8 hours or even 6-7 hours, the academic performance of students in this area can be reached the highest. It can be seen that the high school data in province S is closer to the ideal model than high schools (even middle schools) in other similar regions. In fact, since 1997, province S has continued to standardize school-running behavior and strengthened supervision of the phenomenon of increasing academic burden. Our data showed that the long-term efforts of province S have achieved certain good results.

Teachers, Schools, Administrators, and Parents Should Hold Correct Educational Values and Take A Comprehensive View of the Relationship Between Students' Sleep Time and Academic Performance.

It can be seen from this study that the high performance obtained by sacrificing students' sleep requires a price, such as students' low interest in learning, arts and sports, public welfare activities, research studies, autonomous electives, insufficient participation in club activities, high learning pressure, and the social relationship is tense and subjective, and well-being is low.

The fundamental goal of education and the healthy development of students should not be based solely on students' academic performance as the only evaluation criterion. The "Basic Education Curriculum Reform Outline (Trial)" issued by the Ministry of Education in 2001 pointed out: "Establishing an evaluation system that promotes the overall development of students. Evaluation should not only focus on students' academic performance but also discover and develop students' various potentials." The Opinions of the Ministry of Education on Promoting the Reform of Comprehensive Evaluation of Education Quality in Primary and Secondary Schools issued by the Ministry of Education in 2013 also particularly emphasized the concept of comprehensive indicators for education evaluation. The issuance of these important policy documents reflects the education administrators' thinking on the goals of education reform at the macro level. Educational goals and multiple evaluations should not only pay attention to the overall development of students' morality, intelligence, sports, art, and labor, but also demonstrate students' individual strengths and development potential. Pursuing good grades at the expense of students' sleep time and neglecting the physical and mental development of students and the creation of a good educational environment will inevitably lead China's education astray.

To ensure students' sleep time in educational practice, efforts should be made in the following aspects: First, the educational administrative department and the school should act as parents' consultants, and guide parents to choose appropriate family education methods according to their children's actual conditions. One size fits all. Parents should also understand that it is the duty of parents to let their children grow up healthily and happily. They should not blindly care about their children's academic performance, but should be more concerned about their children's subjective feelings and experiences in learning, concerned about the overall development of students, and balanced distribution of learning energy; It is necessary to face up to the academic burden of students and to think rationally and appropriately, so as not to fall into the misunderstanding of the excessive pursuit of high grades at the expense of students' sleep time. Second, the behaviors in schools that increase the learning burden of students and seriously affect students' sleep time should be strictly investigated and urged for improvement; appropriate homework should be assigned to avoid problematic tactics, fatigue bombing, and phenomena that affect students' sleep time. Third, the education administrative department needs to effectively implement the principle of enrolling nearby to ensure a reasonable distance between the student's residence and the school, so as to reduce the problem of insufficient sleep time caused by the student's home address being too far away from the school, and the long time on the way to school. In the long-term run, enrollment for high school and college entrance examinations should break the "score-only" selection criterion and replace it with a comprehensive standard. It is necessary to pay attention not only to student performance, but also to student development, creativity, and the spirit of serving the society. Guide the school to return to the track where knowledge education and quality education go hand in hand.

Provide Multi-Level Early Warning and Improve the Accountability Mechanism for Schools That Pay the Price of Lack of Sleep and Blindly Pursue High Academic Performance

Even under the general situation of S Province, which has continued to regulate school-running behaviors for many years, more than 60% of the students in the 140 schools surveyed in this study still achieved the highest results when they slept for less than 8 hours. Such a high proportion requires extensive attention. Among them, 24 schools were at the red warning level; 18 schools were at the yellow warning level; as many as 34 schools were at the orange warning level; 9 schools were at the blue warning level. This early warning mechanism is extensible. All regions can refer to this early warning standard and conduct multi-faceted supervision of schools that sacrifice sleep time in exchange for high grades.

Educational administrative departments should truly be aware of the harm to students in pursuit of high grades at the expense of sleep time. They should increase risk awareness, strengthen monitoring and early warning, and carry out necessary guidance and accountability. Early warning and supervision of students' sleep time is systematic work. It cannot be accomplished overnight with just one measure; it requires the joint efforts of many parties. For example, the administrative department of education can set up an early warning and monitoring system for an academic burden to encourage parents to respond to students' burden problems such as lack of sleep and heavy homework; in turn, relevant departments can use this as a reference to investigate relevant schools and supervise their rectification. They can also hire a third-party assessment agency to investigate the sleep time of students, and based on the early warning mechanism established in this study, publish the warning results every month, and criticize schools that blindly pursue high grades at the expense of student sleep time. In addition, different schools are encouraged to develop mutual learning and healthy competition. Schools at an early warning level learn from schools that can guarantee adequate sleep, high academic standards, healthy physical and mental development, and a good educational environment for students. The collision of different educational management modes and methods will produce different educational results, and mutual learning and communication can jointly promote the comprehensive and healthy development of students.

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