Impact of COVID-19 on Emotional Resilience and Learning Management of Middle School Students

Authors' Contribution:
Study Design **A**
Data Collection **B**
Statistical Analysis **C**
Data Interpretation **D**
Manuscript Preparation **E**
Literature Search **F**
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Background: The aim of this study was to explore the emotional resilience of middle school students learning at home in February and March 2020 during the COVID-19 pandemic, and the impact of this resilience on students' learning management skills. The results could provide a basis for psychological health education of middle school students during major life events.

Material/Methods: This study used a survey to explore emotional resilience and learning management abilities in middle school students (N=896) from February 10, 2020, to March 22, 2020. Students used online e-learning during this period due to the COVID-19 pandemic. Data were analyzed using t-testing, Pearson's correlation, and multivariate linear regression.

Results: The results indicate that emotional resilience was significantly lower in eighth grade students than in seventh grade students (t=1.98, P<0.05) and negative emotional recovery increased during the study period. Emotional resilience was positively correlated with learning management skills (r=0.498, P<0.01), and positive emotional ability predicted learning management skills.

Conclusions: The study findings indicate that in the face of major life events, emotional resilience is an important factor for the mental health of adolescents and improves coping ability. Cultivating positive emotions can improve learning efficiency.

MeSH Keywords: **COVID-19 • Resilience, Psychological • Students, Public Health • Emotions**

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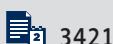
Background

Academic stress generally induces psychological reactions, such as anxiety, anger, depression, and confusion among middle school students, and these reactions may have been exacerbated in the face of the COVID-19 pandemic. Middle school students do not have fully stabilized emotional development, and thus these students are vulnerable to psychological distress when learning efficiency is impaired due to a lack of learning skill [1]. In addition, it has been shown that negative life events have an impact on the academic achievement of middle school students [2].

Adolescent psychological research in the context of the Wenchuan earthquake found that emotional resilience mediated the relationship between negative life events and depressive symptoms, suggesting that it can protect adolescents by mitigating the effects of negative life events [3]. When individuals face stressful events, positive emotions can enhance their coping ability and thereby improve their psychological resilience, which enables them to effectively cope with the events and promotes physical and mental health [4]. Furthermore, Ong et al. [5] found that positive emotional experiences can help highly resilient individuals to effectively recover from stress.

Emotional resilience, defined as the ability to generate positive emotions and recover quickly from negative emotional experiences, is an important component of psychological resilience. It has 2 basic elements: the ability to generate positive emotions when facing negative emotional stimuli and the ability to recover from negative emotional experiences [6,7]. Emotional resilience is more likely to lead to emotionally directed coping, which is related to the individual's emotional efforts in stressful situations. This adaptive mechanism restores and maintains normal emotional levels in the face of major events. Through interaction between the individual and the environment, adaptation can occur. Emotional resilience has a substantial impact on the individual's mental health and social adaptation. Differences in emotional resilience may lead to individual differences in emotional responses, which in turn affect cognitive processing of emotional information [8].

Learning management skills are an important part of learning ability and represent a necessary component of students' academic success. Learning skills are an important content of students' psychological evaluation, and it is the specific application of psychological evaluation in the field of education, and gives a quantitative explanation [1]. During the COVID-19 pandemic, school closures required a change in learning style to online classroom. Focusing on learning management during this time period could help to improve learning efficiency, which might otherwise suffer from a huge increase in students'

complaints and stress. A study of the relationship between stress and academic achievement in Chinese youth over the past 2 decades has shown that stressful life events are negative predictors of academic achievement [9]. Students need a sense of security to truly engage in the learning process. Psychologist Urie Bronfenbrenner's Ecosystems Theory states that every individual is part of the environmental system in which they live. Whether an individual can form a positive interactive relationship with their environment directly affects that person's living conditions [10].

To cope with COVID-19 pandemic prevention and control, the Ministry of Education of China issued instructions for implementing, "School is out, but class is on" (i.e., "Stop classes but don't stop learning") during the 2020 spring semester. Schools at every level actively and swiftly launched large-scale online teaching to ensure that students would "study at home effectively" [11]. Students were forced to stay at home and faced new study pressures, such as changes in environment and teaching styles, as well as a lack of guidance on learning strategies and interpersonal relationships. The situation potentially led middle school students to be more prone to intense emotional fluctuations and to experience increased family interpersonal relationship pain. As a consequence, middle school students may differentiate once normal school life resumes, with some becoming better and achieving strong self-regulation and healthy growth, while others experience more negative emotions and encounter difficulty learning.

This study explored the emotional resilience of middle school students from February 10, 2020, to March 22, 2020, during an ongoing pandemic and assessed its influence on students' learning management skills. The results provide information for improving mental health in middle school students, both through psychological self-improvement and improved mental health education.

Material and Methods

Ethics

All participants provided signed informed consent to participate in the study. The Jiangsu Zhenjiang Experiment school of Ethics Committee approved the study procedures (Approval number: 2020002).

Participants

The data used for the current analyses came from seventh and eighth grade students at a middle school in Jiangsu Province. All 910 questionnaires distributed were returned for a recovery rate of 100%. Among the collected questionnaires, 16 had

Table 1. Adolescents' emotional resilience questionnaire (in Chinese).

1. When I'm in a bad mood, I can think of something happy.
2. Criticism from others will make me sad for a long time.
3. No matter what difficulties I meet, I can keep a good mood.
4. My mood is not easily disturbed by the outside world.
5. Unhappy things will make me upset for a long time.
6. I can adjust my negative emotions in a short time.
7. Unpleasant events during the day often keep me awake at night.
8. In the face of stress or frustration, I can find my own comfort.
9. No matter how bad I feel, I can always look on the bright side.
10. I feel bad when people misunderstand me.
11. It is hard for me to calm down after an argument.

The ability to generate positive emotions: 1, 3, 4, 8, 9. The ability to recover from negative emotional experiences: 2*, 5*, 6, 7*, 10*, 11* (* reverse scoring).

regular rhythmic or incomplete responses; these were regarded as invalid and excluded. Thus, we had 896 valid questionnaires, for an effective recovery rate of 98.46%. Participants were 12–14 years old (mean±standard deviation [SD] given for this and all subsequent values; 12.50±0.923); 451 were seventh graders and 445 were eighth graders.

Adolescents' emotional resilience questionnaire

"The development of adolescents' emotional resilience questionnaire" was published in Chinese [8]. The emotional resilience scale is a self-reported measure with 11 items that is suitable for individuals aged 11–20 years (Table 1). It is divided into 2 dimensions: the ability to generate positive emotions and the ability to recover quickly from negative emotional experiences. The former includes 5 questions. The latter includes 6 topics, 5 of which are reverse scoring.

In the context of the special situation during COVID-19, students were asked to rate their agreement with each item on a 5-point Likert-type scale in this study: 5 points for full compliance, 4 points for some compliance, generally 3 points, 2 points for some disagreement, and 1 point for complete disagreement. The total score of emotional resilience is the sum of the scores of the 2 dimensions. The higher the overall score is, the higher the resilience of the individual has; that is, the stronger the positive emotional ability and emotional recovery ability are. The Cronbach's alpha for internal consistency of this questionnaire was previously determined to be 0.833.

Learning management skill questionnaire

"Middle school student learning skill evaluation questionnaire" [1] accurately measures and evaluates students' learning skill level, including meta-cognitive skill, cognitive process skill, learning process skill, and learning management skill. Each part can be used individually. The learning management skill questionnaire, which contains 30 items assessed, was used to measure learning ability. This self-scoring questionnaire covers the 3 dimensions: time management, environment management, and resource management. Among them, time management has 10 topics, 2 of which are reverse scored; environmental management has 11 topics, 4 of which are reverse scored; and resource management has 9 topics. Each item is rated on a 5-point Likert scale: 5 points for full compliance, 4 points for some compliance, generally 3 points, 2 points for some disagreement, and 1 point for complete disagreement. The reverse question scores are reversed. The higher the total score is, the stronger the learning and management skills are. The Cronbach's alpha for internal consistency of this questionnaire was previously determined to be 0.821.

Statistical analysis

The statistical software package SPSS 20.0 was used to analyze the data. Data are presented as the mean±SD. The independent samples t test was used to compare means of the seventh and eighth grade student samples and the mean scores of the emotional resilience scales of middle school students. The correlation between emotional resilience and learning management skills scores was investigated by linear regression. The level of significance for the independent samples t test and correlation test by linear regression was $P < 0.05$. To ensure that the results of this study had strong validity, the reliability test of Cronbach's α coefficient of emotional resilience scale and learning management skills questionnaire survey were 0.835 and 0.94.

Table 2. Differences in emotional resilience, dimensions, and learning management skills by grade.

	Seventh grade (N=451)	Eighth grade (N=445)	t	p-value
	Mean±SD	Mean±SD		
Emotional resilience	37.53±7.7	36.57±6.78	1.98	.048
Ability to generate positive emotions	18.53±4.21	18.49±3.87	0.098	.922
Ability to recover from negative emotional experiences	19.01±4.68	18.07±4.35	3.12	.002
Learning management skills	112.16±18.39	111.30±17.75	0.71	.475

SD – standard deviation.

Results

Learning management skill, emotional resilience, and various dimensions of middle school students in a pandemic stress environment

The primary outcome was the emotional resilience situation of middle school students. The total score of emotional resilience was 55 points, with an average value of 37.06±7.27, and middle school students were at the upper middle level on average. Among them, the maximum value of positive emotional ability was 25 points, the minimum value was 5 points, and the average value was 18.51±4.05. The maximum value of emotional recovery ability was 30 points, the minimum value was 6 points, and the average value was 18.54±4.54.

The total score for learning management skill was 150 points, the maximum value was 148 points, the minimum value was 58 points, and the average value was 111.74±18.07, which was in the upper middle level. The maximum value of time management was 50 points, the minimum value was 13 points, and the average value was 36.83±7.20. The maximum value of environmental management skill was 55 points, the minimum value was 18 points, and the average value was 41.91±6.57. The maximum value for resource management was 45, the minimum value was 13, and the average value was 33.0±6.46.

We further compared the differences in emotional resilience and learning management skill between the grades (Table 2).

The learning management skill score was not significantly different between seventh and eighth graders (112.16±18.39 and 111.30±17.75, respectively). Further exploration of differences between grades for each skill category revealed no significant differences between grades in the dimensions of time management (seventh grade, 37.01±7.31; eighth grade, 36.63±7.08), environmental management (seventh grade, 42.21±6.70; eighth grade, 41.60±6.42), or resource management (seventh grade, 32.93±6.60; eighth grade, 33.06±6.31).

Table 2 shows that the average value for emotional elasticity of the seventh grade students (37.53±7.7) was higher than the average value for emotional elasticity of the eighth grade students (36.57±6.78), and there was a significant difference between the grades ($P<0.05$). Further examination of the 2 dimensions reveals no significant difference in the positive emotional ability dimension between grades, although there was a very significant difference in emotional recovery ability ($P<0.01$).

Comparison of the difference between high scores and low scores in learning management skill

Emotional resilience not only reflects individual differences of middle school students in the face of emotional stimuli, but also reflects the differences in their responses after experiencing emotional stimuli. This factor plays an important role in whether middle school students cope with a major negative emotional event when adapting to a current environment. We selected the 27% of subjects with the highest emotional elasticity scores as the high-scoring group and the 27% with the lowest emotional elasticity scores as the low-scoring group to examine the impact of emotional elasticity on the learning management skills of middle school students.

Table 3 shows that the low- and high-scoring groups had extremely significant differences in learning management skills ($t=-14.69$, $P<0.001$). Further investigation revealed that the various dimensions of learning management technology were associated with significant differences in time management, environmental management, and resource management ($P<0.001$). Extremely significant differences existed between the high- and low-scoring groups for ability to recover from negative emotional experiences ($t=-7.22$, $P<0.001$), and there were significant differences in time management, environmental management, and resource management, respectively ($P<0.001$). There were extremely significant differences between the high- and low-scoring groups for positive emotional ability ($t=-18.83$, $P<0.001$), with significant differences also observed for time management, environmental management, and resource management ($P<0.001$).

Table 3. Independent samples *t* test of emotional resilience and high-score and low-score groups of various dimensions in learning management skills.

Group	Mean±SD	t	P-value
Ability to generate positive emotions			
Low-score, N=291	99.14±14.4	−18.83	000
High-score, N=281	123.71±16.74		
Ability to recover from negative emotional experiences			
Low-score, N=281	108.41±17.93	−7.22	000
High-score, N=268	119.00±16.35		
Emotional resilience			
Low-score, N=274	101.16±16.14	−14.69	000
High-score, N=266	122.23±17.16		

SD – standard deviation.

Table 4. Correlation between learning management skills and emotional resilience and its dimensions.

	1	2	3	4	5	6	7
Emotional resilience	1						
Ability to generate positive emotions	.827**	1					
Ability to recover from negative emotional experiences	.866**	.436*	1				
Learning management skills	.498**	.577*	.284**	1			
Time management	.435**	.499*	.253**	.908**	1		
Environment management	.480**	.521*	.306**	.862**	.643**	1	
Resource management	.420**	.529*	.202**	.911**	.771**	.678**	1

* *P*<0.05; ** *P*<0.01.

Learning management skill represented the largest difference between the high- and low-scoring groups for positive emotional ability, and these groups differed significantly (*P*<0.001; Table 3). This finding implies positive emotional ability may allow students to better adapt to learning management skill.

The correlation between emotional resilience and learning management skill in middle school students

Table 4 shows that t the coefficient of correlation value is 0.498, which is significant at 0.01 level of significance. Therefore, it can be concluded that a significant positive relationship exists between emotional resilience and learning management skills. An in-depth examination of the relationships between various dimensions revealed that emotional resilience was positively correlated with time management (*r*=0.435, *P*<0.01), positively correlated with environmental management (*r*=0.480, *P*<0.01), and positively correlated with resource management (*r*=0.420, *P*<0.01). Among these, the positive emotion ability dimension had a significant positive correlation with learning

management skills (*r*=0.577, *P*<0.05), and it reached a moderate correlation (0.4≤ *r*≤0.70) [12,13]. It had a low correlation with recovery from negative emotions (*r*=0.284, *P*<0.01).

We further used the method of regression analysis [13], with positive emotional ability and negative emotional recovery ability as predictors and learning management as effect variables. The results of the regression analyses for the effects of learning management skills on predictability are summarized in Table 5.

The regression results (Table 5) show that the ability to generate positive emotions and the ability to recover from negative emotional experiences can explain 33.3% of the variation. The ability to generate positive emotions was strongly associated with learning management skills (*P*<0.001), which means that only positive emotion had a high explanatory power for learning management skills.

Table 5. Variables predictive for learning management skills by regression analysis.

Dependent variable	Model	B	SE	Beta	t
LMS	Constant	62.48	2.58		24.203***
	ARNEE	0.16	0.121	0.040	1.324 n.s.
	AGPE	2.50	0.136	0.559	18.44***
r=0.578; R^2=0.334; adjusted R^2=0.333; F=224.103***					

n.s. – not significant (P>0.05) [13]. *** P<0.001. Predictable variable (constant): AGPE – the ability to generate positive emotions; ARNEE – the ability to recover from negative emotional experiences. Dependent variable: LMS – learning management skills; SE – standard error.

Discussion

Analysis of emotional resilience of middle school students

Zhang and Lu [8] investigated the emotional resilience of middle school students under normal learning conditions and found that the average emotional resilience of seventh grade students was lower than that of eighth grade students; however, the difference was not significant. Among them, the seventh grade of emotional recovery ability is lower than the eighth grade, and there is no grade difference; while the seventh grade of positive emotional ability is higher than the eighth grade. Under normal conditions, the positive emotional ability of middle school students showed a gradual downward trend from the lower grade to the higher grade [8]. This conclusion is consistent with that of Chen's [14] situational simulation of major negative events; specifically, seventh grade emotional elasticity was higher than eighth grade emotional elasticity, and emotional resilience showed a downward trend as the grade increases. This may be mainly because the seventh grade students have just moved from elementary school to middle school, and they face little learning pressure, making their emotional recovery ability stronger. The eighth grade is a period of rapid development and change in the middle school stage. After more than a year of study, friendships with classmates have been established, and academic performance has also undergone major differentiation. Eighth grade students can feel pressure due to different stressors such as academic demands, health, loss of a friend, and so forth. The learning skills and emotional strategies of eighth graders gradually become individualized, which deeply affects their emotional and cognitive development.

Impact of emotional resilience of middle school students on learning management skills during the COVID-19 pandemic

No significant differences in learning management skills and the various components were present between grades. The majority of seventh and eighth graders are 12 and 13 years old, and

their cognitive level is basically at the same stage, which is in line with Piaget's theory of cognitive development. The average learning management skill score of 12-year-old students was 112.17, which was higher than the national norm (103.05). The average value for learning management skill for 13-year-old middle school students was 111.30, which was also higher than the national norm (102.95). Based on seventh graders scoring lower than eighth graders only for resource management skill, seventh graders' ability to use resources is still relatively lacking.

Emotional resilience has a significant effect on the attention bias effect generated during the processing of negative emotional information in adolescents. Adolescents with low emotional resilience have a more obvious negative attention bias [8]. In-depth analysis of the impact of emotional resilience on learning management skills revealed that 2 dimensions of emotional resilience had an impact on the learning management skills of middle school students: the ability to recover from negative emotions was very significantly associated with learning management skills, and positive emotional ability was related to learning management skills. A higher degree correlation indicates that positive emotional ability has a greater impact on learning management skills. Our regression analysis also found that positive emotions had a predictive effect on learning management skills. However, the ability to recover from negative emotional experiences of independent variables have no difference relationship on dependent variables (P>0.05). Therefore, the results show that the independent variable of the ability of positive emotions was a significant source of prediction. This finding shows that at the middle school stage, strengthening the cultivation of positive emotions is necessary because it has an important predictive effect on learning management. The higher the level of emotional resilience, the more quickly an individual can use learning and management skills and demonstrate stronger adaptability.

Implications and recommendations

First of all, infectious disease outbreaks such as COVID-19, as well as other public health events, can cause emotional distress

and anxiety [15]. Fear seems to be a certain consequence of mass quarantine [16], and China quickly established a psychological assistance system in the context of the COVID-19 pandemic [17]. This system reflected that we must not only do a good job of prevention, control, and publicity, but also develop "education for fun," online classroom teaching for young people, and actively carry out psychological intervention and counseling. For example, we can improve dissemination of virus prevention information; control knowledge to avoid excessive panic, extreme emotions, and behaviors; open a psychological hotline; strengthen psychological intervention; and resolve negative emotions in a timely manner to create a good social environment (especially family environment) to help middle school students strengthen their environmental management capabilities and quickly recover from negative emotional experiences.

Second, apart from the obvious disruption to learning, school closures are likely to have other far-reaching negative effects. Measures are needed to support a return to normalcy and resilient learning so that children and their teachers are better prepared to address not only the impact of COVID-19 but any future threats [18]. Simple strategies that can address these goals can include giving young people the love and attention that they need to resolve their fears [19]. Teachers' and parents' efforts for strengthening emotional resilience, especially positive emotional ability, in middle school students are crucial. Severe negative events may cause unhealthy mental states such as lost interest in study and anxiety or depression in middle school students. Negative emotions compromise physical, mental, and emotional well-being, which requires resilience [20]. Cultivating emotional resilience should be carried out through learning and exercise, maintaining optimism, and improving learning efficiency. For example, teaching self-help methods, such as relaxation and how to change negative thinking, strengthen self-control ability, change irrational beliefs, maintain a sense of humor, create a harmonious atmosphere, and so forth, can convert potentially adverse events into favorable events. This process can improve emotional resilience and reduce the negative impact on students. For individuals with extremely low emotional resilience, contacting parents to strengthen psychological support and provide targeted individualized counseling is warranted.

Finally, online teaching can be used to strengthen the environmental management ability of middle school students and improve their emotional resilience. For example, while completing teaching tasks, teachers should listen to their students' feelings. They could also use group counseling to guide middle school students in strengthening their environmental management, learning to identify reliable information, using excellent learning resources, avoiding spam, avoiding procrastination, and preventing internet addiction. Using diverse and engaging teaching methods will improve academic achievement, promote emotional resilience to improve students' emotional quality, and promote comprehensive development.

The limitations of this study were its short duration, conducted between January and March 2020. In addition, we did not take into account academic performance and other factors that may have confounded the outcomes, such as internet addiction via online courses and lack of family support, which are commonly considered to be associated with negative emotion. In addition, we only divided the students into seventh grade and eighth grade groups according to their situation, and we did not analyze other variables. The strength of the study lies with data being collected from middle students during the early stage of the COVID-19 pandemic. The results are significant for the study of emotional resilience and mental health. Future studies should delve deeper into those issues and timely intervention for cultivating students' positive emotions and thus enhancing their resilience.

Conclusions

Under the influence of the COVID-19 pandemic, emotional resilience differed significantly between seventh and eighth graders. We show a significant difference in the ability to recover from negative emotional experiences. We found a significant correlation between emotional resilience and learning management skills, which indicates that individuals with high emotional resilience can recover from negative emotions faster, which is important for mental health; actively pursue academic achievements and success; and show better adaptation and healthy psychology. Regression analysis found that positive emotions had a strong predictive effect on learning management skills. We conclude that cultivating positive emotions can improve learning efficiency.

Conflict of interests

None.

CLINICAL RESEARCH

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