

Development and Validation of a COVID-19 Mindset and Cognition Scale for University Students

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Date: 2022-10-18T00:00:00+00:00

Abstract

The pandemic has brought tremendous impact to human society as a whole, and has profoundly affected contemporary college students. Since the outbreak of COVID-19, the lives of college students have undergone tremendous changes. Under the pandemic, continuous policy adjustments and measures such as campus lockdowns have restricted college students' social interactions and leisure activities, resulting in emotional fluctuations. Traditional scales cannot fully capture the fluctuating and recurrent emotions that oscillate between highs and lows in this complex emotional response. College students represent both a key focus and a challenging aspect of pandemic prevention and control. Current research on college students' pandemic-related mental state cognition and its impacts is lacking, resulting in a lack of targeted approaches for pandemic prevention and control within this group. College students live in a communal setting, and their mental states possess social and collective attributes; their formation and transformation involve multiple factors. It is not a simple accumulation or mechanical superposition of individual mental states. The Depression Anxiety Stress Scales (DASS) tends to focus on measuring severe negative emotions and cannot fully express the "positive" mindset when the pandemic situation improves. Both the Symptom Checklist-90 (SCL-90) and the Self-Rating Depression Scale (SDS) tend to focus on individual measurement rather than research on public risk perception and psychological behaviors. There is a lack of measurement methods for college students' pandemic-related mental state cognition. Through research, we have developed and validated a Mental State Cognition Scale under COVID-19. This research holds positive significance for understanding college students' pandemic-related mental state cognition. Accurately grasping college students' pandemic-related mental state cognition facilitates scientific pandemic prevention and control, and contributes to winning the battle against the pandemic.

Full Text

Development and Validation of the Mental Cognition Scale for College Students During the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has profoundly impacted human society and deeply affected contemporary college students, whose campus lives have undergone tremendous changes. Continuous policy adjustments and campus lockdowns have restricted students' social interactions and leisure activities, leading to emotional fluctuations that traditional scales fail to capture fully. College students represent both a priority and a challenge for pandemic prevention and control. Currently, research on college students' pandemic-related mental cognition and its impacts remains insufficient, resulting in a lack of targeted prevention strategies for this population. As college students live in collective settings, their mental states possess social and group attributes shaped by multiple factors—not merely the simple accumulation of individual mindsets. Instruments such as the Depression Anxiety Stress Scales (DASS) tend to measure severe negative emotions and cannot adequately capture “positive” attitudes when the pandemic situation improves. Similarly, the SCL-90 (Symptom Checklist-90) and SDS (Depression Status Scale) focus on individual pathology rather than public risk perception and psychological behavior. To address this measurement gap, we developed and validated a mental cognition scale specifically for college students during COVID-19. This research holds significant implications for understanding college students' pandemic mental cognition, enabling scientific pandemic prevention and control efforts, and contributing to the broader fight against the pandemic.

Keywords: COVID-19 pandemic; mental cognition; psychological measurement; reliability and validity testing

1. Introduction

The COVID-19 pandemic represents an unprecedented public health crisis with long duration, high infection rates, and profound global impact, exerting far-reaching psychological effects on college students. University life marks a critical transitional and developmental period for individuals, yet it is also a stage when psychological and behavioral problems frequently emerge. Since the outbreak

in December 2019, Chinese universities have implemented active prevention and control measures, including organized vaccination campaigns, nucleic acid testing, travel code verification, restricted campus access, and closed-campus management. Compared to other student groups, college students exhibit characteristics of high concentration, youthfulness, and greater susceptibility to control measures. Primarily residing in dormitories, they experience high population density, which has led to cluster infections on campuses, such as those at Jilin Agricultural Science and Technology College and Shanghai University in 2022. Predominantly aged 18-22, college students value freedom and desire social connection. Under campus control measures, their sense of relative deprivation stems from comparisons with pre-pandemic campus life, other groups facing looser restrictions (e.g., faculty, staff, or students at other universities), and their idealized vision of university life. As a strictly managed group, these comparisons with previous campus policies and off-campus measures can easily generate relative deprivation, subsequently affecting their emotional states.

On March 11, 2020, the WHO declared COVID-19 a global pandemic, creating a worldwide public health crisis. In December 2019, China's Ministry of Education, National Health Commission, and ten other ministries jointly issued the "Healthy China Action—Adolescent Mental Health Action Plan," which prioritized the prevention of student psychological problems. The pandemic has introduced numerous uncertainties that have impacted college students' mental states to varying degrees. The healthy development of college students is vital to the future of the Party and the nation, making it essential to accurately grasp their mental cognition. As a discipline, psychology studies universal human patterns, emphasizing individual characteristics more than fields like sociology. Investigating college students' mental cognition during COVID-19 under these special circumstances holds significant importance.

Internationally, AMIR.H.PAKPOUR and colleagues developed the Fear of COVID-19 Scale (FCV-19S), demonstrating that pandemic-related "fear" has become a research focus and confirming that fear was widespread among the public during the COVID-19 outbreak. We consulted two applied psychology experts and multiple doctoral and master's students in the field, and based on their feedback, identified "uncertainty" as a key dimension. Michael Ryan, Executive Director of the WHO Health Emergencies Programme, stated that the Chinese government implemented very strong measures to suppress transmission during the pandemic, resulting in very low incidence, mortality, and hospitalization rates, allowing society and the economy to continue functioning during the crisis (Michael Ryan, 2022). Protective behavioral tendency constitutes an important component of domestic pandemic mental cognition and represents a crucial aspect of studying college students' mental cognition during COVID-19. Active pandemic response reflects a people-centered, scientific, and pragmatic Chinese approach, characterized by rapid response, timely management, precise testing, and dynamic zero-COVID policies grounded in scientific prevention and targeted measures. Research indicates that human behavior is influenced by multiple levels of natural

and social environments, with the most effective behavioral change achieved through multi-level interventions (Yuan Shijing, 2021). Building upon the international development of the FCV-19S, we retained fear-related items and, through interviews and expert consultation, added items related to “protective behavioral tendency” and “positivity.” The combined measurement of these three dimensions provides a more comprehensive understanding of domestic college students’ pandemic mental cognition.

2. Methods

This study followed standardized procedures for psychological scale development, integrating qualitative and quantitative research methods:

1. **Literature Review:** We conducted comprehensive literature research and online searches to identify current research status and content, thereby establishing our research focus.
2. **Interviews:** Following the literature review, we conducted open-ended interviews to collect college students’ understanding of the pandemic. Through analysis and communication with interviewees, we established the foundational content for our scale.
3. **Expert Consultation:** We consulted applied psychology researchers from the Institute of Psychology, Chinese Academy of Sciences, and applied psychology experts from Beijing Forestry University. Based on their suggestions, we revised the scale through additions and deletions.
4. **Statistical Analysis:** We conducted multiple analyses on the questionnaire data to examine the psychometric properties of the College Students’ COVID-19 Mental Cognition Scale, ensuring its broad applicability in practical measurement.

Following literature review, student interviews, and statistical analysis, we completed the initial version of the scale. Although this version met reliability and validity requirements, room for improvement remained. With assistance from experts at the Institute of Psychology, Chinese Academy of Sciences and Beijing Forestry University, we further revised the questionnaire by removing ambiguous or similar items, eliminating items with cross-loadings, and deleting items with excessive loadings on two factors, ultimately producing the revised scale. The revised scale comprises three dimensions: protective behavioral tendency, uncertainty, and positivity. Protective behavioral tendency refers to individuals’ intention to engage in self-protective behaviors to reduce potential health damage from the pandemic. Uncertainty refers to a cognitive state arising when an individual lacks information or faces information overload about an event or situation, creating conflict and preventing appropriate categorization or organization. In this study, uncertainty specifically denotes the subjective feelings and reactions generated when individuals cannot make reasonable judgments about the pandemic. Positivity refers to maintaining active behavior rather than “lying

flat,” holding aspirations, and demonstrating relatively positive actions during the pandemic.

The College Students’ COVID-19 Mental Cognition Scale items were administered via Wenjuanxing, targeting primarily college students in Dalian, with participants mainly from Dalian Vocational & Technical College and Dalian University of Technology. The survey was launched on March 14, 2020, yielding 518 valid responses.

3. Reliability Analysis of the College Students’ COVID-19 Mental Cognition Scale

As shown in Table 1, the Cronbach’s Alpha values for all variables and dimensions exceeded 0.800, indicating that the reliability coefficients for all variables and their measurement dimensions fall within acceptable ranges. This demonstrates high internal consistency and stability of the questionnaire, permitting further analysis.

4. Validity Analysis

We conducted factor analysis on the sample data to examine the KMO coefficient and Bartlett’s test of sphericity. The KMO value was 0.841 (greater than 0.8) and the significance level was 0.000 (less than 0.05), indicating that the scale was suitable for factor analysis.

Using principal component analysis, we extracted three factors with a cumulative total variance explanation of 72.510%, demonstrating good structural validity and strong explanatory power. Communality values ranged between 0.500 and 0.900, indicating that the extracted common factors could explain most of the variance in the measured variables. Through this analysis and exploration based on item semantics and factor loadings, we retained thirteen items, yielding a three-factor model presented in Table 2.

Confirmatory factor analysis was performed on the scale (Figure 1 [Figure 1: see original paper]). Table 3 presents the model fit indices for the revised model, showing that CMIN/df, TLI, NFI, IFI, CFI, and RMSEA values all met ideal criteria, indicating good model fit.

Table 4 presents the convergent validity test results. Confirmatory factor analysis was used to examine the internal consistency among observed variables belonging to each latent variable. Adequate composite reliability indicates high consistency among observed variables under each latent variable. In our measurement model, factor loadings for all thirteen items ranged between 0.5 and 0.95, meeting the criteria. Composite reliability values were 0.905, 0.850, and 0.897 (all greater than 0.6), and average variance extracted (AVE) values were 0.619, 0.658, and 0.688 (all greater than 0.5). Therefore, the model demonstrates good convergent validity. Since no further dimensions were delineated under each variable, discriminant validity testing was not required. Thus, the

scale exhibits good construct validity. The final items are presented in Table 5 :

Table 5. College Students' COVID-19 Mental Cognition Scale

- **Protective Behavioral Tendency (4 items: A2, A3, A4, A5):**
 - I reduced outdoor activities during the pandemic
 - I wore masks when going out during the pandemic
 - I advised family members to wear masks during the pandemic
 - I washed hands frequently and disinfected regularly during the pandemic
- **Uncertainty (6 items: B2, B9, B10, B12, B14, B16):**
 - I constantly compared myself with pneumonia symptoms
 - I felt I might collapse at any moment
 - I felt helpless about this pandemic
 - I kept thinking the pandemic would spiral out of control
 - I felt very pessimistic about the future development of the pandemic
 - I felt threatened when strangers approached me
- **Positivity (3 items):**
 - I maintained exercise throughout the pandemic
 - I focused on doing things I had always wanted to do during the pandemic
 - I cultivated my interests during the pandemic

5. Discussion

This study initially employed questionnaires, establishing the scale design framework through literature review, interviews, expert consultation, and statistical analysis. As the saying goes, “When youth flourish, the nation flourishes; when youth are strong, the nation is strong.” College students represent the hope of the nation and the future of the motherland. In 2005, Comrade Xi Jinping delivered a thematic report titled “Discussing Life with College Students” focusing on “Ideals, Values, and Humanistic Spirit,” emphasizing: “I hope students will cherish campus life and learning, study hard, conduct themselves properly, and truly become useful members of society and qualified talents for socialist construction” (Xi Jinping, 2005). During scale development, we reviewed literature, consulted experts, and interviewed current college students to compile and validate the scale. Through screening, we reduced the scale from 34 items to the final 13 items, which passed all validity tests. The three-factor structure received theoretical support.

Regarding college students' protective behavioral tendency during the pandemic, domestic researchers suggest that while college students possess general prevention awareness and good living habits, significant room for improvement remains in cognition, attitude, and behavior (Huang Yongzhen et al., 2020). As college students live in collective settings, collectivism positively predicts pandemic prevention behaviors (Huang Feng, 2020). Therefore, examining group

living contexts is essential for understanding college students' pandemic-related concerns.

Concerning college students' uncertainty during the pandemic, numerous domestic studies demonstrate that the pandemic induces psychological uncertainty. Research defines uncertainty as the degree of ignorance about environmental states—simply not knowing what will happen next (Ma Zhiyan, 2021). Experts argue that today's world exists in a state of uncertainty, with the pandemic's repeated outbreaks further intensifying social instability (He Donghang, 2022). Others note that disease, particularly life-threatening illness, often accompanies uncertainty (Zhang Kun, 2012). Studies show that over 50% of people experienced anxiety and fear during the pandemic (Jian Yingmei, 2020). Negative emotional responses such as fear, anxiety, and depression, along with maladaptive cognitive and behavioral reactions, not only affect the fight against COVID-19 but may also cause post-traumatic stress disorder (PTSD) among the public (Ma Cui, 2020). Specifically, 77.5% of students exhibited mild psychological stress symptoms, while 17.3% showed moderate symptoms (Guo Peipei, 2021). In 2022, the WHO introduced the concept of “pandemic fatigue,” referring to adverse reactions to long-term pandemic control measures, including exhaustion, hopelessness about the future, anxiety, and loneliness. Researcher Zhang Kan from the Institute of Psychology, Chinese Academy of Sciences, noted that during major emergencies, approximately 15% of people experience no psychological problems, while 5% have pre-existing psychological disorders. Among the remaining 80%, about half are vulnerable to event-related psychological trauma, while the other half may develop trauma from prolonged exposure to negative information. During the pandemic, adolescents and children are particularly susceptible to psychological disorders and require special attention (Zhang Kan, 2022).

Regarding college students' positivity during the pandemic, researchers suggest that promoting individual positive qualities, recognizing and developing potential, and enhancing well-being are crucial (Seligman MEP, 2001). Positive psychology guides individuals toward self-happiness and social health, centering on well-being and fostering positive experiences (Duckworth AL, 2005). Positive emotions not only make life more fulfilling but also effectively strengthen immunity and enhance confidence in facing disease (Zhao Ya, 2020).

The pandemic has profoundly impacted human society and contemporary college students, who represent both a priority and challenge for prevention and control. Accurately understanding college students' pandemic mental cognition facilitates scientific prevention strategies. With prolonged and repeated outbreaks across multiple regions, college students' psychological states have gradually entered a period of fatigue. Current research deficiencies on college students' pandemic mental cognition and its impacts have resulted in a lack of targeted prevention methods. To address this measurement gap, we developed and validated a mental cognition scale for college students during COVID-19. This research holds positive significance for understanding college students' pan-

demic mental cognition and warrants further exploration of its applications. Accurate understanding of college students' mental cognition will enable scientific pandemic prevention and control, contributing to the ultimate victory over the pandemic.

6. Conclusion

The scale development process adhered to standard procedures for instrument construction. Based on theoretical foundations and general interpretations, we formed a three-dimensional structural hypothesis. Exploratory factor analysis yielded a three-factor structure consistent with our theoretical expectations. After validation and determination of the initial scale, we conducted multiple consultations with experts for item screening, followed by re-examination through exploratory factor analysis and reliability and validity testing. The three-factor structure aligned with theoretical predictions, resulting in the final revised scale. Therefore, the College Students' COVID-19 Mental Cognition Scale demonstrates rationality and effectiveness.

The establishment of this scale provides a theoretical foundation for future research. Theoretically, this study conceptualizes the construct of college students' COVID-19 mental cognition and develops a corresponding measurement instrument. Practically, the scale offers valuable reference for actual measurement of college students' pandemic mental cognition. As the first empirical study in China to develop a COVID-19 mental cognition measure specifically for college students, the findings warrant broader application.

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