

Review

Interventions in Chinese Undergraduate Students' Mental Health: Systematic Review

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Abstract

Background: Over 30% of university students from 8 countries were afflicted with mental distress according to a World Health Organization survey. Undergraduate students in increasing numbers in China have also been reported to suffer from different mental problems. Various psychological distresses significantly impact their academic and daily life, thereby causing role impairments and unsatisfactory academic achievements. While the prevalence of, diverse underlying factors for, and interventions of social support in college students' mental health have extensively been investigated in China, there is no study exclusively focusing on the impact of interventions on their psychological well-being.

Objective: The aim of this review was to identify and synthesize the interventions in the mental health concerns of Chinese undergraduate students studying in China reported in the literature to inform educational authorities, college and university management, students' affairs counselors, and mental health providers.

Methods: We performed a systematic review and reported the research findings of previous studies according to the protocol of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 statement. First, based on the predefined search strategy, keyword searches were performed in the PubMed and ProQuest databases to retrieve relevant studies. Subsequently, we screened the candidate articles based on predefined inclusion and exclusion criteria. Finally, we analyzed the included papers for qualitative synthesis.

Results: We retrieved a total of 675 studies from the PubMed and ProQuest databases using the search strategy on March 15, 2022. Among these candidate studies, 15 that were not written in English, 76 duplicates, and 149 studies of other document types were removed before screening. An additional 313 studies were excluded in the screening process, with 73 articles ruled out for being not relevant to interventions, not related to mental health, or not focused on undergraduate students in the full-text review. As a result, 49 papers were eligible and included in this systematic review. In the qualitative synthesis, we divided the interventions reported in the selected studies into two categories: (1) social support from government authorities, university authorities, students' affairs counselors and teachers, family members, health care authorities and professionals, and the media (various online platforms), and (2) various coping strategies adopted by undergraduate students themselves. We identified further research on mental health interventions that may be delivered by digital medical platforms, conversational agents (eg, chatbots), and researchers.

Conclusions: This was the first systematic review of interventions to address the mental health concerns of Chinese undergraduate students studying in China. The categorization of reported interventions and the identification of new intervention channels can

effectively inform stakeholders. Interventions for undergraduate students' mental health is a research topic worth further investigation.

(*Interact J Med Res* 2022;11(1):e38249) doi: [10.2196/38249](https://doi.org/10.2196/38249)

KEYWORDS

systematic review; intervention; mental health; depression; anxiety; stress; Chinese undergraduate students

Introduction

Background

Over 30% of university students from 8 countries were afflicted with mental distress according to a World Health Organization survey [1]. Undergraduate students in increasing numbers in China have also been reported to suffer from different mental problems [2], including depression, compulsion, anxiety, and interpersonal sensitivity [3-6]. Students experienced different degrees of depressive symptoms in different parts of China, with an incidence of 9.7% in Eastern and Western China, 11.7% in Harbin, 11.8% in 6 universities in Wuhan, 16.8% in Anhui, and 32.82% in Western Liaoning [7-11]. Transitioning from adolescence to adulthood while leaving home to attend colleges requires facing many challenges independently [12], which causes an increase in symptoms of depression, anxiety, and stress [13-15]. Various psychological distresses significantly impact the academic and daily lives of students, thereby causing role impairments and unsatisfactory academic achievements [16-18].

Given the prevalence of mental disorders in 28.4% of Chinese college students [19], studies have been performed to identify the various underlying contributing factors such as interpersonal relationships [6]; multiple factors from individuals, families, schools, and society [12]; gender and income [20,21]; academic stress and load, financial difficulty, departure from home, unstable family, and bullying on campus [3,4,22,23]; personal behaviors and social settings [24]; and lack of physical activities [25]. Pinpointing these factors contributing to college students' mental distress facilitates developing effective mental health interventions to reduce potential adverse impacts on their psychological well-being. Mental health promotion and prevention are needed to improve the mental health condition of college students who are especially vulnerable to pressure and other mental health issues [26], which will contribute to their overall well-being [27]. While the prevalence of, diverse underlying factors for, and interventions of social support in college students' mental health have been extensively investigated in China, there is no study exclusively addressing the interventions for their mental health concerns.

Interventions in the Literature

Social support has proven to be one of the most critical and effective interventions to mitigate mental health risks imposed on college students [28-30]. Social support is a form of mutual communication and connection network, including emotional support, instrumental support, and informational support [31]. Such support has been strongly associated with mental health among college students [32]. When obtaining robust social support from friends, family, and teachers, university students

had better mental health to sustain themselves against crises and stress [32]. Social support was proven to moderate the relationship between stress and depression [33]. High levels of social support could buffer mental health concerns [34].

Various therapies are also effective mental health interventions. Several therapies have showed effects on par with those of pharmacological treatment [35], including psychotherapy [36], interpersonal therapy [37], problem-solving therapy [38], supportive therapy [39], psychoeducation [40], and exercise/physical activity [41].

Universities have traditionally been providing mental health services in clinical settings, such as face-to-face individual or group-based consultations [42]. However, the available resources of many universities are too limited to support comprehensive approaches to students' mental health, and students are frequently unwilling to visit traditionally structured student counseling centers for help [42,43]. Therefore, it is necessary to identify effective mental health interventions that can be delivered to students in virtual settings and cover the spectrum of interventions from prevention to treatment [44].

Mowbray et al [44] developed internet-based interventions that were designed to promote mental health help-seeking, including a mental health literacy/digmatization intervention, a feedback intervention, and a help-seeking list intervention. Web-based depression and anxiety interventions have been confirmed to be effective for treating common mental disorders [45,46].

Objective

The aim of this review was to identify and synthesize the interventions addressing the mental health concerns of Chinese undergraduate students studying in China reported in the literature. The synthesized interventions are expected to inform stakeholders, including educational authorities, college and university management, students' affairs counselors, and mental health providers.

Methods

Study Design

To analyze and synthesize the interventions focused on the mental health of Chinese undergraduate students studying in China, we performed a systematic review and reported the research findings according to the protocol of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 statement [47]. We applied keyword searches to retrieve publications related to this research topic in two databases (PubMed and ProQuest), and screened the candidate articles based on the predefined inclusion and exclusion criteria. Finally, we analyzed the included papers for qualitative synthesis.

Search Strategy

We searched the PubMed and ProQuest databases to identify relevant studies. Based on the studies mentioned in the Introduction, we defined undergraduates' mental health concerns as issues related to depression, anxiety, stress, and disorder. Drawing on these keywords, we designed the following search strategy for this review: ((college student [Title/Abstract]) OR (university student [Title/Abstract]) OR (student [Title/Abstract])) AND ((digit* [Title/Abstract]) OR (online [Title/Abstract])) AND ((mental health [Title/Abstract]) OR (mental disorder [Title/Abstract]) OR (depression* [Title/Abstract]) OR (anxiety [Title/Abstract]) OR (disorder [Title/Abstract]) OR (stress [Title/Abstract])) AND (intervention) AND ((Chinese) OR (non-English) OR (Chinese-speaking)). Considering that many relevant articles were not published in peer-reviewed journals, we considered both peer-reviewed and nonpeer-reviewed articles in this systematic review. We did not impose any restrictions on the publication date of the candidate articles to retrieve all papers related to this topic. On March 15, 2022, we retrieved the candidate studies from the PubMed and ProQuest databases using the above search strategy. The keywords of the strategy were searched in the titles and abstracts of the candidate articles.

Study Selection Criteria

Papers that were not written in English were excluded because translation of the articles was not feasible or reliable. Additionally, we only included journal articles and excluded other article types (eg, review papers, letters, reports, and editorials).

This systematic review focused on the interventions in the mental health of Chinese undergraduate students in China. Therefore, the following criteria had to be satisfied in the selection of eligible papers: (1) the target population is undergraduate students; (2) the undergraduate students are Chinese who study in colleges and universities in China; and (3) the candidate articles need to be related to interventions for undergraduate students' mental health or mental disorder problems, including depression, anxiety, and stress. Articles that were focused on undergraduate students' mental health or mental disorder problems but involved no interventions, and those focused on interventions addressing the mental health or mental disorder problems of Chinese undergraduate students studying in countries other than China were excluded from this review.

Screening and Article Selection

We used Microsoft Excel to collect and manage the data of the candidate papers, including author, year of publication, country, target population (participants), study design/method, interventions, and limitations. The screening of the eligible studies was performed in the following two steps. First, two reviewers (YS and YC) reviewed the titles and abstracts of the candidate articles, excluding those that were not related to interventions addressing the mental health concerns of Chinese undergraduate students studying in China. Papers whose eligibility was unclear were retained for the full-text review. Second, six reviewers (YS, YC, XQ, RL, XW, and TL) reviewed the full texts of the remaining articles independently. Any controversies were resolved through discussing and consulting with two additional authors (MJ and WX) to make final decisions at the panel meeting of all members of the research team.

Data Extraction

We extracted data in light of our research objective to collect key information from eligible articles. The data extraction was performed by six researchers (YS, YC, XQ, RL, XW, and TL) independently, and reviewed and cross-checked by two researchers (MJ and WX). Any discrepancies were addressed through a consensus discussion at the panel meeting of all members of the research team.

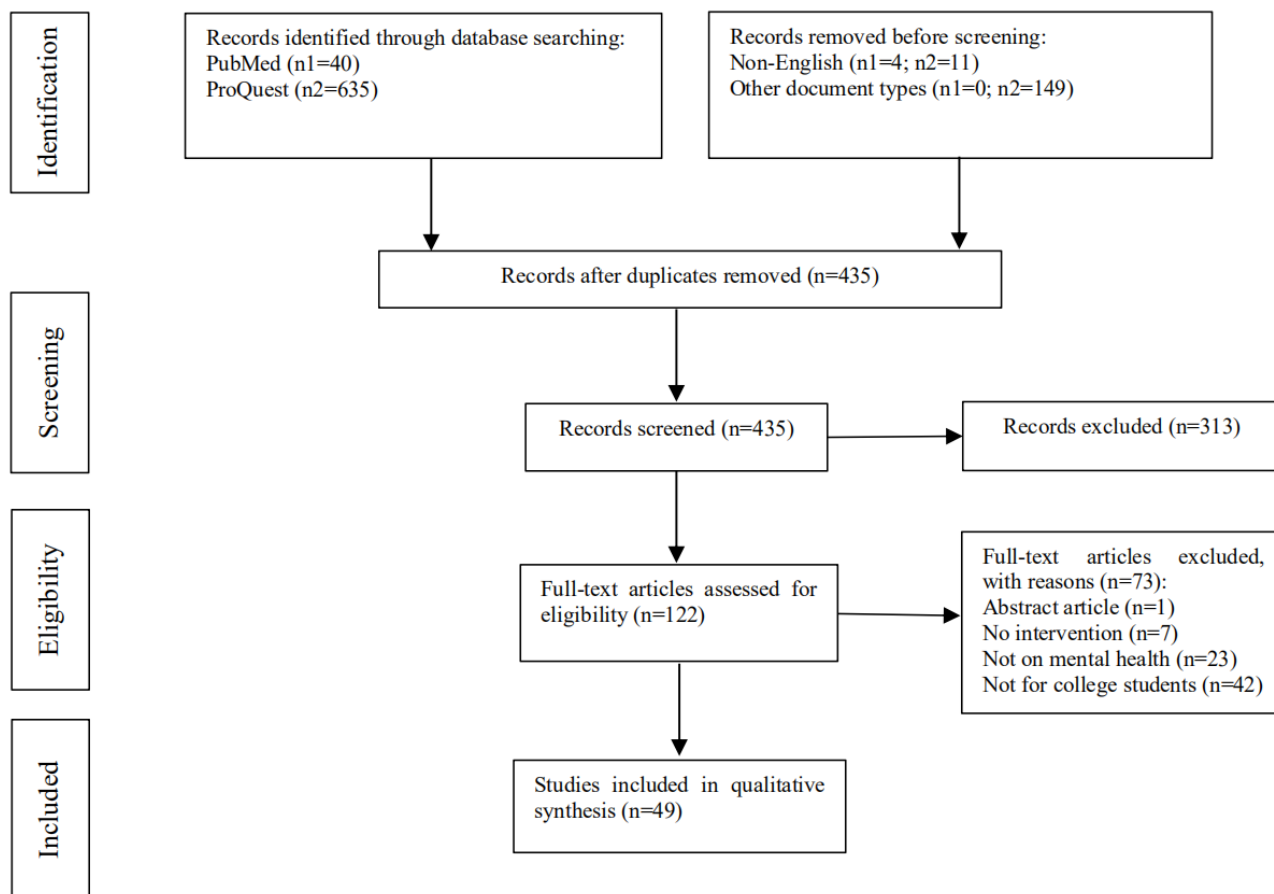
Data Analysis and Synthesis

It was not feasible to conduct a meta-analysis owing to the expected variety of study designs, mental health interventions, and study limitations. As such, a descriptive analysis was carried out to summarize the data extracted from the included papers.

Results

Search Results

We retrieved a total of 675 studies from the PubMed and ProQuest databases using the search strategy. Among these candidate studies, 15 that were not written in English, 76 duplicates, and 149 studies of other document types were removed before screening. An additional 313 studies were excluded in the screening process, with 73 articles ruled out for being not relevant to interventions, not related to mental health, or not including undergraduate students in the full-text review. As a result, 49 papers were deemed to be eligible and included in this systematic review. The PRISMA flowchart of the screening and reviewing processes is provided in [Figure 1](#).

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart of the selection of eligible studies.

Characteristics of Included Studies

The following items of the extracted data were obtained: publication information (name of authors, country, and publication year), target population (participants), study design (research methods), interventions, and limitations. Table S1 in [Multimedia Appendix 1](#) describes these characteristics of the 49 included studies.

Interventions in the mental health of Chinese undergraduate students studying in China have only recently attracted scholarly attention, as evidenced by the fact that all 49 included studies [2,12,26,48-93] were published between 2020 and 2022, including 11 (22%) published in 2020, 33 (67%) published in 2021, and 2 (4%) published in 2022. This indicates the worsening mental health condition of this particular population in recent years, especially in the context of the repeated resurgences of the COVID-19 pandemic, which increased the stress of college students and exposed them to new frustrating stressors that caused various mental health concerns [2]. Given college students' high stress and anxiety levels during the COVID-19 pandemic [88], 35 (71%) of the 49 studies [2,12,48,49,52-58,61-64,67-69,72-77,81-89,91,92] investigated the COVID-19-induced mental health concerns of Chinese undergraduate students and proposed specific interventions in response to the severity of the psychological impact of COVID-19 [87].

The included studies were primarily conducted as cross-sectional surveys via online questionnaires. The main limitation of these

studies is that self-reported online questionnaires are likely to result in a certain degree of recall bias and response bias due to the stigma attached to mental health conditions.

Undergraduates' Mental Health Concerns

In the 49 included studies, we identified the following forms of mental health concerns: depression, anxiety, stress, interpersonal sensitivity, fear, distress, psychological disorders, self-harm/suicidal, insomnia, obsessive interpersonal sensitivity, trauma, negative emotions, and insecurity.

Categorization of Mental Health Interventions

Overview

The interventions proposed in the included studies can be divided into two broad categories: social support and coping strategies. Social support was provided by government authorities [49,52-54,61,62,68,72,84,86-88]; university authorities [12,48,50,51,53-55,57-59,62,64,65,67,69,91,93]; students' affairs counselors and teachers [54,75,83-85,87,93]; family members [52,54,57,83,94]; health care authorities and professionals [52,63,66,75,77-79,87]; researchers [70,85]; and media-, internet-, and smartphone-based interventions [26,53,55,56,60,71,73,75,77,80,81]. Positive coping strategies were adopted by undergraduate students themselves [52,82,83,85,86,89,92,93]. In addition, negative coping strategies were also reported in a few studies [52,59,74,75,89]. All of the interventions are listed in [Table 1](#).

Table 1. Interventions reported in the 49 included studies.

Reference	Interventions, conclusions, and recommendations
Huang et al [2]	Active coping strategies helped improve their psychological well-being; family support was particularly important for maintaining mental health and ameliorating mental health challenges in this major health crisis; suitable psychointervention, routine screening for risk behaviors, and provision of further social support are needed for undergraduate students in the COVID-19 pandemic or other emergency public health events
Lei et al [12]	Universities should develop a care culture and environment that supports the life adjustment of college students, promotes cultural and sports activities, and facilitates the expansion of social networks; mental health education and psychological counseling services should be strengthened, including hotlines offering timely help to address students' urgent needs; early detection and effective management of mental health problems can effectively reduce serious mental health disorders
Mak et al [26]	Internet-based cognitive behavioral and mindfulness training programs are effective, which can be easily incorporated into existing service provision portfolios that promote mental health and reduce psychological distress to ultimately promote mental health among college students and young working adults
Yu et al [48]	Screening for ACEs ^a , and strength-based, trauma-informed interventions on fostering resilience are needed to promote mental well-being among Chinese young adults
Zhang et al [49]	In practical interventions, authorities (eg, governments and universities) should first focus on improving efficacy appraisal by providing psychological support to gain the trust of college students so that they believe in and comply with scientific prevention and control measures. By inviting psychiatrists to deliver lectures, authorities can reasonably and effectively enhance the public information of COVID-19-related knowledge and scientific prevention and control measures.
Shen et al [50]	It is important to address ADHD ^b symptoms among students with anxiety; it is of importance to screen medical students for anxiety disorders to better promote the mental health and well-being of this population and better prevent suicidal behaviors
Sze et al [51]	Given its associations with negative emotions and other aspects of health, screening and management of EE ^c may improve multiple areas of health and well-being
Zhao and Zhou [52]	It is critical for policymakers, public health agencies, parents, psychologists, and health care staff to remain sensitive to the potential negative consequences of ubiquitous social media exposure; the general public, especially those who have been directly or indirectly traumatized by COVID-19, could be advised to avoid excessive social media use and learn effective emotion regulation strategies (eg, reappraisal) to reduce negative emotions induced by news coverage
Yu et al [53]	The government can open free psychological hotline consultations to help college students solve their psychological problems; the media should release correct information in a timely manner and prevent the spread of rumors; universities can actively organize health education activities and encourage college students to arrange their time reasonably and take the initiative to find a suitable way to relieve stress during home quarantine
Li and Peng [54]	Adopting positive coping strategies may enhance social support that in turn relieves anxiety. The effect of social support, especially family and counselor support, can decrease anxiety in coping with the COVID-19 pandemic cognitively and behaviorally. Policymakers and school administrators should encourage meaningful communication between family members and activate effective counseling services to maintain positive mental health
Wang et al [55]	Reducing SNS ^d addiction and mental problems by conducting interventions using cognitive behavioral approaches; screening for and addressing excessive SNS use are needed to prevent SNS addiction and mental distress among young people.
Sit et al [56]	Evidence-based digital mental health interventions
Liang et al [57]	University campuses should develop and implement effective screening procedures to closely monitor students' exposure to stressors and mental health status; psychological intervention programs should be designed to address fear and fully utilize psychological assistance hotlines to help college students better adjust themselves; performing psychological help-seeking intervention, strengthening the dissemination of mental health knowledge, and improving the level of mental health perception are effective ways to improve help-seeking attitudes and increase the probability that college students will seek psychological help
Nurunnabiet al [58]	University authorities should be aware of students' coping strategies. In particular, students who live without parents or relatives should be taken care of properly during the outbreak. To help students cope with the mental pressure, university authorities may consider arranging or organizing programs such as an online experience-sharing competition, and encourage students by offering rewards or financial aids. Required food and health care materials should be supplied to ensure the students' safety
Wu et al [59]	Sleep hygiene, mobile phone and internet use hygiene, mental health education courses, professional psychological counseling, and other interventions should be considered and implemented. Appropriate interventions that target problematic smartphone use could potentially reduce anxiety and depression levels, which will in turn provide a buffer against the negative impact of poor sleep quality on eating disorder symptoms
Chen et al [60]	Web-based intervention for subclinical depression (MoodBox) informed by evidence-based psychological interventions, including CBT ^e , IPT ^f , and mindfulness meditation
Yu et al [61]	Various cognitive, behavioral, and psychosocial responses to COVID-19 showed both direct and indirect effects (via mental distress due to COVID-19) on depression. Thus, interventions to improve such multidimensional factors might reduce mental distress during the initial COVID-19 outbreak period

Reference	Interventions, conclusions, and recommendations
Zhang et al [62]	Relevant education and psychological counseling to parents during the outbreak to help them understand their children's mental state, with universities providing psychological counseling and psychological interventions to students, focusing on college students who are most severely affected by the epidemic
Li et al [63]	Recommends providing long-term psychological services for students; the results could help health care professionals identify college students at high risk of mental health problems so that appropriate interventions can be targeted against them
Tang et al [64]	Recommends providing psychological interventions for quarantined college students to help them reduce fear and improve sleep duration. Universities need to consider planning acute and long-term psychological services for more vulnerable students, graduates, and students living in the most severely affected areas
Zhou et al [65]	One week of positive mental imagery training can help to improve negative emotions and anxiety in depression; further exploration of this training program is suggested
Shen et al [66]	Providing mental health care and counseling services to students of high-risk groups in medical schools; the early diagnosis and treatment of ADHD may have a suicide prevention effect
Li et al [67]	Parents strengthen communication with their children and provide psychological support to their children. Universities carry out relevant online mental health courses and implement psychological intervention measures to improve students' psychological adaptability
Yang et al [68]	The government, school administrators, and society strengthen operability research to provide coping strategies, implement psychological interventions, and conduct relevant training
Liu et al [69]	Universities should adopt a web-based PPI ^g to improve the mental health of college students
Carciofo [70]	Longitudinal studies of these variables may establish causal relationships and may inform interventions to treat psychological distress and disorders
Yen et al [71]	Depressed college students have less hostility after entering the internet, suggesting that the internet as a useful medium to provide treatment for people with depression
Zheng et al [72]	Recommends adequate social support and long-term targeted psychological interventions for college students. More serious mental health problems seen among fourth-year students, proposing to specifically increase their employment opportunities and develop mental health rehabilitation programs
Song et al [73]	Online or smartphone-based psychoeducation and psychological interventions that will also reduce the risk of virus transmission by foregoing face-to-face therapy
Tao et al [74]	Unsupervised, self-initiated interventions against mental and sleep disorders of students can lead to more disastrous outcomes
Jia et al [75]	Public health education from health authorities in various governments is needed for dissemination of the importance of preventive measures during COVID-19. Psychological health services should be implemented to alleviate the adverse effects of this pandemic under national social distancing. Psychological interventions could also be carried out through online platforms under national social distancing during COVID-19. Teachers should also pay attention to strengthening the dissemination of COVID-19 knowledge and preventive measures to reduce the level of anxiety and depression in the student population
Dun et al [76]	Interventions to decrease sedentary time and improve mental health may be warranted to mitigate weight gain during the lockdown period and reverse the weight gain in youth after the COVID-19 pandemic
Yu et al [77]	Grief counseling and online sacramental ceremonies should be implemented for this group to prevent negative emotional difficulties; mindfulness meditation and CBT can reduce students' anxiety and depression
Pan and Zhuang [78]	Integration of cognitive behavioral intervention and adventure training in a class setting might be an effective and feasible approach for the mental health counseling of university students
Auyeung and Mo [79]	PPI
Zhao et al [80]	Mediating effect of online social support was stronger among college students with lower perceived social support than those with higher perceived social support
Xin et al [81]	Online brief interventions need to be made available, including screening of mental distress, counseling hotlines, emotional regulation and coping skills, and promotion of positive psychology
Liang et al [82]	Compared to meeting no guidelines, meeting the sleep guideline (alone or in combination with other guidelines) was associated with significantly lower levels of depression and anxiety; meeting both SB ^h and MVPA ⁱ guidelines was also associated with a significantly lower level of depression. Hence, meeting more guidelines, especially adhering to a healthy sleep routine, may play an important role in promoting the mental health of young adults
Sun et al [83]	Perceived available peer support negatively contributed to depressive symptoms. Both negative and positive indicators of emotional well-being mediated the association between perceived available peer support and depressive symptoms, and advanced the practical needs for preventive efforts and accessible care to support the psychological and emotional needs of young people during the COVID-19 pandemic.

Reference	Interventions, conclusions, and recommendations
Li et al [84]	Over 50% of the participants had obvious fear and anxiety symptoms at 61.64% and 58.39%, respectively. Conformity (49.49%), invulnerability (26.11%), insensitivity (21.49%), and rebelliousness (12.41%) symptoms also appeared. Senior students experienced more anxiety than freshmen. Psychological symptoms (except for insensitivity) had no significant difference with respect to gender, residence, and annual household income in one-way analysis of variance
Zhu et al [85]	Association between mental health and emotion regulation, which will help direct a psychological intervention that relieves these issues during the pandemic
Zhuo et al [86]	Back-to-school students who are certain and uncertain that COVID-19 will rebound again were significantly more anxious and depressed than those with optimistic attitudes. Government departments should pay high attention to the mental health problems evoked by intolerance of uncertainty (IU). Social support as a moderator could buffer the relationship between IU and mental health, including anxiety and depression during unprecedentedly uncertain times
Li et al [87]	Mental health services reducing PTSD ^j should be provided; students who have lost loved ones and suffered family financial loss should be given particular care
Zhan et al [88]	Education departments should attach great importance to the mental health of college students, and it is necessary to provide precise psychological interventions for groups experiencing greater pressure levels and marked anxiety and depression
Ding et al [89]	Three coping styles were all significantly correlated with psychological distress in Chinese college students during the early stage of the COVID-19 pandemic. Adaptive emotion-focused coping was negatively associated with perceived stress and psychological distress. Emotion-focused coping was positively associated with perceived stress and distress. Individuals who use specific reactive emotion-focused coping strategies more often, such as focusing on emotions, denial, seeking emotional social support, and disengaging, experience more stress.
Zhou et al [90]	Intercultural cooperation should be promoted to develop a cross-culturally valid concept of stigma against psychological help that could be used as the basis for intercultural comparison and developing interventions to reduce stigma
Liang et al [91]	Guiding postgraduate students to correctly understand their mental health status and individual differences in mental tolerance, and encouraging postgraduate students to seek help if they experience psychological problems so as to help them adjust their goals and plans according to reality, and avoid the development of other problems such as PTSD; establishing an early warning system for the mental health of postgraduate students during the pandemic and improve online and offline psychological counseling service systems; considering the characteristics and situation of different postgraduate groups for postgraduate student management to develop targeted mental health education programs and adopting objective measures, so as to improve postgraduate mental health and nurture both physical and mental health to facilitate China's modernization; developing and maintaining conditions to improve the communication between postgraduate students and advisors during the pandemic and create a new postgraduate guidance mode to relieve the psychological problems of postgraduate students
Wen et al [92]	Enhancing positive self-beliefs such as hope and self-efficacy helps to buffer the effects of insecurity on stress. Physical and psychological exercises that enhance hope can be effective interventions to help university students buffer the impacts of insecurity and alleviate stress during the outbreak. Improving positive self-beliefs can help to relieve the pressure of university students during the outbreak. University students can improve their self-efficacy by participating in movement-based courses, including Pilates and Tai Chi, so as to improve their positive mood and relieve stress. They can also effectively improve their hope levels by setting personal goals and conducting goal-pursuit exercises, which can also contribute to the reduction of insecurity and stress
Lin et al [93]	Dental schools and educators promote stress-coping strategies and modify teaching curricula to reduce students' stress. Stress management efforts such as time management, encouragement from advisors, and regular exercise are recommended

^aACE: adverse childhood experience.

^bADHD: attention deficit and hyperactivity disorder.

^cEE: emotional eating.

^dSNS: social networking site.

^eCBT: cognitive behavioral therapy.

^fIPT: interpersonal psychotherapy.

^gPPI: positive psychology intervention.

^hSB: sedentary behavior.

ⁱMVPA: moderate-to-vigorous physical activity.

^jPTSD: posttraumatic stress disorder.

Social Support

Main Categories

In the 49 included studies, we identified various types of social support from government authorities; university authorities; students' affairs counselors and teachers; family members;

health care authorities and professionals; researchers; and the media-, internet-, and smartphone-based interventions.

Government Authorities

Governments need to join hands with school administrators and various social parties to strengthen feasibility research to offer coping strategies, perform psychological interventions, and conduct relevant training [68]. Specifically, government

authorities at all levels need to (1) specially improve efficacy appraisal through providing psychological backup for undergraduate students, by inviting psychiatrists to deliver relevant lectures [49]; (2) offer free psychological counseling via hotlines to help undergraduate students solve their psychological problems [53]; (3) develop interventions to improve undergraduate students' various cognitive, behavioral, and psychosocial responses to public health emergencies such as COVID-19 [61]; (4) provide parents with relevant education and psychological counseling to help them understand their children's mental state [62]; (5) advocate adequate social support and long-term targeted psychological intervention to provide more employment opportunities and develop mental health rehabilitation programs for the fourth-year undergraduate students who suffered more mental problems [72,84]; (6) pay special attention to mental health concerns induced by intolerance of uncertainty [86]; and (7) particularly care for students who have lost loved ones and experienced family financial losses [87].

Policymakers and public health agencies need to (1) be sensitive to the potential adverse effects of omnipresent exposure to social media [52] and (2) encourage effective communication among family members and activate effective psychological counseling services [54].

Education departments ought to provide precise psychological interventions for those suffering greater pressure and marked anxiety and depression among undergraduate students [88].

University Authorities

Previous studies proposed university authorities to make the following interventions in undergraduate students' mental health concerns, including (1) developing a caring culture and ambience, which backs up undergraduate students to make life adjustments, promoting cultural and sports activities, facilitating the expansion of social networks, strengthening mental health education and counseling (eg, hotlines providing timely help for those in urgent need), early detection and effectively managing mental health concerns [12]; (2) screening for adverse childhood experiences and providing strength-based, trauma-informed interventions on fostering resilience [48]; (3) screening for anxiety disorders [50,57]; (4) screening and managing of emotional eating [51]; (5) organizing health education activities, and encouraging undergraduate students to arrange their time reasonably and find a proper approach to alleviate stress [53]; (6) encouraging timely, effective communication between family members [54]; (7) conducting interventions using cognitive behavioral approaches and screening for and addressing excessive social networking service use [55]; (8) developing psychological help-seeking interventions, strengthening the dissemination of mental health knowledge, and improving the level of mental health perception to improve help-seeking attitudes and increase the probability of seeking psychological help [57]; (9) being aware of undergraduate students' coping strategies, organizing programs such as an online experience-sharing competition, encouraging students by offering rewards or financial aids, and supplying necessary food and health care materials [58]; (10) implementing various interventions such as sleep hygiene, mobile phone and

internet use hygiene, mental health education courses, and professional psychological counseling [59,62,64,67,91]; (11) providing positive mental imagery training [65]; (12) offering relevant online mental health courses [67]; (13) adopting a web-based positive psychology intervention [69]; (14) establishing an early warning system for mental health concerns, guiding students to correctly understand their mental health status and individual differences in mental tolerance while encouraging them to seek help if necessary, developing targeted mental health education programs, and creating a new guidance mode to improve the communication between students and counselors [91]; and (15) promoting stress-coping strategies [93].

Students' Affairs Counselors and Teachers

Student counselors need to assume the responsibilities to provide support and positive coping strategies [54,93] along with psychological health services [75,85], in particular accessible care [83] for senior students who experienced more anxiety [84] and students who have lost loved ones and suffered family financial loss [87], emotion regulation guidance [85], and encouragement [93]. Teachers should pay close attention to disseminating COVID-19 knowledge and preventive measures [75], and modify teaching curricula [93] to reduce undergraduate students' academic pressure in the face of public health emergencies and natural disasters.

Family Members

One study argued that the role of family support in maintaining undergraduate students' mental health must be emphasized [94]. We found 4 studies reporting interventions delivered by family members. Family support can effectively decrease anxiety cognitively and behaviorally [54]. Therefore, parents need to strengthen communication with their children and provide psychological support for them [57], provide accessible care to support the psychological and emotional needs of their children [83], and maintain sensitivity to the potential negative consequences on their children brought about by ubiquitous social media coverage [52].

Health Care Authorities and Professionals

Health care professionals should identify, diagnose, and treat undergraduate students at high risk of mental health concerns early so that proper interventions, including long-term psychological services, can be tailored for them [63,66]. Grief counseling, mindfulness meditation, and cognitive behavioral therapy are recommended to reduce students' anxiety and depression [77], along with positive psychological intervention [79], and authorities should remain sensitive to the potential negative consequences of ubiquitous social media exposure [52].

Health authorities should provide public health education, implement psychological health services online and offline [75], integrate cognitive behavioral intervention and adventure training in a class setting [78], and offer mental health services reducing posttraumatic stress disorder [87].

Researchers

Researchers need to conduct longitudinal studies of morning affect, eveningness, and amplitude distinctness to establish

causal relationships between these factors and negative emotionality, and thus inform interventions to treat psychological distress and disorders [70]. They should also study the association between mental health and emotion regulation to help direct psychological interventions [85].

Media-, Internet-, and Smartphone-Based Interventions

Evidence-based digital mental health interventions were found to be useful in improving mental health concerns [56,60], because depressed undergraduate students became less hostile when logging onto the internet, suggesting the internet as a useful medium to provide treatment for people with depression [71]. In the context of face-to-face intervention delivery hindered by the COVID-19 pandemic, internet-delivered interventions such as internet-delivered cognitive behavioral therapy can be considered to address effects of social networking service addiction on the mental health status of Chinese university students [55]. It is effective to use internet-based cognitive behavioral and mindfulness training programs, which can easily be integrated into existing service provision portfolios that promote mental health and reduce psychological distress to promote the mental health of undergraduate students [26]. Online brief interventions need to be made available, including screening of mental distress, counseling hotlines, emotional regulation and coping skills, and promotion of positive psychology [60,73,75,81], whose mediating effects were proven to be stronger among undergraduate students with lower perceived social support [80]. Online sacramental ceremonies should be implemented to prevent negative emotional difficulties [77]. The media need to release correct information in a timely manner and curb the spread of rumors [53], which may aggravate the mental health concerns of psychologically vulnerable undergraduate students.

Coping Strategies

A recent study mentioned positive coping strategies as intervention measures to help improve college students' psychological well-being [2]. Some of the 49 included studies reported positive coping strategies, including regulating emotions effectively [52,85]; meeting the sleep, sedentary behavior, and moderate-to-vigorous physical activity guidelines [82]; developing optimistic attitudes [86]; adopting problem-focused and adaptive emotion-focused coping [89]; enhancing positive self-beliefs (eg, hope and self-efficacy) and physical and psychological exercises [92]; and managing stress through time management and regular exercise [93]. Moreover, undergraduate students need to provide mutual peer support and accessible care, because perceived peer support and care alleviated depressive symptoms and met young people's psychological and emotional needs [83]. All of these positive coping strategies were proven to be effective in promoting undergraduate students' mental health [82].

However, negative coping should be avoided, which can lead to more disastrous consequences [75]. The reported negative coping strategies include excessive use of social media, which can be counteracted with emotion regulation (eg, reappraisal) to reduce negative emotions induced by news coverage [52]; problematic smartphone use [59]; unsupervised, self-initiated

intervention [74]; and maladaptive emotion-focused coping [89].

Discussion

Principal Findings

The great uncertainty about the pandemic, the abrupt transition to and participation in online classes, and the COVID-19-related impacts on life all frequently contributed to the increased stress and anxiety of undergraduate students [95-97], in addition to their inability to tackle problems concerning interpersonal relationships, academic challenges, and career development due to the lack of life and social experience [98,99]. Therefore, 35 (71%) of the 49 included studies that investigated Chinese undergraduates' mental health concerns induced more or less by the COVID-19 pandemic. The proposed interventions to counteract the severe psychological influence of the pandemic were synthesized into two broad categories: social support and coping strategies. Social support has proven to be an effective protective factor for mental health in previous studies [100-103]. Social support means providing practical help, emotional backup, and information assistance by those around individuals in mental distress [104]. Social support was found to be negatively correlated with adverse mental health outcomes (anxiety, depression, and insomnia), which were aggravated by COVID-19-induced intolerance of uncertainty [86]. Social support also served as a moderator buffering the relationship between intolerance of uncertainty and mental health, including anxiety and depression [86].

Coping strategies have proven to be effective protective factors for mental health in previous studies [100-103]. All of these interventions are crucially important in the context of the COVID-19 pandemic and other future public health crises or natural disasters, which can cause long-term mental disorders in various populations [99]. Therefore, the effective mental health interventions in the forms of various social support and coping strategies reported in the 49 included studies can surely shed light on the interventions in undergraduate students' mental health issues.

Moreover, we identified some mental health interventions that were not reported in the included studies but are potentially effective and robust, including those delivered by digital medical platforms, conversational agents (eg, chatbots), and researchers.

Digital Medical Platforms

Two of the most popular digital medical platforms, *haodaiifu* ("The Good Doctor") and *zuoshouyisheng* ("The Left-handed Doctor"), in China were not recommended in the selected studies. These two platforms, among others, should proactively be advocated as effective mental health interventions for undergraduate students, especially given the widely acknowledged stigma attached to mental health concerns [50]. In saving undergraduate students' face and protecting their privacy, digital medical platforms should be popularized among undergraduate students and the general public. Internet-based interventions have been confirmed to be effective for treating common mental disorders [44-46].

Conversational Agents

The chatbot, as the most popular type of conversational agent, simulates human conversations to provide medical and health care interventions. These human-like, empathetic chatbots are capable of monitoring people's health [105]. Chatbots and conversational agents display many advantages unmatched by other health consultation alternatives, such as easing the overburdened contact centers and decreasing health risks caused through personal contact [106], providing the only possible solution to catering to the unprecedented demand for health-related information given the lack of professional human agents [107,108], providing timely services at any time [109], ensuring consistent quality services [110], and avoiding moral judgment of user information [111]. Chatbots need to be recommended as an effective mental health intervention tool to undergraduate students, who can try an app on *zuoshouyisheng* that is equipped with the chatbot function.

Researchers

Only two of the included studies mentioned the role of researchers [70,85]. In fact, researchers can effectively intervene in undergraduate students' mental health by synthesizing interventions proposed in previous studies and by reporting novel intervention strategies. These synthesized and novel interventions can inform various stakeholders, including educational authorities, college and university management, students' affairs counselors, and mental health providers. Although playing a role of indirect intervention, their part should never be overlooked.

Comparison With Previous Work

In this review, we synthesized the interventions for addressing Chinese undergraduates' mental health concerns into two categories of social support and coping strategies, confirming the findings of these two effective protective factors for mental health highlighted in previous studies [100-103]. Social support from family members, friends, colleagues, relatives, and neighbors [104], and from educational authorities, college and university management, students' affairs counselors, and mental health providers proposed in many of the 49 included studies can deliver critical and effective interventions, mitigating mental health risks imposed on college students [28-30], sustaining them against crises and stress [32], moderating the relationship between stress and depression [33], and buffering mental health concerns [34]. Previous studies showed that younger adults and people with greater social strain but less social support suffer worse mental health, and that perceived social support impacts the overall depression outcome and the recovery from affective disorders [104,112-114]. The importance of various forms of social support can never be overemphasized in the interventions in Chinese undergraduates' mental health concerns.

Eight of the 49 included studies reported positive coping strategies [52,82,83,85,86,89,92,93], which effectively improved undergraduates' mental health conditions. Four of the 49 publications proposed negative coping strategies [52,59,74,75,89], which may cause disastrous consequences. Coping strategies refer to the thoughts and behaviors used by individuals to manage the internal and external demands of

stressful events [115]. Although various forms of social support turned out to play an essential role in mitigating Chinese undergraduates' mental health concerns, these stakeholders' own coping strategies are more essential. When people face challenging or intricate negative events, the coping style they adopt, be it positive or negative, is crucially important, which will influence their psychosocial outcomes and especially their mental health [115]. People adopting positive coping strategies were afflicted with less emotional distress, whereas those adopting negative coping strategies suffered more emotional distress [116].

Eleven of the 49 included studies described evidence-based internet-delivered digital mental health interventions such as internet-based cognitive behavioral and mindfulness training programs, online brief interventions, online sacramental ceremonies, internet-delivered cognitive behavioral therapy, and others [26,53,55,56,60,71,73,75,77,80,81]. These reported internet- or technology-based interventions can easily be incorporated into existing mental health service provision portfolios. The internet is likely to be an ideal channel to provide promising interventions for students in tertiary education [43,117]. Web-based depression and anxiety interventions were proven effective in treating common mental disorders [45,46]. An internet-based intervention complex, comprising a mental health literacy/destigmatization intervention, a feedback intervention, and a help-seeking list intervention, was proposed by Mowbray et al [44] to promote mental health help-seeking, improve mental health-related knowledge, and decrease the stigma attached to mental health concerns. Online interventions have the potential to fulfill a function in decreasing the depression and anxiety prevalence in the target populations [44]. According to a very recent Canadian study, organizations have been expanding the use of virtual care and digital mental health interventions such as web-based programs, apps, and websites [118]. This is a prevalent trend worldwide. The rapid shift from the use of traditional interventions to the use of digital mental health services and interventions [119] can inform stakeholders of the necessity to adopt digital interventions to support undergraduates' mental health.

The quality and accessibility of mental health can be improved through mobile apps [120]. Chatbots are one of the main mobile apps for mental health [121]. Chatbots were used to deliver psychological service for medical professionals and the public in China [122,123]. However, none of the 49 included studies proposed chatbot-delivered interventions in undergraduates' mental health issues. Chatbots have been pervasively used in the field of mental health [121], contributing to addressing the shortage of mental health care [124]. They promise to be an ideal tool that delivers interventions to people suffering from mental health concerns, especially those reluctant to seek mental health advice due to stigmatization. Stakeholders concerned about Chinese undergraduates' mental health should adopt and popularize this new technology.

Limitations

This review had several limitations. First, we merely searched two databases (PubMed and ProQuest) for eligible publications. Therefore, there are possibly articles left uncovered in this

review. In further research, we will consider more databases, including Embase, CINAHL, PsycInfo, ACM Digital Library, and others. Second, some principal findings may have a low generalizability, considering that most interventions were only reported in only one or two selected articles. Third, we did not compare the findings of this review with other systematic reviews, as this review was the first of its kind.

Conclusions

Considering that colleges and universities in China have reported unprecedented numbers of students in psychological distress in recent years [2], we performed the first systematic review of interventions addressing the mental health concerns of Chinese undergraduate students studying in China. We found that it is necessary to review this topic systematically, considering the

deteriorating mental health of Chinese undergraduate students, especially in the context of COVID-19 resurgences. We divided all the interventions reported in the selected studies into two categories: (1) social support from government authorities, university authorities, students' affairs counselors and teachers, family members, health care authorities and professionals, and the media (various online platforms), and (2) various coping strategies adopted by undergraduate students themselves. We identified further research on mental health interventions through digital medical platforms, conversational agents (eg, chatbots), and researchers. These interventions combined can provide important implications for practical interventions in the mental health concerns of college students. The intervention in undergraduate students' mental health concerns is a research topic worth further investigation.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Characteristics of the eligible studies.

[\[DOCX File , 82 KB-Multimedia Appendix 1\]](#)

References

1. Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Benjet C, Cuijpers P, WHO WMH-ICS Collaborators. WHO World Mental Health Surveys International College Student Project: prevalence and distribution of mental disorders. *J Abnorm Psychol* 2018 Oct;127(7):623-638 [FREE Full text] [doi: [10.1037/abn0000362](https://doi.org/10.1037/abn0000362)] [Medline: [30211576](https://pubmed.ncbi.nlm.nih.gov/30211576/)]
2. Huang Y, Su X, Si M, Xiao W, Wang H, Wang W, et al. The impacts of coping style and perceived social support on the mental health of undergraduate students during the early phases of the COVID-19 pandemic in China: a multicenter survey. *BMC Psychiatry* 2021 Oct 27;21(1):530 [FREE Full text] [doi: [10.1186/s12888-021-03546-y](https://doi.org/10.1186/s12888-021-03546-y)] [Medline: [34706690](https://pubmed.ncbi.nlm.nih.gov/34706690/)]
3. Said D, Kypril K, Bowman J. Risk factors for mental disorder among university students in Australia: findings from a web-based cross-sectional survey. *Soc Psychiatry Psychiatr Epidemiol* 2013 Jun;48(6):935-944. [doi: [10.1007/s00127-012-0574-x](https://doi.org/10.1007/s00127-012-0574-x)] [Medline: [22945366](https://pubmed.ncbi.nlm.nih.gov/22945366/)]
4. Huckins JF, DaSilva AW, Hedlund EL, Murphy EI, Rogers C, Wang W, et al. Causal factors of anxiety and depression in college students: longitudinal ecological momentary assessment and causal analysis using Peter and Clark momentary conditional independence. *JMIR Ment Health* 2020 Jun 10;7(6):e16684 [FREE Full text] [doi: [10.2196/16684](https://doi.org/10.2196/16684)] [Medline: [32519971](https://pubmed.ncbi.nlm.nih.gov/32519971/)]
5. Cheng S, Jia C, Wang Y. Only children were associated with anxiety and depressive symptoms among college students in China. *Int J Environ Res Public Health* 2020 Jun 05;17(11):4035 [FREE Full text] [doi: [10.3390/ijerph17114035](https://doi.org/10.3390/ijerph17114035)] [Medline: [32517044](https://pubmed.ncbi.nlm.nih.gov/32517044/)]
6. Li J, Li J, Jia R, Wang Y, Qian S, Xu Y. Mental health problems and associated school interpersonal relationships among adolescents in China: a cross-sectional study. *Child Adolesc Psychiatry Ment Health* 2020 Mar 30;14(1):12 [FREE Full text] [doi: [10.1186/s13034-020-00318-6](https://doi.org/10.1186/s13034-020-00318-6)] [Medline: [32256690](https://pubmed.ncbi.nlm.nih.gov/32256690/)]
7. Chen L, Wang L, Qiu XH, Yang XX, Qiao ZX, Yang YJ, et al. Depression among Chinese university students: prevalence and socio-demographic correlates. *PLoS One* 2013 Mar 13;8(3):e58379 [FREE Full text] [doi: [10.1371/journal.pone.0058379](https://doi.org/10.1371/journal.pone.0058379)] [Medline: [23516468](https://pubmed.ncbi.nlm.nih.gov/23516468/)]
8. Sun L, Sun L, Sun Y, Yang L, Wu H, Zhang D, et al. Correlations between psychological symptoms and social relationships among medical undergraduates in Anhui Province of China. *Int J Psychiatry Med* 2011 Nov 21;42(1):29-47. [doi: [10.2190/pm.42.1.c](https://doi.org/10.2190/pm.42.1.c)] [Medline: [22372023](https://pubmed.ncbi.nlm.nih.gov/22372023/)]
9. Sun X, Niu G, You Z, Zhou Z, Tang Y. Gender, negative life events and coping on different stages of depression severity: A cross-sectional study among Chinese university students. *J Affect Disord* 2017 Feb;209:177-181. [doi: [10.1016/j.jad.2016.11.025](https://doi.org/10.1016/j.jad.2016.11.025)] [Medline: [27923194](https://pubmed.ncbi.nlm.nih.gov/27923194/)]
10. Hou H, Feng X, Li Y, Meng Z, Guo D, Wang F, et al. Suboptimal health status and psychological symptoms among Chinese college students: a perspective of predictive, preventive and personalised health. *EPMA J* 2018 Dec 28;9(4):367-377 [FREE Full text] [doi: [10.1007/s13167-018-0148-4](https://doi.org/10.1007/s13167-018-0148-4)] [Medline: [30538788](https://pubmed.ncbi.nlm.nih.gov/30538788/)]
11. Gorsic M, Novak D. Design and pilot evaluation of competitive and cooperative exercise games for arm rehabilitation at home. *Annu Int Conf IEEE Eng Med Biol Soc* 2016 Aug;2016:4690-4694 [FREE Full text] [doi: [10.1109/EMBC.2016.7591774](https://doi.org/10.1109/EMBC.2016.7591774)] [Medline: [28269319](https://pubmed.ncbi.nlm.nih.gov/28269319/)]

12. Lei X, Liu C, Jiang H. Mental health of college students and associated factors in Hubei of China. *PLoS One* 2021 Jul 2;16(7):e0254183 [FREE Full text] [doi: [10.1371/journal.pone.0254183](https://doi.org/10.1371/journal.pone.0254183)] [Medline: [34214107](https://pubmed.ncbi.nlm.nih.gov/34214107/)]
13. Beiter R, Nash R, McCrady M, Rhoades D, Linscomb M, Clarahan M, et al. The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *J Affect Disord* 2015 Mar 01;173:90-96. [doi: [10.1016/j.jad.2014.10.054](https://doi.org/10.1016/j.jad.2014.10.054)] [Medline: [25462401](https://pubmed.ncbi.nlm.nih.gov/25462401/)]
14. Kontoangelos K, Tsiori S, Koundi K, Pappa X, Sakkas P, Papageorgiou C. Greek college students and psychopathology: new insights. *Int J Environ Res Public Health* 2015 Apr 29;12(5):4709-4725 [FREE Full text] [doi: [10.3390/ijerph120504709](https://doi.org/10.3390/ijerph120504709)] [Medline: [25938913](https://pubmed.ncbi.nlm.nih.gov/25938913/)]
15. Wang J, Zou J, Luo J, Liu H, Yang Q, Ouyang Y, et al. Mental health symptoms among rural adolescents with different parental migration experiences: A cross-sectional study in China. *Psychiatry Res* 2019 Sep;279:222-230. [doi: [10.1016/j.psychres.2019.03.004](https://doi.org/10.1016/j.psychres.2019.03.004)] [Medline: [30878304](https://pubmed.ncbi.nlm.nih.gov/30878304/)]
16. Alonso J, Mortier P, Auerbach RP, Bruffaerts R, Vilagut G, Cuijpers P, WHO WMH-ICS Collaborators. Severe role impairment associated with mental disorders: Results of the WHO World Mental Health Surveys International College Student Project. *Depress Anxiety* 2018 Sep 30;35(9):802-814 [FREE Full text] [doi: [10.1002/da.22778](https://doi.org/10.1002/da.22778)] [Medline: [29847006](https://pubmed.ncbi.nlm.nih.gov/29847006/)]
17. Alonso J, Vilagut G, Mortier P, Auerbach RP, Bruffaerts R, Cuijpers P, WHO WMH-ICS Collaborators. The role impairment associated with mental disorder risk profiles in the WHO World Mental Health International College Student Initiative. *Int J Methods Psychiatr Res* 2019 Jun 06;28(2):e1750 [FREE Full text] [doi: [10.1002/mpr.1750](https://doi.org/10.1002/mpr.1750)] [Medline: [30402985](https://pubmed.ncbi.nlm.nih.gov/30402985/)]
18. Bruffaerts R, Mortier P, Kiekens G, Auerbach RP, Cuijpers P, Demyttenaere K, et al. Mental health problems in college freshmen: prevalence and academic functioning. *J Affect Disord* 2018 Jan 01;225:97-103 [FREE Full text] [doi: [10.1016/j.jad.2017.07.044](https://doi.org/10.1016/j.jad.2017.07.044)] [Medline: [28802728](https://pubmed.ncbi.nlm.nih.gov/28802728/)]
19. Gao L, Xie Y, Jia C, Wang W. Prevalence of depression among Chinese university students: a systematic review and meta-analysis. *Sci Rep* 2020 Sep 28;10(1):15897. [doi: [10.1038/s41598-020-72998-1](https://doi.org/10.1038/s41598-020-72998-1)] [Medline: [32985593](https://pubmed.ncbi.nlm.nih.gov/32985593/)]
20. Ngasa SN, Sama C, Dzekem BS, Nforchu KN, Tindong M, Aroke D, et al. Prevalence and factors associated with depression among medical students in Cameroon: a cross-sectional study. *BMC Psychiatry* 2017 Jun 09;17(1):216 [FREE Full text] [doi: [10.1186/s12888-017-1382-3](https://doi.org/10.1186/s12888-017-1382-3)] [Medline: [28599624](https://pubmed.ncbi.nlm.nih.gov/28599624/)]
21. Blanco C, Okuda M, Wright C, Hasin DS, Grant BF, Liu S, et al. Mental health of college students and their non-college-attending peers: results from the National Epidemiologic Study on Alcohol and Related Conditions. *Arch Gen Psychiatry* 2008 Dec;65(12):1429-1437. [doi: [10.1001/archpsyc.65.12.1429](https://doi.org/10.1001/archpsyc.65.12.1429)] [Medline: [19047530](https://pubmed.ncbi.nlm.nih.gov/19047530/)]
22. Arayeshgari M, Tapak L, Roshanaei G, Poorolajal J, Ghaleiha A. Application of group smoothly clipped absolute deviation method in identifying correlates of psychiatric distress among college students. *BMC Psychiatry* 2020 May 04;20(1):198 [FREE Full text] [doi: [10.1186/s12888-020-02591-3](https://doi.org/10.1186/s12888-020-02591-3)] [Medline: [32366242](https://pubmed.ncbi.nlm.nih.gov/32366242/)]
23. Plexousakis SS, Kourkoutas E, Giovazolias T, Chatira K, Nikolopoulos D. School bullying and post-traumatic stress disorder symptoms: the role of parental bonding. *Front Public Health* 2019;7:75. [doi: [10.3389/fpubh.2019.00075](https://doi.org/10.3389/fpubh.2019.00075)] [Medline: [31024876](https://pubmed.ncbi.nlm.nih.gov/31024876/)]
24. Sayers J. The world health report 2001 — Mental health: new understanding, new hope. *Bull World Health Organ* 2001;79(11):1085 [FREE Full text] [doi: [10.1590/S0042-96862001001100014](https://doi.org/10.1590/S0042-96862001001100014)]
25. Wu X, Tao S, Zhang Y, Zhang S, Tao F. Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students. *PLoS One* 2015;10(3):e0119607 [FREE Full text] [doi: [10.1371/journal.pone.0119607](https://doi.org/10.1371/journal.pone.0119607)] [Medline: [25786030](https://pubmed.ncbi.nlm.nih.gov/25786030/)]
26. Mak WW, Chio FH, Chan AT, Lui WW, Wu EK. The efficacy of internet-based mindfulness training and cognitive-behavioral training with telephone support in the Enhancement of mental health among college students and young working adults: randomized controlled trial. *J Med Internet Res* 2017 Mar 22;19(3):e84 [FREE Full text] [doi: [10.2196/jmir.6737](https://doi.org/10.2196/jmir.6737)] [Medline: [28330831](https://pubmed.ncbi.nlm.nih.gov/28330831/)]
27. Promoting mental health: concepts, emerging evidence, practice: summary report. World Health Organization. 2004. URL: <https://apps.who.int/iris/handle/10665/42940> [accessed 2022-02-07]
28. Tol WA, Barbui C, Galappatti A, Silove D, Betancourt TS, Souza R, et al. Mental health and psychosocial support in humanitarian settings: linking practice and research. *Lancet* 2011 Oct 29;378(9802):1581-1591 [FREE Full text] [doi: [10.1016/S0140-6736\(11\)61094-5](https://doi.org/10.1016/S0140-6736(11)61094-5)] [Medline: [22008428](https://pubmed.ncbi.nlm.nih.gov/22008428/)]
29. Xiang Y, Dong X, Zhao J. Effects of envy on depression: the mediating roles of psychological resilience and social support. *Psychiatry Investig* 2020 Jun;17(6):547-555 [FREE Full text] [doi: [10.30773/pi.2019.0266](https://doi.org/10.30773/pi.2019.0266)] [Medline: [32517416](https://pubmed.ncbi.nlm.nih.gov/32517416/)]
30. Zhao J, Peng X, Chao X, Xiang Y. Childhood maltreatment influences mental symptoms: the mediating roles of emotional intelligence and social support. *Front Psychiatry* 2019 Jun 21;10:415. [doi: [10.3389/fpsy.2019.00415](https://doi.org/10.3389/fpsy.2019.00415)] [Medline: [31316399](https://pubmed.ncbi.nlm.nih.gov/31316399/)]
31. Taylor SE. Social support: a review. In: Friedman HS, editor. *The Oxford Handbook of Health Psychology*. Oxford, UK: Oxford University Press; 2011.
32. Tahmasbipour N, Taheri A. A survey on the relation between social support and mental health in students Shahid Rajaei University. *Procedia Soc Behav Sci* 2012;47:5-9. [doi: [10.1016/j.sbspro.2012.06.603](https://doi.org/10.1016/j.sbspro.2012.06.603)]
33. Wang X, Cai L, Qian J, Peng J. Social support moderates stress effects on depression. *Int J Ment Health Syst* 2014;8(1):41 [FREE Full text] [doi: [10.1186/1752-4458-8-41](https://doi.org/10.1186/1752-4458-8-41)] [Medline: [25422673](https://pubmed.ncbi.nlm.nih.gov/25422673/)]

34. Li J, Liang W, Yuan B, Zeng G. Internalized stigmatization, social support, and individual mental health problems in the public health crisis. *Int J Environ Res Public Health* 2020 Jun 23;17(12):4507 [FREE Full text] [doi: [10.3390/ijerph17124507](https://doi.org/10.3390/ijerph17124507)] [Medline: [32585910](https://pubmed.ncbi.nlm.nih.gov/32585910/)]
35. Wahle F, Bollhalder L, Kowatsch T, Fleisch E. Toward the design of evidence-based mental health information systems for people with depression: a systematic literature review and meta-analysis. *J Med Internet Res* 2017 May 31;19(5):e191 [FREE Full text] [doi: [10.2196/jmir.7381](https://doi.org/10.2196/jmir.7381)] [Medline: [28566267](https://pubmed.ncbi.nlm.nih.gov/28566267/)]
36. Hofmann SG, Asnaani A, Vonk IJJ, Sawyer AT, Fang A. The efficacy of cognitive behavioral therapy: a review of meta-analyses. *Cognit Ther Res* 2012 Oct 01;36(5):427-440 [FREE Full text] [doi: [10.1007/s10608-012-9476-1](https://doi.org/10.1007/s10608-012-9476-1)] [Medline: [23459093](https://pubmed.ncbi.nlm.nih.gov/23459093/)]
37. de Mello MF, de Jesus Mari J, Bacaltchuk J, Verdelli H, Neugebauer R. A systematic review of research findings on the efficacy of interpersonal therapy for depressive disorders. *Eur Arch Psychiatry Clin Neurosci* 2005 Apr 12;255(2):75-82. [doi: [10.1007/s00406-004-0542-x](https://doi.org/10.1007/s00406-004-0542-x)] [Medline: [15812600](https://pubmed.ncbi.nlm.nih.gov/15812600/)]
38. Bell AC, D'Zurilla TJ. Problem-solving therapy for depression: a meta-analysis. *Clin Psychol Rev* 2009 Jun;29(4):348-353. [doi: [10.1016/j.cpr.2009.02.003](https://doi.org/10.1016/j.cpr.2009.02.003)] [Medline: [19299058](https://pubmed.ncbi.nlm.nih.gov/19299058/)]
39. Brent DA, Holder D, Kolko D, Birmaher B, Baugher M, Roth C, et al. A clinical psychotherapy trial for adolescent depression comparing cognitive, family, and supportive therapy. *Arch Gen Psychiatry* 1997 Sep 01;54(9):877-885. [doi: [10.1001/archpsyc.1997.01830210125017](https://doi.org/10.1001/archpsyc.1997.01830210125017)] [Medline: [9294380](https://pubmed.ncbi.nlm.nih.gov/9294380/)]
40. Cuijpers P. A psychoeducational approach to the treatment of depression: A meta-analysis of Lewinsohn's "coping with depression" course. *Behav Ther* 1998;29(3):521-533. [doi: [10.1016/S0005-7894\(98\)80047-6](https://doi.org/10.1016/S0005-7894(98)80047-6)]
41. Ströhle A. Physical activity, exercise, depression and anxiety disorders. *J Neural Transm* 2009 Jun;116(6):777-784. [doi: [10.1007/s00702-008-0092-x](https://doi.org/10.1007/s00702-008-0092-x)] [Medline: [18726137](https://pubmed.ncbi.nlm.nih.gov/18726137/)]
42. Drum DJ, Denmark AB. Campus suicide prevention: bridging paradigms and forging partnerships. *Harv Rev Psychiatry* 2012;20(4):209-221. [doi: [10.3109/10673229.2012.712841](https://doi.org/10.3109/10673229.2012.712841)] [Medline: [22894730](https://pubmed.ncbi.nlm.nih.gov/22894730/)]
43. Farrer L, Gulliver A, Chan JKY, Batterham PJ, Reynolds J, Caelear A, et al. Technology-based interventions for mental health in tertiary students: systematic review. *J Med Internet Res* 2013 May 27;15(5):e101 [FREE Full text] [doi: [10.2196/jmir.2639](https://doi.org/10.2196/jmir.2639)] [Medline: [23711740](https://pubmed.ncbi.nlm.nih.gov/23711740/)]
44. Mowbray CT, Megivern D, Mandiberg JM, Strauss S, Stein CH, Collins K, et al. Campus mental health services: recommendations for change. *Am J Orthopsychiatry* 2006 Apr;76(2):226-237. [doi: [10.1037/0002-9432.76.2.226](https://doi.org/10.1037/0002-9432.76.2.226)] [Medline: [16719642](https://pubmed.ncbi.nlm.nih.gov/16719642/)]
45. Andersson G, Cuijpers P. Internet-based and other computerized psychological treatments for adult depression: a meta-analysis. *Cogn Behav Ther* 2009;38(4):196-205. [doi: [10.1080/16506070903318960](https://doi.org/10.1080/16506070903318960)] [Medline: [20183695](https://pubmed.ncbi.nlm.nih.gov/20183695/)]
46. Reger MA, Gahm GA. A meta-analysis of the effects of internet- and computer-based cognitive-behavioral treatments for anxiety. *J Clin Psychol* 2009 Jan;65(1):53-75. [doi: [10.1002/jclp.20536](https://doi.org/10.1002/jclp.20536)] [Medline: [19051274](https://pubmed.ncbi.nlm.nih.gov/19051274/)]
47. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021 Mar 29;372:n71 [FREE Full text] [doi: [10.1136/bmj.n71](https://doi.org/10.1136/bmj.n71)] [Medline: [33782057](https://pubmed.ncbi.nlm.nih.gov/33782057/)]
48. Yu Z, Wang L, Chen W, Perrin N, Gross D. Childhood adversity and mental health among Chinese young adults: the protective role of resilience. *J Adv Nurs* 2021 Dec 07;77(12):4793-4804. [doi: [10.1111/jan.15070](https://doi.org/10.1111/jan.15070)] [Medline: [34617614](https://pubmed.ncbi.nlm.nih.gov/34617614/)]
49. Zhang W, Xiong S, Zheng Y, Wu J. Response efficacy and self-efficacy mediated the relationship between perceived threat and psychic anxiety among college students in the early stage of the COVID-19 pandemic. *Int J Environ Res Public Health* 2022 Feb 28;19(5):2832 [FREE Full text] [doi: [10.3390/ijerph19052832](https://doi.org/10.3390/ijerph19052832)] [Medline: [35270528](https://pubmed.ncbi.nlm.nih.gov/35270528/)]
50. Shen Y, Zhang Y, Chan BSM, Meng F, Yang T, Luo X, et al. Association of ADHD symptoms, depression and suicidal behaviors with anxiety in Chinese medical college students. *BMC Psychiatry* 2020 Apr 22;20(1):180 [FREE Full text] [doi: [10.1186/s12888-020-02555-7](https://doi.org/10.1186/s12888-020-02555-7)] [Medline: [32321462](https://pubmed.ncbi.nlm.nih.gov/32321462/)]
51. Sze KYP, Lee EKP, Chan RHW, Kim JH. Prevalence of negative emotional eating and its associated psychosocial factors among urban Chinese undergraduates in Hong Kong: a cross-sectional study. *BMC Public Health* 2021 Mar 24;21(1):583 [FREE Full text] [doi: [10.1186/s12889-021-10531-3](https://doi.org/10.1186/s12889-021-10531-3)] [Medline: [33761930](https://pubmed.ncbi.nlm.nih.gov/33761930/)]
52. Zhao N, Zhou G. Social media use and mental health during the COVID - 19 pandemic: moderator role of disaster stressor and mediator role of negative affect. *Appl Psychol Health Well - Being* 2020 Sep 17;12(4):1019-1038. [doi: [10.1111/aphw.12226](https://doi.org/10.1111/aphw.12226)]
53. Yu M, Tian F, Cui Q, Wu H. Prevalence and its associated factors of depressive symptoms among Chinese college students during the COVID-19 pandemic. *BMC Psychiatry* 2021 Jan 29;21(1):66 [FREE Full text] [doi: [10.1186/s12888-021-03066-9](https://doi.org/10.1186/s12888-021-03066-9)] [Medline: [33514336](https://pubmed.ncbi.nlm.nih.gov/33514336/)]
54. Li Y, Peng J. Does social support matter? The mediating links with coping strategy and anxiety among Chinese college students in a cross-sectional study of COVID-19 pandemic. *BMC Public Health* 2021 Jul 02;21(1):1298 [FREE Full text] [doi: [10.1186/s12889-021-11332-4](https://doi.org/10.1186/s12889-021-11332-4)] [Medline: [34215244](https://pubmed.ncbi.nlm.nih.gov/34215244/)]
55. Wang T, Wong JYH, Wang MP, Li ACY, Kim SS, Lee JJ. Effects of social networking service (SNS) addiction on mental health status in Chinese university students: structural equation modeling approach using a cross-sectional online survey. *J Med Internet Res* 2021 Dec 08;23(12):e26733 [FREE Full text] [doi: [10.2196/26733](https://doi.org/10.2196/26733)] [Medline: [34889760](https://pubmed.ncbi.nlm.nih.gov/34889760/)]

56. Sit HF, Hong IW, Burchert S, Sou EKL, Wong M, Chen W, et al. A feasibility study of the WHO Digital Mental Health Intervention step-by-step to address depression among Chinese young adults. *Front Psychiatry* 2021 Jan 7;12:812667. [doi: [10.3389/fpsy.2021.812667](https://doi.org/10.3389/fpsy.2021.812667)] [Medline: [35069297](https://pubmed.ncbi.nlm.nih.gov/35069297/)]
57. Liang S, Chen R, Liu L, Li X, Chen J, Tang S, et al. The psychological impact of the COVID-19 epidemic on Guangdong college students: the difference between seeking and not seeking psychological help. *Front Psychol* 2020 Sep 4;11:2231. [doi: [10.3389/fpsyg.2020.02231](https://doi.org/10.3389/fpsyg.2020.02231)] [Medline: [33013582](https://pubmed.ncbi.nlm.nih.gov/33013582/)]
58. Nurunnabi M, Hossain SFAH, Chinna K, Sundarasan S, Khoshaim HB, Kamaludin K, et al. Coping strategies of students for anxiety during the COVID-19 pandemic in China: a cross-sectional study. *F1000Res* 2020 Sep 10;9:1115 [FREE Full text] [doi: [10.12688/f1000research.25557.1](https://doi.org/10.12688/f1000research.25557.1)] [Medline: [33274049](https://pubmed.ncbi.nlm.nih.gov/33274049/)]
59. Wu R, Guo L, Rong H, Shi J, Li W, Zhu M, et al. The role of problematic smartphone uses and psychological distress in the relationship between sleep quality and disordered eating behaviors among Chinese college students. *Front Psychiatry* 2021 Dec 13;12:793506. [doi: [10.3389/fpsy.2021.793506](https://doi.org/10.3389/fpsy.2021.793506)] [Medline: [34966312](https://pubmed.ncbi.nlm.nih.gov/34966312/)]
60. Chen X, Zhang X, Zhu X, Wang G. Efficacy of an internet-based intervention for subclinical depression (MoodBox) in China: study protocol for a randomized controlled trial. *Front Psychiatry* 2020 Jan 12;11:585920. [doi: [10.3389/fpsy.2020.585920](https://doi.org/10.3389/fpsy.2020.585920)] [Medline: [33510658](https://pubmed.ncbi.nlm.nih.gov/33510658/)]
61. Yu Y, She R, Luo S, Xin M, Li L, Wang S, et al. Factors influencing depression and mental distress related to COVID-19 among university students in China: online cross-sectional mediation study. *JMIR Ment Health* 2021 Feb 22;8(2):e22705 [FREE Full text] [doi: [10.2196/22705](https://doi.org/10.2196/22705)] [Medline: [33616541](https://pubmed.ncbi.nlm.nih.gov/33616541/)]
62. Zhang Y, Zhao J, Xi J, Fan B, Wang Q, Yao Z, et al. The prevalence and determinant of PTSD symptoms among home-quarantined Chinese university students during the COVID-19 pandemic. *Healthcare* 2021 Oct 16;9(10):1383 [FREE Full text] [doi: [10.3390/healthcare9101383](https://doi.org/10.3390/healthcare9101383)] [Medline: [34683063](https://pubmed.ncbi.nlm.nih.gov/34683063/)]
63. Li N, Fan L, Wang Y, Wang J, Huang Y. Risk factors of psychological distress during the COVID-19 pandemic: the roles of coping style and emotional regulation. *J Affect Disord* 2022 Feb 15;299:326-334 [FREE Full text] [doi: [10.1016/j.jad.2021.12.026](https://doi.org/10.1016/j.jad.2021.12.026)] [Medline: [34920036](https://pubmed.ncbi.nlm.nih.gov/34920036/)]
64. Tang W, Hu T, Hu B, Jin C, Wang G, Xie C, et al. Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home-quarantined Chinese university students. *J Affect Disord* 2020 Sep 01;274:1-7 [FREE Full text] [doi: [10.1016/j.jad.2020.05.009](https://doi.org/10.1016/j.jad.2020.05.009)] [Medline: [32405111](https://pubmed.ncbi.nlm.nih.gov/32405111/)]
65. Zhou W, Li P, Lei X, Yuan H. Envision a bright future to heal your negative mood: a trial in China. *Cogn Ther Res* 2021 Aug 11;46(2):343-357. [doi: [10.1007/s10608-021-10246-0](https://doi.org/10.1007/s10608-021-10246-0)]
66. Shen Y, Chan BSM, Huang C, Cui X, Liu J, Lu J, et al. Suicidal behaviors and attention deficit hyperactivity disorder (ADHD): a cross-sectional study among Chinese medical college students. *BMC Psychiatry* 2021 May 18;21(1):258 [FREE Full text] [doi: [10.1186/s12888-021-03247-6](https://doi.org/10.1186/s12888-021-03247-6)] [Medline: [34006240](https://pubmed.ncbi.nlm.nih.gov/34006240/)]
67. Li D, Zou L, Zhang Z, Zhang P, Zhang J, Fu W, et al. The psychological effect of COVID-19 on home-quarantined nursing students in China. *Front Psychiatry* 2021 Mar 26;12:652296. [doi: [10.3389/fpsy.2021.652296](https://doi.org/10.3389/fpsy.2021.652296)] [Medline: [33897502](https://pubmed.ncbi.nlm.nih.gov/33897502/)]
68. Yang K, Wang L, Liu H, Li L, Jiang X. Impact of coronavirus disease 2019 on the mental health of university students in Sichuan Province, China: An online cross-sectional study. *Int J Ment Health Nurs* 2021 Aug;30(4):875-884 [FREE Full text] [doi: [10.1111/inm.12828](https://doi.org/10.1111/inm.12828)] [Medline: [33704896](https://pubmed.ncbi.nlm.nih.gov/33704896/)]
69. Liu K, Duan Y, Wang Y. The effectiveness of a web-based positive psychology intervention in enhancing college students' mental well-being. *Soc Behav Pers* 2021 Aug 04;49(8):1-13. [doi: [10.2224/sbp.10459](https://doi.org/10.2224/sbp.10459)]
70. Carciofo R. Morning affect, eveningness, and amplitude distinctness: associations with negative emotionality, including the mediating roles of sleep quality, personality, and metacognitive beliefs. *Chronobiol Int* 2020 Nov 13;37(11):1565-1579. [doi: [10.1080/07420528.2020.1798978](https://doi.org/10.1080/07420528.2020.1798978)] [Medline: [32787687](https://pubmed.ncbi.nlm.nih.gov/32787687/)]
71. Yen J, Yen C, Wu H, Huang C, Ko C. Hostility in the real world and online: the effect of internet addiction, depression, and online activity. *Cyberpsychol Behav Soc Netw* 2011 Nov;14(11):649-655. [doi: [10.1089/cyber.2010.0393](https://doi.org/10.1089/cyber.2010.0393)] [Medline: [21476897](https://pubmed.ncbi.nlm.nih.gov/21476897/)]
72. Zheng X, Guo Y, Ma W, Yang H, Luo L, Wen L, et al. A longitudinal study on the mental health of college students in Jinan during the peak stage of the COVID-19 epidemic and the society reopening. *Biomed Hub* 2021 Oct 12;6(3):102-110 [FREE Full text] [doi: [10.1159/000519586](https://doi.org/10.1159/000519586)] [Medline: [34950671](https://pubmed.ncbi.nlm.nih.gov/34950671/)]
73. Song B, Zhao Y, Zhu J. COVID-19-related traumatic effects and psychological reactions among international students. *J Epidemiol Glob Health* 2021 Mar;11(1):117-123 [FREE Full text] [doi: [10.2991/jegh.k.201016.001](https://doi.org/10.2991/jegh.k.201016.001)] [Medline: [33605116](https://pubmed.ncbi.nlm.nih.gov/33605116/)]
74. Tao X, Chen D, Fan Y, Zhang L, Shan H, Wei Y, et al. A cross-sectional study for the mental health status and sleep quality among college students in Macao during the COVID-19 pandemic. *PeerJ* 2021;9:e12520. [doi: [10.7717/peerj.12520](https://doi.org/10.7717/peerj.12520)] [Medline: [34966578](https://pubmed.ncbi.nlm.nih.gov/34966578/)]
75. Jia Y, Qi Y, Bai L, Han Y, Xie Z, Ge J. Knowledge-attitude-practice and psychological status of college students during the early stage of COVID-19 outbreak in China: a cross-sectional study. *BMJ Open* 2021 Feb 05;11(2):e045034 [FREE Full text] [doi: [10.1136/bmjopen-2020-045034](https://doi.org/10.1136/bmjopen-2020-045034)] [Medline: [33550266](https://pubmed.ncbi.nlm.nih.gov/33550266/)]
76. Dun Y, Ripley-Gonzalez JW, Zhou N, You B, Li Q, Li H, et al. Weight gain in Chinese youth during a 4-month COVID-19 lockdown: a retrospective observational study. *BMJ Open* 2021 Jul 22;11(7):e052451 [FREE Full text] [doi: [10.1136/bmjopen-2021-052451](https://doi.org/10.1136/bmjopen-2021-052451)] [Medline: [34301671](https://pubmed.ncbi.nlm.nih.gov/34301671/)]

77. Yu J, Yang Z, Wu Y, Ge M, Tang X, Jiang H. Prevalence of and factors associated with depressive symptoms among college students in Wuhan, China during the normalization stage of COVID-19 prevention and control. *Front Psychiatry* 2021 Oct 15;12:742950. [doi: [10.3389/fpsy.2021.742950](https://doi.org/10.3389/fpsy.2021.742950)] [Medline: [34721111](https://pubmed.ncbi.nlm.nih.gov/34721111/)]
78. Pan J, Zhuang X. Effectiveness of an adventure-based cognitive behavioral program for Hong Kong university students. *Res Soc Work Pract* 2021 Oct 19;32(2):227-237. [doi: [10.1177/10497315211042096](https://doi.org/10.1177/10497315211042096)]
79. Auyeung L, Mo PKH. The efficacy and mechanism of online positive psychological intervention (PPI) on improving well-being among Chinese university students: a pilot study of the Best Possible Self (BPS) intervention. *J Happiness Stud* 2018 Nov 26;20(8):2525-2550. [doi: [10.1007/s10902-018-0054-4](https://doi.org/10.1007/s10902-018-0054-4)]
80. Zhao C, Xu H, Lai X, Yang X, Tu X, Ding N, et al. Effects of online social support and perceived social support on the relationship between perceived stress and problematic smartphone usage among Chinese undergraduates. *Psychol Res Behav Manag* 2021;14:529-539. [doi: [10.2147/PRBM.S302551](https://doi.org/10.2147/PRBM.S302551)] [Medline: [33976576](https://pubmed.ncbi.nlm.nih.gov/33976576/)]
81. Xin M, Luo S, She R, Yu Y, Li L, Wang S, et al. Negative cognitive and psychological correlates of mandatory quarantine during the initial COVID-19 outbreak in China. *Am Psychol* 2020;75(5):607-617. [doi: [10.1037/amp0000692](https://doi.org/10.1037/amp0000692)] [Medline: [32673008](https://pubmed.ncbi.nlm.nih.gov/32673008/)]
82. Liang K, de Lucena Martins CM, Chen S, Clark CCT, Duncan MJ, Bu H, et al. Sleep as a priority: 24-hour movement guidelines and mental health of Chinese college students during the COVID-19 pandemic. *Healthcare* 2021 Sep 06;9(9):1166 [FREE Full text] [doi: [10.3390/healthcare9091166](https://doi.org/10.3390/healthcare9091166)] [Medline: [34574940](https://pubmed.ncbi.nlm.nih.gov/34574940/)]
83. Sun Y, Lin S, Chung KKH. University students' perceived peer support and experienced depressive Symptoms during the COVID-19 pandemic: the mediating role of emotional well-being. *Int J Environ Res Public Health* 2020 Dec 12;17(24):9308 [FREE Full text] [doi: [10.3390/ijerph17249308](https://doi.org/10.3390/ijerph17249308)] [Medline: [33322751](https://pubmed.ncbi.nlm.nih.gov/33322751/)]
84. Li Y, Qin L, Shi Y, Han J. The psychological symptoms of college student in China during the lockdown of COVID-19 epidemic. *Healthcare* 2021 Apr 11;9(4):447 [FREE Full text] [doi: [10.3390/healthcare9040447](https://doi.org/10.3390/healthcare9040447)] [Medline: [33920411](https://pubmed.ncbi.nlm.nih.gov/33920411/)]
85. Zhu Y, Wang H, Wang A. An evaluation of mental health and emotion regulation experienced by undergraduate nursing students in China during the COVID-19 pandemic: A cross-sectional study. *Int J Ment Health Nurs* 2021 Oct 13;30(5):1160-1169 [FREE Full text] [doi: [10.1111/inm.12867](https://doi.org/10.1111/inm.12867)] [Medline: [33848056](https://pubmed.ncbi.nlm.nih.gov/33848056/)]
86. Zhuo L, Wu Q, Le H, Li H, Zheng L, Ma G, et al. COVID-19-related intolerance of uncertainty and mental health among back-to-school students in Wuhan: the moderation effect of social support. *Int J Environ Res Public Health* 2021 Jan 22;18(3):981 [FREE Full text] [doi: [10.3390/ijerph18030981](https://doi.org/10.3390/ijerph18030981)] [Medline: [33499409](https://pubmed.ncbi.nlm.nih.gov/33499409/)]
87. Li X, Fu P, Fan C, Zhu M, Li M. COVID-19 stress and mental health of students in locked-down colleges. *Int J Environ Res Public Health* 2021 Jan 18;18(2):771 [FREE Full text] [doi: [10.3390/ijerph18020771](https://doi.org/10.3390/ijerph18020771)] [Medline: [33477595](https://pubmed.ncbi.nlm.nih.gov/33477595/)]
88. Zhan H, Zheng C, Zhang X, Yang M, Zhang L, Jia X. Chinese college students' stress and anxiety levels under COVID-19. *Front Psychiatry* 2021 Jun 10;12:615390. [doi: [10.3389/fpsy.2021.615390](https://doi.org/10.3389/fpsy.2021.615390)] [Medline: [34177635](https://pubmed.ncbi.nlm.nih.gov/34177635/)]
89. Ding Y, Fu X, Liu R, Hwang J, Hong W, Wang J. The impact of different coping styles on psychological distress during the COVID-19: the mediating role of perceived stress. *Int J Environ Res Public Health* 2021 Oct 18;18(20):10947 [FREE Full text] [doi: [10.3390/ijerph182010947](https://doi.org/10.3390/ijerph182010947)] [Medline: [34682693](https://pubmed.ncbi.nlm.nih.gov/34682693/)]
90. Zhou Y, Lemmer G, Xu J, Rief W. Cross-cultural measurement invariance of scales assessing stigma and attitude to seeking professional psychological help. *Front Psychol* 2019;10:1249. [doi: [10.3389/fpsyg.2019.01249](https://doi.org/10.3389/fpsyg.2019.01249)] [Medline: [31214074](https://pubmed.ncbi.nlm.nih.gov/31214074/)]
91. Liang Z, Kang D, Zhang M, Xia Y, Zeng Q. The impact of the COVID-19 pandemic on Chinese postgraduate students' mental health. *Int J Environ Res Public Health* 2021 Nov 03;18(21):11542 [FREE Full text] [doi: [10.3390/ijerph182111542](https://doi.org/10.3390/ijerph182111542)] [Medline: [34770056](https://pubmed.ncbi.nlm.nih.gov/34770056/)]
92. Wen F, Zhu J, Ye H, Li L, Ma Z, Wen X, et al. Associations between insecurity and stress among Chinese university students: the mediating effects of hope and self-efficacy. *J Affect Disord* 2021 Feb 15;281:447-453. [doi: [10.1016/j.jad.2020.12.047](https://doi.org/10.1016/j.jad.2020.12.047)] [Medline: [33360366](https://pubmed.ncbi.nlm.nih.gov/33360366/)]
93. Lin X, Zhang C, Yang S, Hsu M, Cheng H, Chen J, et al. Stress and its association with academic performance among dental undergraduate students in Fujian, China: a cross-sectional online questionnaire survey. *BMC Med Educ* 2020 Jun 03;20(1):181 [FREE Full text] [doi: [10.1186/s12909-020-02095-4](https://doi.org/10.1186/s12909-020-02095-4)] [Medline: [32493378](https://pubmed.ncbi.nlm.nih.gov/32493378/)]
94. Caravaca-Sánchez F, Aizpurua E, Stephenson A. Substance use, family functionality, and mental health among college students in Spain. *Soc Work Public Health* 2021 Feb 17;36(2):221-231. [doi: [10.1080/19371918.2020.1869134](https://doi.org/10.1080/19371918.2020.1869134)] [Medline: [33463401](https://pubmed.ncbi.nlm.nih.gov/33463401/)]
95. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health* 2020 Mar 06;17(5):1729 [FREE Full text] [doi: [10.3390/ijerph17051729](https://doi.org/10.3390/ijerph17051729)] [Medline: [32155789](https://pubmed.ncbi.nlm.nih.gov/32155789/)]
96. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res* 2020 May;287:112934 [FREE Full text] [doi: [10.1016/j.psychres.2020.112934](https://doi.org/10.1016/j.psychres.2020.112934)] [Medline: [32229390](https://pubmed.ncbi.nlm.nih.gov/32229390/)]
97. Wang X, Hegde S, Son C, Keller B, Smith A, Sasangohar F. Investigating mental health of US college students during the COVID-19 pandemic: cross-sectional survey study. *J Med Internet Res* 2020 Sep 17;22(9):e22817 [FREE Full text] [doi: [10.2196/22817](https://doi.org/10.2196/22817)] [Medline: [32897868](https://pubmed.ncbi.nlm.nih.gov/32897868/)]

98. Zou P, Sun L, Yang W, Zeng Y, Chen Q, Yang H, et al. Associations between negative life events and anxiety, depressive, and stress symptoms: A cross-sectional study among Chinese male senior college students. *Psychiatry Res* 2018 Dec;270:26-33. [doi: [10.1016/j.psychres.2018.09.019](https://doi.org/10.1016/j.psychres.2018.09.019)] [Medline: [30243129](https://pubmed.ncbi.nlm.nih.gov/30243129/)]
99. Mak IWC, Chu CM, Pan PC, Yiu MGC, Chan VL. Long-term psychiatric morbidities among SARS survivors. *Gen Hosp Psychiatry* 2009 Jul;31(4):318-326 [FREE Full text] [doi: [10.1016/j.genhosppsych.2009.03.001](https://doi.org/10.1016/j.genhosppsych.2009.03.001)] [Medline: [19555791](https://pubmed.ncbi.nlm.nih.gov/19555791/)]
100. Yalcin I. Relationships between well-being and social support: a meta analysis study. *Turkish J Psych* 2015;26(1):21-32. [doi: [10.5080/u7769](https://doi.org/10.5080/u7769)]
101. Zhu S, Zhuang Y, Ip P. Impacts on children and adolescents' lifestyle, social support and their association with negative impacts of the COVID-19 pandemic. *Int J Environ Res Public Health* 2021 Apr 29;18(9):4780 [FREE Full text] [doi: [10.3390/ijerph18094780](https://doi.org/10.3390/ijerph18094780)] [Medline: [33947146](https://pubmed.ncbi.nlm.nih.gov/33947146/)]
102. Meshi D, Ellithorpe ME. Problematic social media use and social support received in real-life versus on social media: associations with depression, anxiety and social isolation. *Addict Behav* 2021 Aug;119:106949. [doi: [10.1016/j.addbeh.2021.106949](https://doi.org/10.1016/j.addbeh.2021.106949)] [Medline: [33934007](https://pubmed.ncbi.nlm.nih.gov/33934007/)]
103. Fu C, Wang G, Shi X, Cao F. Social support and depressive symptoms among physicians in tertiary hospitals in China: a cross-sectional study. *BMC Psychiatry* 2021 Apr 29;21(1):217 [FREE Full text] [doi: [10.1186/s12888-021-03219-w](https://doi.org/10.1186/s12888-021-03219-w)] [Medline: [33926402](https://pubmed.ncbi.nlm.nih.gov/33926402/)]
104. Pössel P, Burton SM, Cauley B, Sawyer MG, Spence SH, Sheffield J. Associations between social support from family, friends, and teachers and depressive symptoms in adolescents. *J Youth Adolesc* 2018 Feb 10;47(2):398-412. [doi: [10.1007/s10964-017-0712-6](https://doi.org/10.1007/s10964-017-0712-6)] [Medline: [28695369](https://pubmed.ncbi.nlm.nih.gov/28695369/)]
105. Rahman M, Amin R, Liton M, Hossain N. Disha: an implementation of machine learning based Bangla healthcare chatbot. 2019 Presented at: 22nd International Conference on Computer and Information Technology (ICCI); December 18-20, 2019; Bangladesh. [doi: [10.1109/iccit48885.2019.9038579](https://doi.org/10.1109/iccit48885.2019.9038579)]
106. Hao K. The pandemic is emptying call centers. AI chatbots are swooping in. *MIT Technology Review*. 2020 May 14. URL: <https://www.technologyreview.com/2020/05/14/1001716/ai-chatbots-take-call-center-jobs-during-coronavirus-pandemic/> [accessed 2022-02-07]
107. Judson T, Odisho A, Young J, Bigazzi O, Steuer D, Gonzales R, et al. Implementation of a digital chatbot to screen health system employees during the COVID-19 pandemic. *J Am Med Inform Assoc* 2020 Jul 01;27(9):1450-1455 [FREE Full text] [doi: [10.1093/jamia/ocaa130](https://doi.org/10.1093/jamia/ocaa130)] [Medline: [32531066](https://pubmed.ncbi.nlm.nih.gov/32531066/)]
108. Miner AS, Laranjo L, Kocaballi AB. Chatbots in the fight against the COVID-19 pandemic. *NPJ Digit Med* 2020 May 4;3(1):65. [doi: [10.1038/s41746-020-0280-0](https://doi.org/10.1038/s41746-020-0280-0)] [Medline: [32377576](https://pubmed.ncbi.nlm.nih.gov/32377576/)]
109. Mittal A, Agrawal A, Chouksey A, Shriwas R, Agrawal S. A comparative study of chatbots and humans. *Int J Adv Res Comput Commun Eng* 2016;5(3):1055-1057. [doi: [10.17148/IJARCC.2016.53253](https://doi.org/10.17148/IJARCC.2016.53253)]
110. AbuShawar B, Atwell E. Usefulness, localizability, humanness, and language-benefit: additional evaluation criteria for natural language dialogue systems. *Int J Speech Technol* 2016 Jan 4;19(2):373-383. [doi: [10.1007/s10772-015-9330-4](https://doi.org/10.1007/s10772-015-9330-4)]
111. Følstad A, Skjuve M. Chatbots for customer service: user experience and motivation. 2019 Presented at: 1st International Conference on Conversational User Interfaces (CUI 2019); August 22-23, 2019; Dublin, Ireland. [doi: [10.1145/3342775.3342784](https://doi.org/10.1145/3342775.3342784)]
112. Escobar DFSS, Noll PRES, Jesus TFD, Noll M. Assessing the mental health of Brazilian students involved in risky behaviors. *Int J Environ Res Public Health* 2020 May 22;17(10):3647 [FREE Full text] [doi: [10.3390/ijerph17103647](https://doi.org/10.3390/ijerph17103647)] [Medline: [32455911](https://pubmed.ncbi.nlm.nih.gov/32455911/)]
113. Leskelä U, Rytälä H, Komulainen E, Melartin T, Sokero P, Lestelä-Mielonen P, et al. The influence of adversity and perceived social support on the outcome of major depressive disorder in subjects with different levels of depressive symptoms. *Psychol Med* 2006 Mar 28;36(6):779-788. [doi: [10.1017/s0033291706007276](https://doi.org/10.1017/s0033291706007276)]
114. Hallgren M, Lundin A, Tee FY, Burström BO, Forsell Y. Somebody to lean on: Social relationships predict post-treatment depression severity in adults. *Psychiatry Res* 2017 Mar;249:261-267. [doi: [10.1016/j.psychres.2016.12.060](https://doi.org/10.1016/j.psychres.2016.12.060)] [Medline: [28131948](https://pubmed.ncbi.nlm.nih.gov/28131948/)]
115. Folkman S. Stress, coping, and hope. *Psychooncology* 2010 Sep 26;19(9):901-908. [doi: [10.1002/pon.1836](https://doi.org/10.1002/pon.1836)] [Medline: [20799373](https://pubmed.ncbi.nlm.nih.gov/20799373/)]
116. Yan L, Gan Y, Ding X, Wu J, Duan H. The relationship between perceived stress and emotional distress during the COVID-19 outbreak: effects of boredom proneness and coping style. *J Anxiety Disord* 2021 Jan;77:102328 [FREE Full text] [doi: [10.1016/j.janxdis.2020.102328](https://doi.org/10.1016/j.janxdis.2020.102328)] [Medline: [33160275](https://pubmed.ncbi.nlm.nih.gov/33160275/)]
117. Reavley N, Jorm A. Prevention and early intervention to improve mental health in higher education students: a review. *Early Interv Psychiatry* 2010 May;4(2):132-142. [doi: [10.1111/j.1751-7893.2010.00167.x](https://doi.org/10.1111/j.1751-7893.2010.00167.x)] [Medline: [20536969](https://pubmed.ncbi.nlm.nih.gov/20536969/)]
118. Davenport TA, Cheng VWS, Iorfino F, Hamilton B, Castaldi E, Burton A, et al. Flip the clinic: a digital health approach to youth mental health service delivery during the COVID-19 pandemic and beyond. *JMIR Ment Health* 2020 Dec 15;7(12):e24578 [FREE Full text] [doi: [10.2196/24578](https://doi.org/10.2196/24578)] [Medline: [33206051](https://pubmed.ncbi.nlm.nih.gov/33206051/)]
119. Kemp J, Chorney J, Kassam I, MacDonald J, MacDonald T, Wozney L, et al. Learning about the current state of digital mental health interventions for Canadian youth to inform future decision-making: mixed methods study. *J Med Internet Res* 2021 Oct 19;23(10):e30491 [FREE Full text] [doi: [10.2196/30491](https://doi.org/10.2196/30491)] [Medline: [34665141](https://pubmed.ncbi.nlm.nih.gov/34665141/)]

120. Chandrashekar P. Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps. *Mhealth* 2018 Mar;4:6. [doi: [10.21037/mhealth.2018.03.02](https://doi.org/10.21037/mhealth.2018.03.02)] [Medline: [29682510](https://pubmed.ncbi.nlm.nih.gov/29682510/)]
121. Abd-Alrazaq AA, Alajlani M, Alalwan AA, Bewick BM, Gardner P, Househ M. An overview of the features of chatbots in mental health: a scoping review. *Int J Med Inform* 2019 Dec;132:103978. [doi: [10.1016/j.ijmedinf.2019.103978](https://doi.org/10.1016/j.ijmedinf.2019.103978)] [Medline: [31622850](https://pubmed.ncbi.nlm.nih.gov/31622850/)]
122. Liu S, Yang L, Zhang C, Xiang Y, Liu Z, Hu S, et al. Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiatry* 2020 Apr;7(4):e17-e18 [FREE Full text] [doi: [10.1016/S2215-0366\(20\)30077-8](https://doi.org/10.1016/S2215-0366(20)30077-8)] [Medline: [32085841](https://pubmed.ncbi.nlm.nih.gov/32085841/)]
123. Zhu Y, Janssen M, Wang R, Liu Y. It is me, chatbot: working to address the COVID-19 outbreak-related mental health issues in China. User experience, satisfaction, and influencing factors. *Int J Hum-Comput Interact* 2021 Nov 01:1-13. [doi: [10.1080/10447318.2021.1988236](https://doi.org/10.1080/10447318.2021.1988236)]
124. Palanica A, Flaschner P, Thommandram A, Li M, Fossat Y. Physicians' perceptions of chatbots in health care: cross-sectional web-based survey. *J Med Internet Res* 2019 Apr 05;21(4):e12887 [FREE Full text] [doi: [10.2196/12887](https://doi.org/10.2196/12887)] [Medline: [30950796](https://pubmed.ncbi.nlm.nih.gov/30950796/)]

Abbreviations

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Edited by T Leung; submitted 24.03.22; peer-reviewed by D Xia, Y Yu; comments to author 25.04.22; revised version received 16.05.22; accepted 27.05.22; published 15.06.22

Please cite as:

Shan Y, Ji M, Xie W, Li R, Qian X, Zhang X, Hao T

Interventions in Chinese Undergraduate Students' Mental Health: Systematic Review

Interact J Med Res 2022;11(1):e38249

URL: <https://www.i-jmr.org/2022/1/e38249>

doi: [10.2196/38249](https://doi.org/10.2196/38249)

PMID:

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