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Journal of Health and Quality of Life

Journal homepage:
https://karyailham.com.my/index.php/jhqol/index
ISSN: 3030-5101

Gender Differences in Mental Well-being Among Chinese College Students: A Bayesian Analysis

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ARTICLE INFO

Article history:
Received 1 July 2025
Received in revised form 18 July 2025
Accepted 31 August 2025
Available online 30 September 2025

Keywords:
Gender differences; mental well-being; mental health; college students; Bayesian analysis

ABSTRACT

This study addressed the growing concern of mental health issues among Chinese college students, a group increasingly vulnerable due to academic pressures and social transitions. Prior research suggests that gender plays a significant role in mental well-being, yet there is limited understanding of these differences within the Chinese higher education context. Focusing on gender as a key factor, this research aimed to fill this gap and inform targeted mental health support strategies. Using a cross-sectional convenience sample of 519 students (mean age = 21.18 years, SD = 2.00; 309 females) recruited via an online platform, mental well-being was assessed with the Short Warwick-Edinburgh Mental Well-Being Scale (overall mean score = 23.30, SD = 3.82). Independent samples t-tests and Bayesian analyses revealed that male students reported significantly higher levels of mental well-being than female students. These gender differences may be influenced by factors such as differential social expectations, coping mechanisms, and greater stigma surrounding mental health issues among females. The findings underscore the need for gender-sensitive mental health interventions in Chinese higher education to promote well-being across all student groups effectively.

1. Introduction

Mental health is understood as a multifaceted construct reflecting an individual's subjective appraisal of health, happiness, and life satisfaction across emotional, psychological, and social domains [1]. It has come to be regarded as an indispensable component of overall health, particularly for young adults transitioning to tertiary education [2].

Extant research uniformly demonstrates that university students exhibit elevated levels of psychological distress relative to their non-student peers [3]. On campuses, compromised mental health is closely linked to developmental difficulties, academic underperformance, and an increased likelihood of withdrawal or dropout [4,5]. Chinese students face more intense academic pressure

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https://doi.org/10.37934/jhqol.7.1.4955

than their Western peers due to heavier homework demands and higher expectations from parents and teachers [6]. This pressure has been linked to various psychological problems.

Accurate evaluation of mental health necessitates instruments with strong psychometric credentials. The WHO-5 Well-Being Index, for example, consists of five items that assess subjective well-being over the preceding two weeks on a six-point Likert scale, with higher scores denoting greater well-being [7]. By contrast, the Psychological Well-Being (PWB) Scale comprises 42 items distributed across six dimensions, including autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance, offering a more comprehensive appraisal of psychological functioning [8]. Complementing these measures, the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) employs 14 items to integrate both experiential and functional aspects of well-being and has repeatedly demonstrated robust reliability and validity across diverse cultural and clinical settings [9].

Individual factors such as age, ethnicity, sex and various psychological traits were linked to poor mental health outcomes [10]. Likewise, Tannenbaum *et al.,* [11] emphasize that differences in mental health between females and males arise from both biological sex and sociocultural gender influences. These gender influences appear to shape mental health outcomes, yet findings among college populations remain inconsistent. For example, a cross-sectional study in Portugal found that female students reported poorer mental health, lower satisfaction with their academic life, and greater self-perceived vulnerability than their male peers [12]. In contrast, longitudinal research in China showed that female undergraduates experienced significantly higher levels of anxiety especially during their first and second years, whereas male students manifested greater depressive symptoms [13]. Similarly, Canadian data collected during the COVID-19 pandemic indicated that female students suffered more pronounced declines in academic performance, heightened social isolation, increased stress, and poorer mental health compared to male students; frequent social media use as a coping mechanism was also associated with worse perceived impacts on academic performance and stress levels among female students [14]. Nevertheless, the precise magnitude and consistency of gender-based differences in mental health among Chinese college students remain to be fully elucidated.

Traditional frequentist approaches to group comparisons may lack sensitivity to detect subtle yet meaningful gender-related variations in samples of moderate size. In contrast, Bayesian methods afford several methodological advantages: they permit the formal incorporation of prior knowledge, yield full posterior distributions for parameters of interest, and support more nuanced inference under conditions of uncertainty [15]. Accordingly, the present study adopts Bayesian estimation to investigate gender differences in mental health among Chinese college students.

This study was to (1) assess the overall mental health levels of male and female Chinese college students; (2) apply Bayesian statistical analysis to provide probabilistic estimates and credible intervals for gender-based comparisons.

2. Methodology

2.1 Study Design

This study employed a cross-sectional design. The reporting adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines to ensure transparency and methodological rigor [16].

2.2 Sample

The study aimed to detect a small effect size (Cohen's d = 0.2) in mental health differences between male and female Chinese college students. A Bayesian two-sided independent samples t-test was planned to evaluate whether gender differences exist in mental health. To achieve sufficient sensitivity, we targeted a 90% probability (Bayesian power) that the Bayes factor (BF_{10}) exceeds 1, assuming the true effect size is d = 0.2. Based on Bayesian sample size planning principles and assuming approximate normality and symmetry in the data, the required sample size was estimated at approximately 215 participants per group (430 total participants) to meet this evidential threshold.

Inclusion criteria required participants to be currently registered college students, regardless of major or year of study (first, second, or third year). Individuals reporting chronic diseases or other conditions that could impede their completion of the study were excluded.

2.3 Instrument

Participants provided demographic information (year of enrollment, age, and gender) and completed the Short Warwick Edinburgh Mental Well-being Scale (SWEMWBS). The SWEMWBS consists of seven positively worded items rated on a five-point Likert scale from 1 ("Never") to 5 ("Always"). Raw scores are summed and then converted to metric scores following the standard transformation procedure, with higher values indicating greater mental well-being. The Chinese version of the SWEMWBS has demonstrated acceptable psychometric properties [17]; in the present study, Cronbach's alpha was 0.779.

2.4 Data Collection

Participants were recruited using convenience sampling through online promotion. Data were collected via an online survey administered on the WJX platform (www.wjx.cn). Participants were provided with a brief introduction to the study and asked to give informed consent electronically. They were assured that participation was anonymous and voluntary, with the freedom to withdraw at any time. A research assistant monitored survey administration and performed data quality checks.

2.5 Data Analysis

Descriptive statistics were calculated for continuous variables (e.g., age, SWEMWBS scores) and categorical variables (e.g., gender). An independent samples t-test and a Bayesian two-sided independent samples t-test were conducted to assess gender differences in SWEMWBS scores. The Bayes factor (BF_{10}) was used to quantify the evidence for or against the hypothesis of a gender difference in mental health. Analyses were performed using appropriate Bayesian statistical software, with prior distributions set based on recommended default values for standardized effect sizes. Results are reported with posterior estimates, credible intervals, and Bayes factors to provide a comprehensive interpretation of the evidence.

3. Results

Of the 525 college students who completed the study, six did not report their gender and were excluded, leaving a final sample of 519 participants (mean age = 21.18 years, SD = 2.00, range = 16–33). The mean SWEMWBS score was 23.30 (SD = 3.82; range = 7–35).

An independent samples t-test was conducted to examine gender differences in mental well-being scores among Chinese college students using the Warwick-Edinburgh Mental Well-being Scale (SWEMWBS). The results revealed a statistically significant difference, t (517) = 3.061, p = .002. Male students (n = 210) reported significantly higher well-being scores (M = 23.91, SD = 3.53) than female students (n = 309; M = 22.88, SD = 3.95). The mean difference was approximately 1.04 points.

Complementing the frequentist results, a Bayesian independent samples t-test yielded a Bayes factor of BF_{10} = 9.14, providing moderate to strong evidence in favor of a gender difference. The posterior median effect size was δ = 0.267 with a 95% credible interval of [0.093, 0.441], suggesting that the data are around 9 times more likely under the alternative hypothesis than the null. This supports the conclusion that gender differences in mental health exist, with male students scoring higher in this sample. See Figure 1.

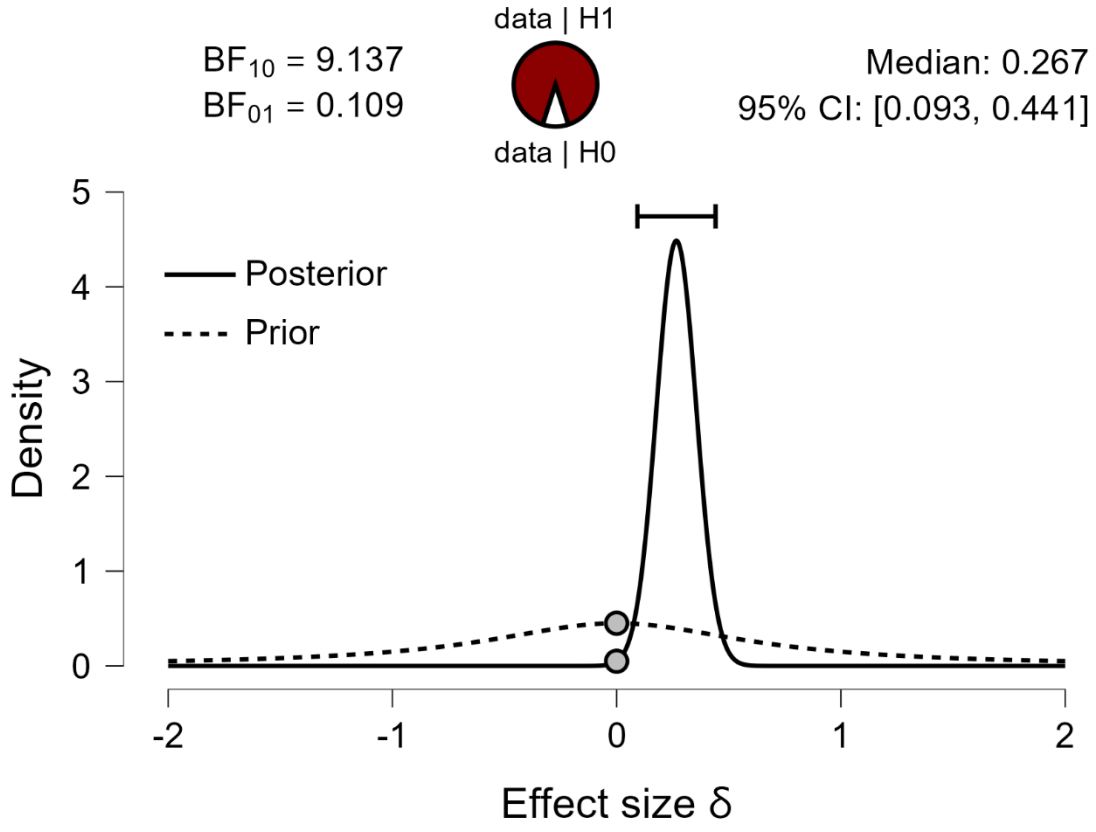

Fig. 1. Bayesian posterior distribution plot (with prior overlay)

4. Discussion

The present study investigated gender disparities in mental health among Chinese college students. Consistent with national enrolment trends in China [18], our sample was predominantly female, and the mean mental health score exceeded that reported in a prior Chinese sample [19]. This divergence likely reflects sampling differences: whereas our participants were exclusively university students, the earlier study drew from a heterogeneous group of working females,

adolescents, and students in Hong Kong and the Chinese mainland. University environments may confer unique psychosocial resources (e.g., peer support, campus counseling services) that elevate average well-being scores relative to more varied community samples.

In line with extant literature in China [20], male undergraduates reported significantly higher mental health than their female peers. This gender gap may be rooted in differential socialization processes, females often internalize stress and report higher levels of anxiety and depression [21], and in persistent cultural expectations that discourage emotional disclosure among men [22]. Additionally, female students may face compounded pressures related to academic achievement, family obligations, and future career uncertainty [23], all of which can lead to worse mental health.

Several theoretical frameworks suggest that gender disparities in mental health emerge from a complex interplay of factors rather than a single source. The diathesis–stress and cognitive vulnerability models [24], for instance, propose that individuals possess preexisting cognitive tendencies, such as negative attributional styles or perfectionistic standards, that, when activated by stress, increase the risk of psychopathology. Empirical evidence indicates that these cognitive vulnerabilities are more common among females [25], helping to account for observed gender gaps in depression and anxiety. Complementing this view, gender socialization theory emphasizes the role of early cultural and familial norms in shaping emotional expression and coping [26]. From childhood onward, girls are often encouraged to be nurturing and emotionally attuned, which may promote rumination and self-criticism, whereas boys are socialized toward stoicism and action-oriented problem solving, potentially leading them to underreport or downplay psychological distress. Together, these models underscore the importance of considering both internal vulnerabilities and socially constructed gender roles when explaining why mental health outcomes differ by gender.

4.1 Limitations

This study had limitations. First, we did not collect detailed data on family background or broader social-environmental factors, both of which can substantially influence mental health. Also, reliance on self-reported instruments introduces the potential for response bias, as participants may alter their answers based on perceived social acceptability. Finally, college students may not always recognize or accurately report emotional disturbances due to limited mental health literacy or prevailing gender stereotypes.

4.2 Implications

This study offers practical recommendations for educators and healthcare professionals, who seek to identify gender-specific risk factors and design-tailored mental health promotion programs on college campuses. Instead of gender-neutral strategies, interventions should be gender-sensitive, indicating recognition of psychological distress and the targeted reduction of risk factors unique to each gender. Effective campus initiatives may include expanded counseling services, support for resilience-building, improved mental health literacy, and efforts to encourage help-seeking.

When designing interventions or conducting future research, it is beneficial to adopt an integrated framework that accounts for biological, psychological, and sociocultural factors. For example, counseling centers could offer group workshops focused on assertiveness, stress management, and life skills, while student affairs departments might collaborate with peer mentoring programs to enhance social support networks. Furthermore, faculty development initiatives should include training to help educators recognize signs of mental health concerns and provide appropriate support and referrals.

5. Conclusions

To sum up, male college students exhibited higher levels of mental health than their female counterparts. These findings underscore gender as a determinant of student mental health and suggest that gender-sensitive strategies may be essential for effectively promoting health among college populations.

Acknowledgement
This work was supported by the Philosophy and Social Sciences Special Project of the Shanghai Municipal Education Commission (Grant number: 2023ZSD011).

Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this paper. No financial support, grants, or other forms of compensation were received that could have influenced the outcomes of this work. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions Statement
Cheng Cheng conceptualized and designed the study, supervised the project, performed the experiments, analyzed the data, interpreted the results, wrote and revised the manuscript. All authors read and approved the final version.

Data Availability Statement
All data are available from the corresponding author upon reasonable request.

Ethics Statement
The current study was approved by the Human Ethics Committee of the School of Nursing, Fudan University (IRB-2025-04-03). Ethical approval was obtained where required, and informed consent was obtained from all participants involved in the research.

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