



Research article

The relationships between mental health and social media addiction, and between academic burnout and social media addiction among Chinese college students: A network analysis

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ABSTRACT

Background: The rapid growth in the use of social media applications on the internet has significant impacts on mental health, especially among university students. This study aims to explore the network characteristics and core symptoms between social media addiction, mental health issues (anxiety, depression, stress), and academic burnout. Understanding these relationships is crucial for enhancing psychological interventions and improving academic performance in the digital age.

Methods: A cross-sectional study was conducted with undergraduates and doctoral students from Air Force Medical University. Participants (n = 432) completed self-report scales, including the Depression Anxiety and Stress Scale, Academic Burnout Inventory, and Bergen Social Media Addiction Scale. Network analysis was performed using R to model the relationships between study variables, employing Gaussian Graphical Models and the least absolute shrinkage and selection operator technique for robust network estimation.

Results: Bridge Expected Influence results indicate that “Depression” is consistently the most central node, playing a critical role in the network connecting social media addiction, academic burnout, and psychological stress. The study reveals a significant positive correlation between social media addiction and both academic burnout and mental health issues. Particularly, excessive use of social media can distract students, leading to academic burnout, and exacerbating feelings of anxiety and depression.

Conclusion: Social media addiction has a significant impact on the psychological health and academic performance of college students. This study highlights the potential risks associated with social media usage behaviors and provides a scientific basis for developing related intervention

Abbreviations: SMA, Social Media Addiction; AB, Academic Burnout; BEI, bridge expected influence; GGM, Gaussian graphical model; EBIC, extended Bayesian information criterion; LASSO, least absolute shrinkage and selection operator; CI, confidence interval; CS, correlation stability.

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measures. These interventions aim to help college students reduce their dependence on social media, thereby restoring a healthy state of life and study.

1. Introduction

With the widespread adoption of the Internet and smartphones, various usage-related issues have emerged. Social media addiction, characterized as a psychological state, manifests as a maladaptive dependence on social media platforms and may develop into symptoms typical of behavioral addiction [1,2]. A meta-analysis indicated that the overall prevalence of social media addiction reached 24 % across 32 countries and regions, with college students particularly at risk [3]. This form of addiction is marked by obsession, excessive use, and emotional instability, exhibiting similarities to Internet addiction [4], and is often regarded as a subtype. Furthermore, difficulties in social interactions are considered a prerequisite for the development of addiction.

According to the social compensation hypothesis [5] and the theory of compensatory Internet use [6], individuals experiencing social anxiety may resort to online social media as a compensatory mechanism to alleviate feelings of stress and isolation. This behavior serves to fulfill their desire to escape reality, thus making them more vulnerable to social media addiction. Research has shown that individuals with social anxiety are more likely to develop addictive tendencies, particularly towards social media platforms that offer greater opportunities for social comparison. The rapid emergence and growth of short video applications (such as TikTok, Kwai, Instagram, etc.) have significantly influenced various aspects of human life, work, and learning [7,8]. The pervasive use of network technology has also triggered problematic behaviors associated with Internet usage, such as social media addiction, along with mental health issues including anxiety, depression, and stress. Therefore, identifying and understanding the symptoms of problematic technology usage is essential for developing effective intervention strategies aimed at reducing mental health problems and enhancing individual well-being.

Social media addiction refers to the excessive dependence on and addiction to social media or social networking activities. Driven by uncontrollable motivations, an undue focus on social and online engagement can consume significant amounts of time and energy, and adversely affect other important aspects of life [9]. Research indicates that issues related to social networking sites are associated with psychological distress, depression, anxiety, and low self-esteem [10]. In addition, social media use, including addiction, may increase the risk of cybervictimization. Craig et al. applied problem behavior theory and social learning theory to elucidate this association. According to problem behavior theory, risky behaviors often co-occur, and certain individuals possess specific characteristics that make them more susceptible to engaging in such behaviors.

Social media addiction is also closely associated with mental health outcomes [11]. A study involving Bosnian adolescents treated at a state hospital demonstrated that those diagnosed with anxiety and depression reported higher levels of cyber victimization [12]. Another study involving 1691 Malaysian adolescents revealed that individuals with depressive symptoms exhibited a greater tendency toward social media addiction, particularly before and during the COVID-19 pandemic [13], and among Malaysian college students, social media addiction during the COVID-19 pandemic was associated with heightened depressive and anxiety symptoms as well as low self-esteem [14]. Furthermore, research on Chinese college students has indicated that those engaged in social media and gaming environments display elevated symptoms of anxiety and Internet addiction [15]. Overall, these findings underscore the complex interplay between social media addiction and mental health and highlight the need for further research and appropriate intervention strategies.

Anxiety has been shown to significantly affect academic burnout among college students [16]. Research has indicated that anxiety is negatively correlated with academic performance, with learning engagement serving solely as a mediating variable between social anxiety and academic performance. Additionally, social media addiction and learning engagement together create a chained mediating effect between social anxiety and academic performance. This relationship elucidates the potential mechanisms underlying the correlation between social anxiety and academic performance, which is crucial for developing intervention strategies to improve the mental health and academic performance of college students. However, the relationship between social media addiction and academic burnout remains unclear. Another intermediary study suggested that social media addiction acts as a mediator between anxiety and academic burnout [17]. Conversely, social anxiety compromises an individual's ability to navigate social interactions effectively, leading to reduced academic engagement and participation. It has been established that social anxiety negatively impacts classroom participation due to limited communication with instructors. Furthermore, research indicates that individuals experiencing anxiety and depression may isolate themselves and adopt avoidance behaviors to alleviate their anxiety. Such avoidance strategies, including difficulties in learning during class, reluctance to speak, ask questions, engage in discussions, or participate in other learning activities can result in adaptation challenges and absenteeism, subsequently impairing academic performance. Although previous studies have demonstrated that college students with social anxiety exhibit lower academic performance and higher levels of academic burnout [18], research exploring the underlying causes of this relationship is limited. When individuals experience meaning avoidance and anxiety, they may turn to hedonic activities, such as social media or Internet addiction, to escape real-world responsibilities [19]. Therefore, further investigation into the mechanisms by which social anxiety affects academic performance is of great significance for developing academic performance management strategies among college students.

Previous studies paid limited attention to the roles of anxiety, depression, and stress in social media addiction and academic burnout. Issues surrounding social networking sites are closely linked to psychological distress, depression, anxiety, and low self-esteem [20]. Although numerous studies have explored the antecedents of problematic social media behavior and its mediating relationship with anxiety [9], research on the impact of social media use, particularly on how anxiety, depression, stress, and academic

burnout affect social media addiction among college students, remains insufficient. Research indicates that individuals who spend more than 3 h per day on social media are twice as likely to develop depression, anxiety, and other mental health issues as the general population [7]. Social media, as a multifaceted information platform, not only provides channels for information acquisition, communication, and self-expression, but also integrates learning and entertainment functions.

Recent studies have revealed a correlation between social media use and mental health issues among college students. Excessive or prolonged social media use may negatively affect sleep quality among college students, leading to attention deficits and potentially harmful brain neurodevelopment [21]. Moreover, there is a significant positive correlation between social media and video game addiction and the occurrence of mental health disorders, a relationship that has been substantiated [22].

In the context of the ongoing COVID-19 pandemic, social isolation has become more prevalent. Surveys indicate that 70 % of undergraduate students are adversely affected by anxiety, depression, and stress in their academic or work environments [23]. Therefore, this study focused on college students to explore the impact of social media addiction on their mental health and academic burnout. In addition, we looked at the effect of social isolation on subjective feelings such as loneliness, anxiety, and depression as well as objective aspects such as perceived social distance [24]. Furthermore, addiction to short videos negatively impacts college students' learning motivation, directly influencing academic progress, and indirectly exacerbating academic procrastination by reducing attention control. Notably, an individual's tendency toward boredom plays a key role in this process; when the tendency for boredom is high, the adverse effects of short video addiction on attention control are mitigated.

Intrinsic motivation fosters high-quality learning, deep understanding, better academic performance, more effective psychological adjustment, and reduced dropout rates [25]. Park et al. [20] conducted a path analysis involving 160 Korean medical students to investigate the sequential relationships among motivation, stress, depression, and personality traits, creating a feedback loop. This model indicated that stress and motivation may be interconnected, with motivation indirectly influencing stress through academic performance. In a highly competitive environment, students with higher learning ability scores may struggle to maintain good academic performance, potentially leading to increased stress. Conversely, students who score high on the external regulation scale may experience a state similar to that of intrinsic motivation, being significantly influenced by both intrinsic and extrinsic factors. This suggests that the pressure to achieve favorable grades may affect both motivation and stress levels.

Network analysis is a visualization model that represents complex relationships through a series of nodes and the edges between them. This method is widely used in psychometrics and clinical medicine to explore the interconnections and intrinsic relationships between psychological variables or symptoms [26]. In the network structure, centrality indices, also known as centrality, are used to quantitatively assess the core positions of nodes in the network, thus revealing their importance within the entire network. Recently, researchers in clinical psychology have begun constructing network models of the relationships between symptoms within mental disorders. They define symptoms that connect two different mental disorders as "bridge symptoms" [27]. However, in most studies, the centrality indices of bridge symptoms and their specific implications in the network have not been clearly defined.

This study focused on key nodes, such as social media addiction, academic burnout, anxiety, depression, and stress, providing a solid foundation for theoretical research on the regulation of these issues, as well as offering effective entry points for clinical psychological interventions. Through this research, we aimed to better understand the interactions among these key nodes within a network, thereby exploring measures and strategies for addressing social media addiction more accurately and efficiently. This will facilitate further breakthroughs and progress in interdisciplinary fields, such as communication studies, psychology, and psychiatry.

In summary, this study employed network analysis to research the dimensions of social media addiction, management of academic burnout, and anxiety, depression, and stress among college students, aiming to develop a network model that identifies the network structure and core dimensions of these factors. Unlike previous network analyses, this study used bridge connections and explored the core differences between the networks of social media addiction and academic burnout, social media addiction and anxiety, and depression and stress, using bridge expected influence indices while disregarding the individual community network itself. Based on the factors and mechanisms influencing social media addiction, this study aimed to provide clinically effective intervention targets and measures for individual mental health. The goal was to help college students reduce their dependence on social media and restore a healthy lifestyle and study state.

2. Materials and methods

2.1. Participants

This study employed a stratified random sampling method and conducted a survey among undergraduate, master's, and doctoral students at the Air Force Medical University. The study was reviewed and approved by the Medical Ethics Committee of Xijing Hospital affiliated with Air Force Medical University (Approval No.: KY20222135-C-1), and was conducted in accordance with the Declaration of Helsinki guidelines. From December 2022 to March 2023, 489 adults aged 18 and older were recruited. After removing questionnaires with demographic data errors, incomplete responses, and incorrect screening questions, a total of 431 valid questionnaires were obtained, resulting in an 88 % response rate. The participants included 139 males and 292 females, aged between 23 and 39 years (mean age 27.34 ± 2.70). After reading the informed consent form, participants could choose whether to further participate in the study. We are committed to protecting the privacy of all participants.

2.2. Measurements

2.2.1. The Depression Anxiety and Stress Scale (DASS-21)

The scale comprises a total of 21 items, with each subscale of depression, anxiety, and stress consisting of 7 items. Participants rate each item on a 4-point Likert scale ranging from 0 (does not apply) to 3 (applies completely), with higher total scores indicating more severe negative emotions. In China, numerous studies have been conducted to evaluate the psychometric properties of the DASS-21. Gong was the first to introduce the Chinese version of this scale and conducted a survey among college students [28], demonstrating its stable psychometric properties and its ability to reflect the psychological distress experienced by Chinese college students. The DASS-21 has been widely used in various countries and populations, including China, and has shown good reliability and validity. The DASS-21, developed by Lovibond, has demonstrated good internal consistency, with Cronbach's alphas of 0.94 for depression, 0.87 for anxiety, and 0.91 for stress [29]. With a Cronbach's alpha coefficient of 0.90.

2.2.2. Academic Burnout Inventory scale

The Academic Burnout Inventory for college students, developed by Lian Rong, includes a dimension of academic burnout comprising eight items. The scale demonstrates good structural validity and high internal consistency. This inventory uses a five-point rating scale, where reverse-scored items are scored inversely. Higher scores on the scale indicate a higher level of academic burnout experienced by the participants [30]. Cronbach's α coefficient of the scale in the present study was 0.87.

2.2.3. Bergen Social Media Addiction Scale (BSMAS)

The scale consisted of six items evaluating the participants' social media use over the past year. Respondents were required to rate all items on a Likert 5-point scale, ranging from 1 (rarely) to 5 (often). Participants' scores were derived from the total sum of their responses on the scale, with a Cronbach's alpha coefficient of 0.77 in this study [31].

2.3. Statistical analysis

Descriptive statistical analysis was conducted on all data using SPSS 23.0 software, which included calculation of means, standard deviations, and Cronbach's alpha coefficients. Network data analysis and visualization were performed in R (version 4.3.1). In the network, 17 nodes represented various dimensions of three communities, using the Gaussian Graphical Model (GGM) for data fitting. In the GGM, edges (connections between two nodes) represent partial correlations. Model selection was carried out using the graphical lasso algorithm (least absolute shrinkage and selection operator, LASSO) combined with the extended Bayesian information criterion (EBIC) to obtain a more stable and interpretable regularized partial correlation network. The network layout was displayed using the Fruchterman-Reingold algorithm [32]. Network construction and visualization were implemented using the qgraph package in R [33]. In the network, positive correlations were set in blue edges, and negative correlations in red. Thicker edges indicate stronger associations between two symptoms/variables, and vice versa. Expected influence response assessed the importance of each node within the network. A node's predictability indicates the extent to which variations in a node can be predicted and explained by variations in its connected nodes [34]. In the network, predictability was estimated by the upper limit of prediction of its connected nodes,

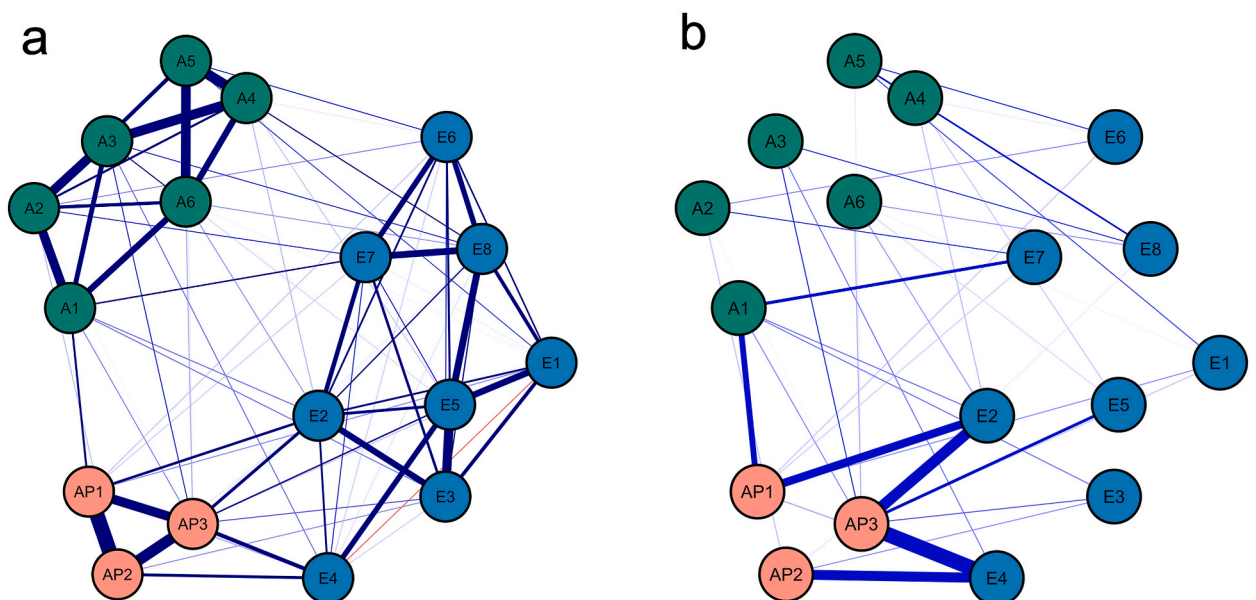


Fig. 1. The anxiety-resilience network model and the bridge expected influence indices among Chinese college students.

represented by a ring around the node. The network’s accuracy and stability were assessed using the bootnet package [35]. Firstly, non-parametric bootstrapping (2000 times bootnet) was used to calculate the 95 % confidence intervals for edge weights to measure their accuracy. Secondly, case-dropping bootstrap was used to obtain the correlation stability coefficient, thus evaluating the stability of nodes’ expected influence. Previous research suggests that correlation stability coefficients should ideally be above 0.5 and not below 0.25 [35]. Finally, bootstrapping (2000 times bootnet) was used for differential testing of edge weights and nodes’ expected influence to assess whether differences between two edge weights or nodes’ expected influences were statistically significant (significance level $\alpha = 0.05$).

3. Results

3.1. Descriptive statistics

In this study, the undergraduate students had an age range of 18–39 years, with a mean (standard deviation) age of 26.89 (2.54) years. The participants included 139 males and 292 females.

3.2. Network analysis

3.2.1. Anxiety, depression, Stress-Academic Burnout-Social Media Addiction network

The Anxiety, Depression, Stress-Academic Burnout-Social Media Addiction network model is depicted in Fig. 1. Within this network, there are 17 nodes and 136 edges (edge weights range from -0.02 to 0.46 , with an average weight of 0.06). Of these, 81 edges are non-zero, and there are 38 inter-community edges in the network.

Network estimations were conducted for the three communities within the Anxiety, Depression, Stress-Academic Burnout-Social Media Addiction network, with descriptions of each node’s dimensions presented in Table 1. The internal structure of the Anxiety, Depression, Stress-Academic Burnout-Social Media Addiction network was estimated, focusing on the Anxiety, Depression, Stress-Social Media Addiction network and the Academic Burnout-Social Media Addiction network, as shown in Fig. 2. As depicted in Fig. 1 (Figs. S1 and S2 of the supplemental material), there are positive correlations between each node and all other nodes in the network.

In the Anxiety, Depression, Stress-Social Media Addiction network, the strongest edges are between AP3 “I feel depressed and unhappy due to my research work” and E4 “After a whole day of academic research, I feel completely exhausted” (edge weight = 0.14), AP3 “I feel depressed and unhappy due to my research work” and E2 “Waking up in the morning, thinking about facing a day of academic research, I feel very tired” (edge weight = 0.11), AP2 “I feel a great deal of pressure from my academic research work” and E4 “After a whole day of academic research, I feel completely exhausted” (edge weight = 0.11), AP1 “I am constantly worried about how to complete my academic research tasks” and E2 “Waking up in the morning, thinking about facing a day of academic research, I feel very tired” (edge weight = 0.10), and AP3 “I feel depressed and unhappy due to my research work” and E5 “I feel weary of academic research” (edge weight = 0.06).

constantly worried about how to complete my academic research tasks” and A1 “Due to these short video apps, I find it difficult to concentrate on studying or working” has an edge weight of 0.08 . In the Academic Burnout-Social Media Addiction network, the edge between A1 “Due to these short video apps, I find it difficult to concentrate on studying or working” and E7 “I want to do academic

Table 1

The means, standard deviations and bridge expected influences of the items in the anxiety-depression- resilience network.

Items	Abbreviation	M	SD	Strength	BEI
DASS					
1 Anxiety	AP1	4.48	1.28	0.52	0.23
2 Stress	AP2	4.59	1.12	0.24	0.14
3 Depression	AP3	4.21	1.36	1.17	0.44
Academic Burnout scale					
1 I feel that the academic knowledge I’ve learned is completely useless.	E1	2.66	1.11	-1.51	0.07
2 Waking up early in the morning, the thought of facing a day of academic research makes me feel very tired.	E2	3.17	1.11	0.69	0.27
3 I find it difficult to maintain a long-lasting passion for academic research	E3	3.23	1.18	-0.04	0.08
4 After a whole day of academic research, I feel completely exhausted.	E4	3.59	0.98	-2.03	0.29
5 I feel tired of academic research.	E5	2.99	1.03	2.01	0.08
6 I often fall asleep while doing academic research.	E6	2.87	1.06	-1.48	0.08
7 I want to do academic research, but I find it very dull.	E7	3.12	1.01	-0.50	0.11
8 Academic research always makes me feel annoyed.	E8	2.78	0.98	0.44	0.11
BSMAS					
1 Due to these short video apps, I find it difficult to concentrate on studying or working.	A1	4.46	1.53	-0.32	0.22
2 Spending more time on these short video apps has led to poor sleep or insomnia.	A2	4.21	1.57	0.51	0.07
3 These short video apps interfere with my social activities.	A3	4.00	1.58	0.04	0.11
4 My family or friends think I spend too much time on these short video apps.	A4	3.75	1.63	0.18	0.03
5 I would feel anxious if I couldn’t access these short video apps.	A5	3.67	1.70	-0.18	0.13
6 I have tried to reduce the time I spend on these short video apps, but without success.	A6	3.95	1.61	0.19	0.06

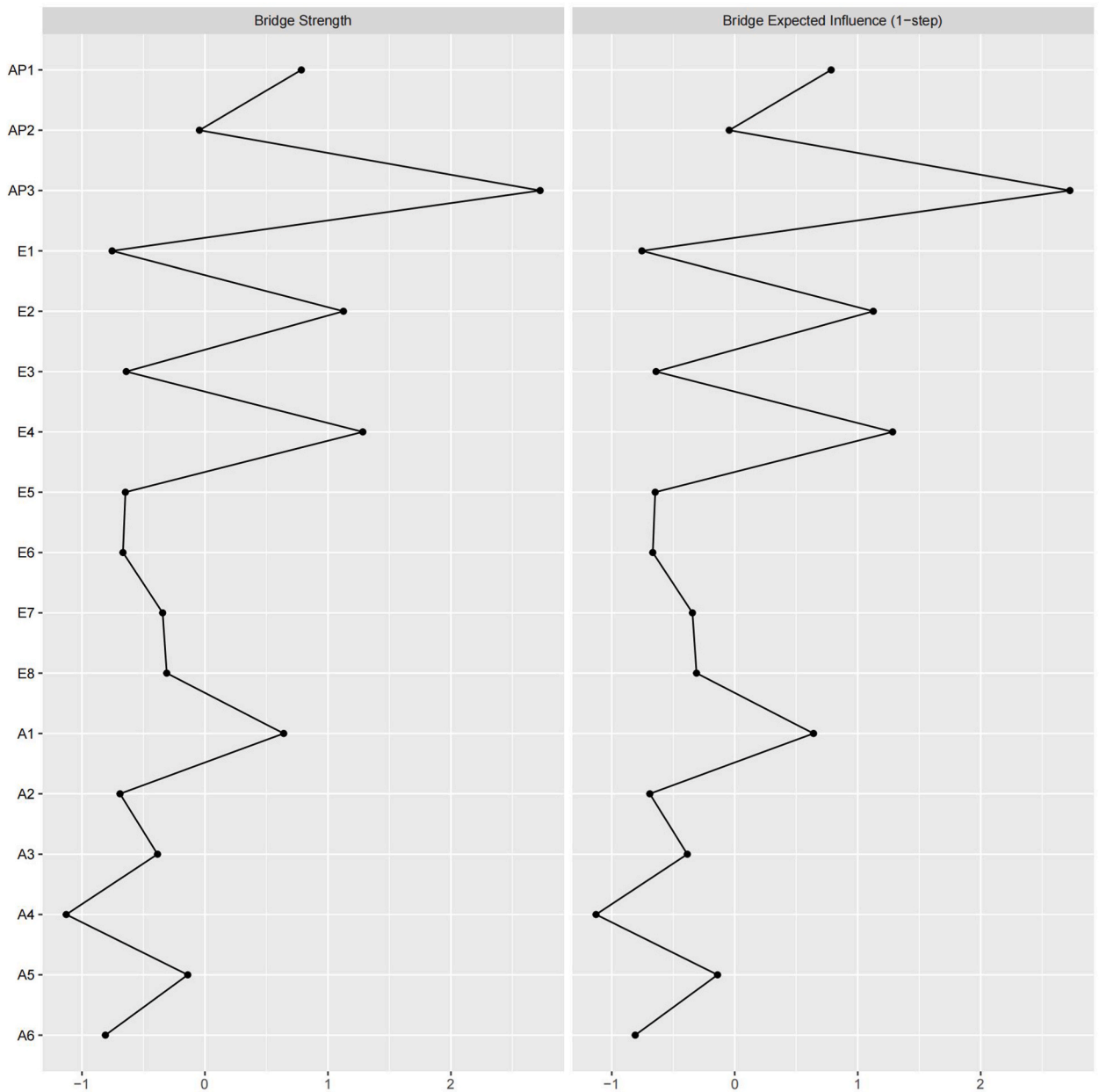


Fig. 2. Bridge expected influence indices in the anxiety-resilience (Z-score).

research, but I find it tedious” has an edge weight of 0.06, and the edge between A4 “My family or friends think I spend too much time on these short video apps” and E8 “Academic research always bores me” has an edge weight of 0.05.

In the Anxiety, Depression, Stress-Social Media Addiction network, as depicted in Fig. 2, node AP3 “I feel depressed and unhappy due to my research work” (BEI = 0.44) and node A1 “Due to these short video apps, I find it difficult to concentrate on studying or working” (BEI = 0.22) have the highest Bridge Expected Influence (BEI) values in their network. Therefore, nodes AP3 and A1 are identified as bridges in the Anxiety, Depression, Stress-Social Media Addiction network, representing risk factors. Conversely, node A4 “My family or friends think I spend too much time on these short video apps” (BEI = 0.03) has the lowest centrality, acting as a protective factor.

Fig. 2 shows that the BEI of AP3 “I feel depressed and unhappy due to my research work” (BEI = 0.44) and A1 “Due to these short video apps, I find it difficult to concentrate on studying or working” is significantly higher than most other nodes in the network ($P < 0.05$). The consistency coefficient (CS) for BEI is 0.75, indicating that the BEI estimates are sufficiently stable (see Fig. 7). The 95 % confidence intervals (CI) for edge weights in the network are narrow, demonstrating accurate assessment of edge weights (see Fig. 3). Bootstrap bias test results for edge weights are shown in Fig. 4. Bootstrap bias test results for node weights are shown in Figs. 5 and 6.

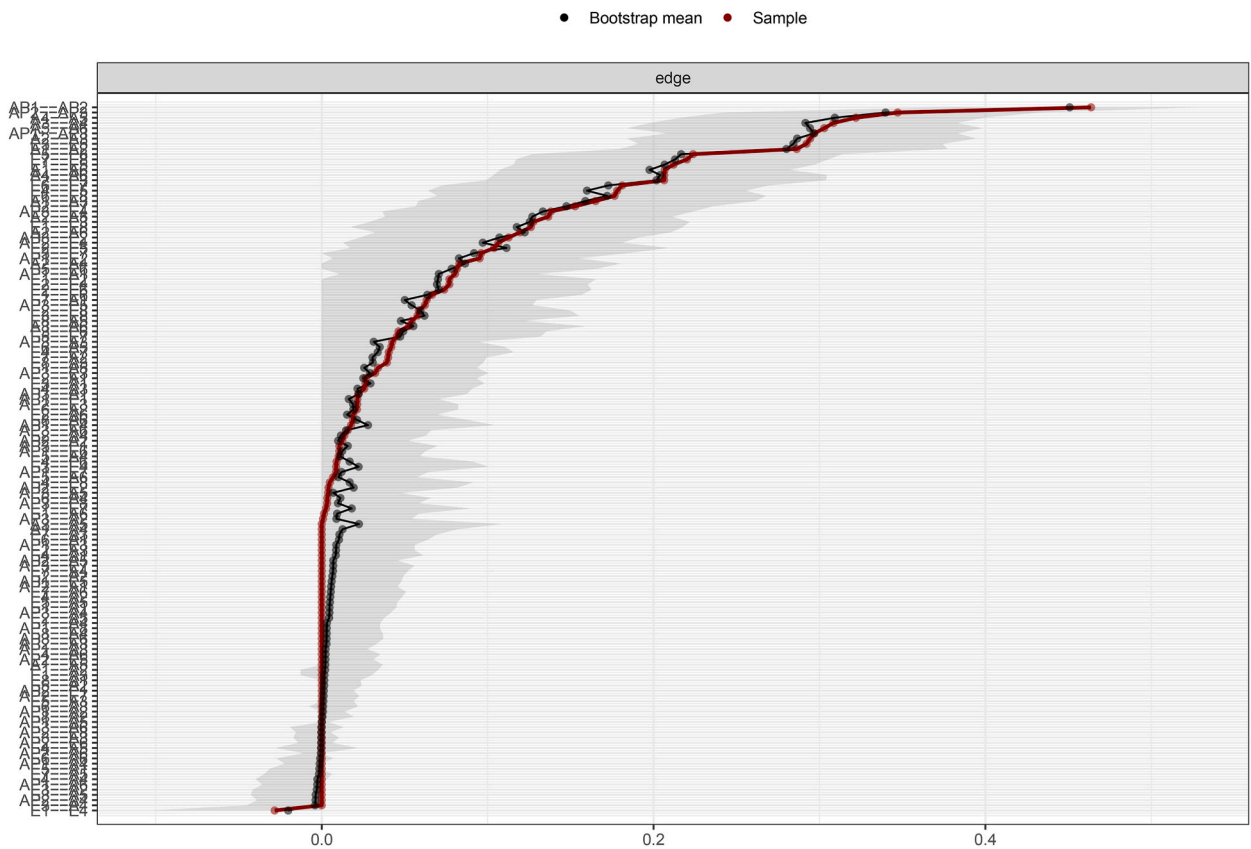


Fig. 3. Accuracy of edge weights in the network.

In the Academic Burnout-Social Media Addiction network, node E4 "After a whole day of academic research, I feel completely exhausted" (BEI = 0.29) and node A1 "Due to these short video apps, I find it difficult to concentrate on studying or working" (BEI = 0.22) have the highest BEI values in their network. Thus, nodes E4 and A1 are identified as bridges in the Academic Burnout-Social Media Addiction network, representing risk factors. Meanwhile, node E1 "I feel that the academic research knowledge I learn is useless" (BEI = 0.07) has the lowest centrality, serving as a protective factor.

4. Discussion

Although numerous studies have investigated the relationships among social media addiction, anxiety, depression, stress, and academic burnout [22,36], this study is the first to employ network analysis to examine the dimensional relationships among these constructs within a unified framework. Results indicated that the dimensions of social media addiction and academic burnout were significantly related to anxiety, depression, and stress. Some dimensions function as central or bridge nodes and play crucial roles in the development and maintenance of anxiety, depression, and stress. This information enhances our understanding of the specific pathways between social media addiction and the psychological constructs of anxiety, depression, stress, and academic burnout. Targeted strategies and interventions have been proposed to prevent negative mental health outcomes.

4.1. The psychopathological pathways between social media addiction and mental health

Network analysis studies of anxiety, depression, and stress have revealed that these three factors are closely interconnected. This finding may indicate comorbidity between anxiety and depression. Persistent anxiety can deplete an individual's energy and emotional resources, leading to feelings of sadness, loss of interest, and negative thinking, which may manifest as depression. When college students face challenges in both internal and external environments, they experience stress. Prolonged or excessive academic stress can increase the risk of depression. If college students cannot effectively cope with stress, they may gradually lose interest and pleasure in life, which can then lead to depressive symptoms [37,38].

Results from this study on social media addiction, anxiety, and depression indicate that both "Anxiety" and "Depression" are significantly positively correlated with A1 "Due to these short video apps, I find it difficult to concentrate on studying or working." This may be attributed to the rich and rapidly updated content of short videos, which can easily capture the college students' attention. For

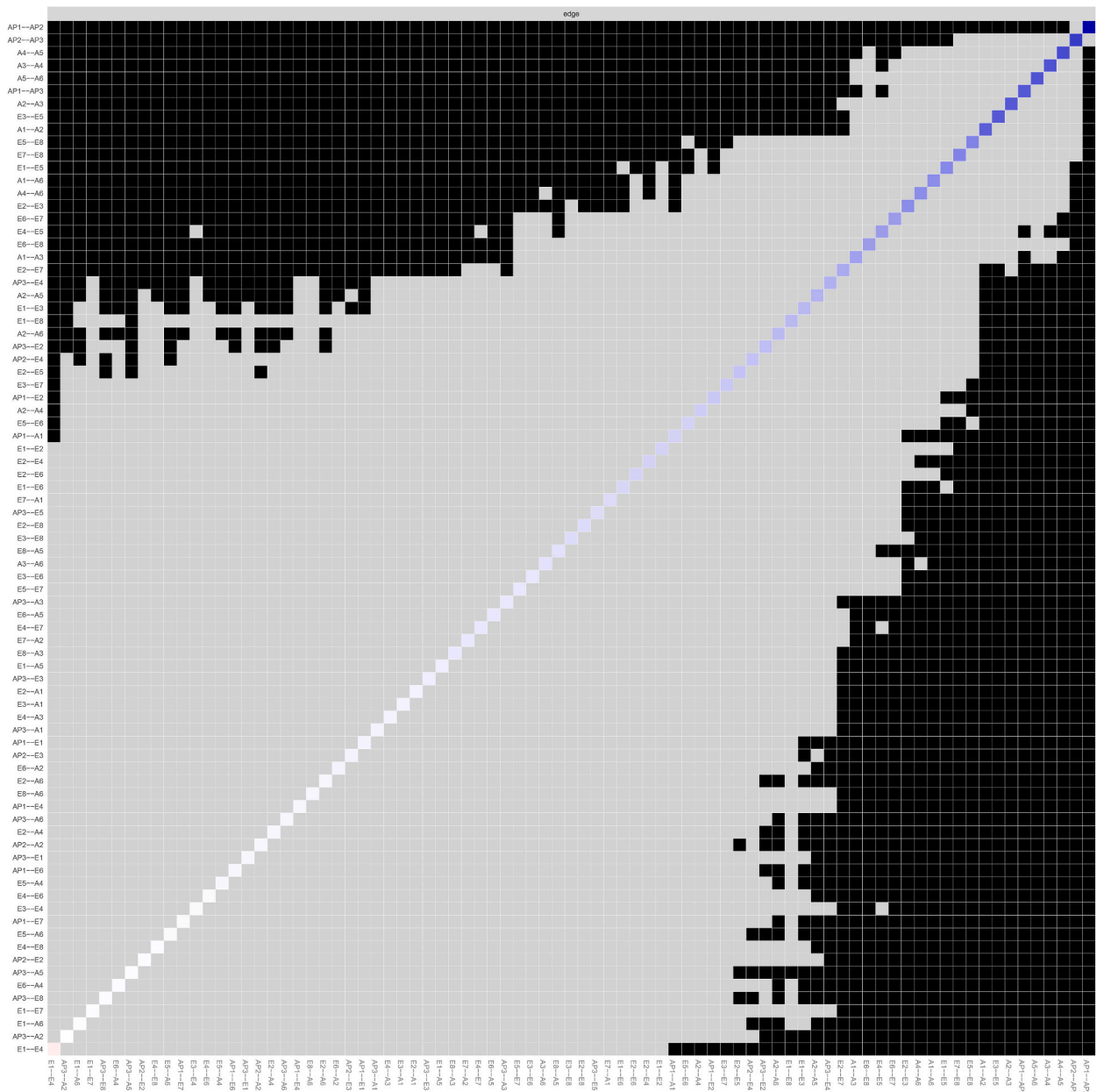


Fig. 4. Bootstrapped difference test for edge weights in the network.

these students, these short video apps may serve as a means of escaping real-world pressures, thereby making it challenging to focus on studies or work. Prolonged use of short video applications may also exacerbate anxiety, creating a vicious cycle that can lead to depression [39,40].

“Depression” is significantly positively correlated with A3 “These short video apps disrupt my social activities.” When college students are engrossed in short videos, they may reduce their interactions with friends and family in real life, thereby disrupting their normal social activities. The excessive use of short videos can lead to greater immersion in the virtual world, further intensifying a sense of alienation from the real world. Additionally, overuse of short video apps may exacerbate depressive symptoms, as a lack of face-to-face social interactions can lead to a lack of emotional support [41] and may increase vulnerability to cyberbullying. Victims of cyberbullying report higher levels of negative psychological sequelae, such as depression, anxiety, and psychological distress [42]. Experiences of cybervictimization can generate feelings of anger, helplessness, and despair, leading to mental health issues [43]. Consistent with previous research findings, Internet and social media addiction were significantly positively correlated with a greater propensity for depression, anxiety, and stress symptoms in this study. Moreover, other factors such as sleep disruption, decreased physical activity, and reduced face-to-face social interactions also impact social media addiction [44].

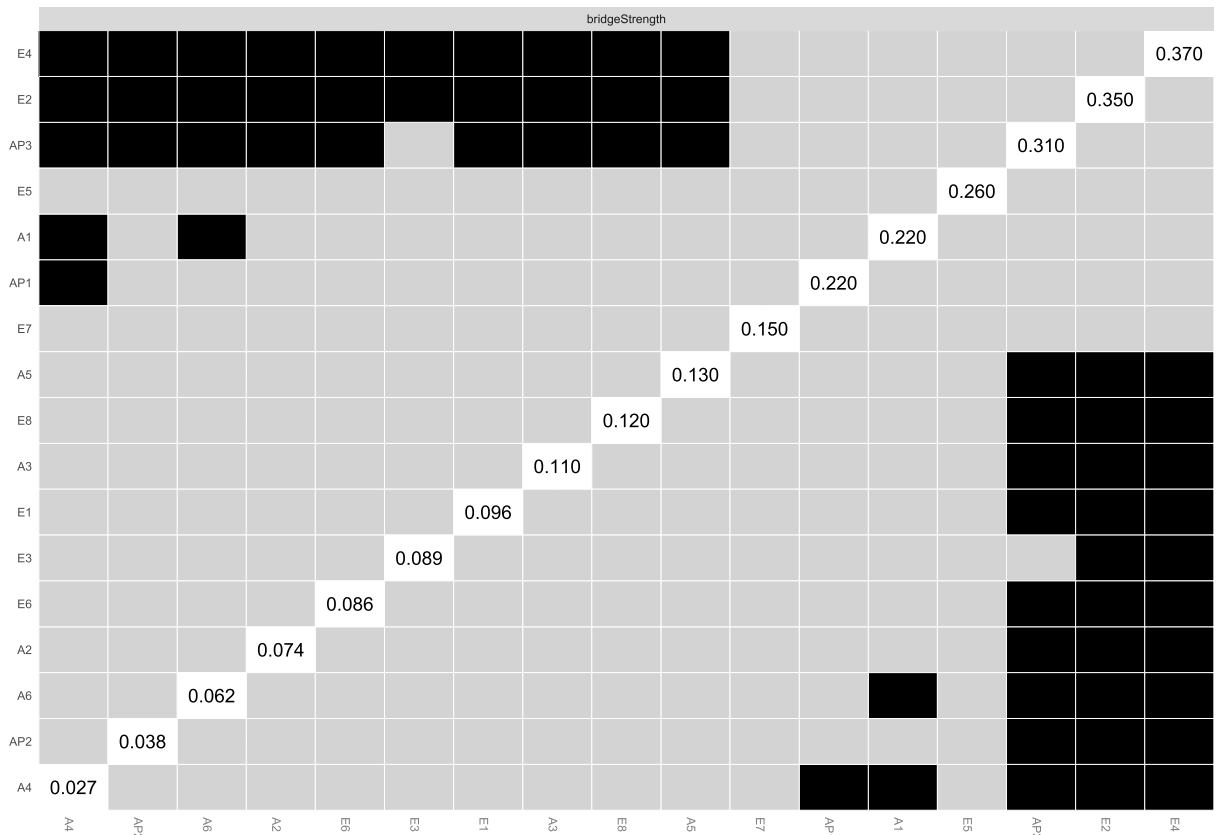


Fig. 5. Stability of node bridge strength and bridge expected influences in the network.

4.2. The psychopathological pathways between social media addiction and academic burnout

The network analysis results between social media addiction and academic burnout indicate a significant positive correlation between A1 "Due to these short video apps, I find it difficult to concentrate on studying or working" and E7 "I want to do academic research, but I find it tedious." This may be because academic research often requires long-term engagement and patient waiting, in contrast to the instant gratification provided by short video apps. This psychological gap may cause individuals to find academic research tedious, leading to academic burnout [45]. Additionally, A1 "Due to these short video apps, I find it difficult to concentrate on studying or working" is significantly correlated with E2 "Waking up in the morning, thinking about facing a day of academic research, I feel very tired." When college students frequently use these apps, it can lead to distracted attention and difficulty in maintaining a focus on research tasks for extended periods. This distraction can diminish the concentration and work efficiency of students. Excessive use of social media and short video apps also consumes substantial mental resources, leading individuals to feel exhausted when facing tasks that require high concentration and thoughtful consideration, such as academic research. This sense of fatigue not only affects students' academic performance but may also negatively impact their mental health [46].

A significant positive correlation exists between A5 "If I cannot access these short video apps, I feel anxious" and E8 "Academic research always bores me." Academic burnout often manifests as a loss of interest and enthusiasm for academic research activities [47]. When college students devote substantial time and energy to social media and short video apps, they may find traditional academic research activities dull and uninteresting. This shift in interest [48] may make it increasingly difficult for students to engage in academic research. Students who develop a dependency on short video apps and experience anxiety and boredom are also more likely to feel disinclined toward academic research activities. This suggests that to alleviate academic burnout and enhance interest in academic research, students need to use social media apps in moderation and cultivate an interest in traditional academic activities. Instructors should also be aware of students' social media usage and provide the necessary psychological support and academic guidance to help them overcome academic burnout and rekindle their passion for research. Additionally, students should be aware of the potential risks associated with social media addiction and take proactive steps to balance social media use with academic research activities.

This study revealed the complex and intricate interrelationships among social media addiction, anxiety, depression, stress, and academic burnout through the application of network analysis. It not only overcomes the limitations of traditional correlation analysis,

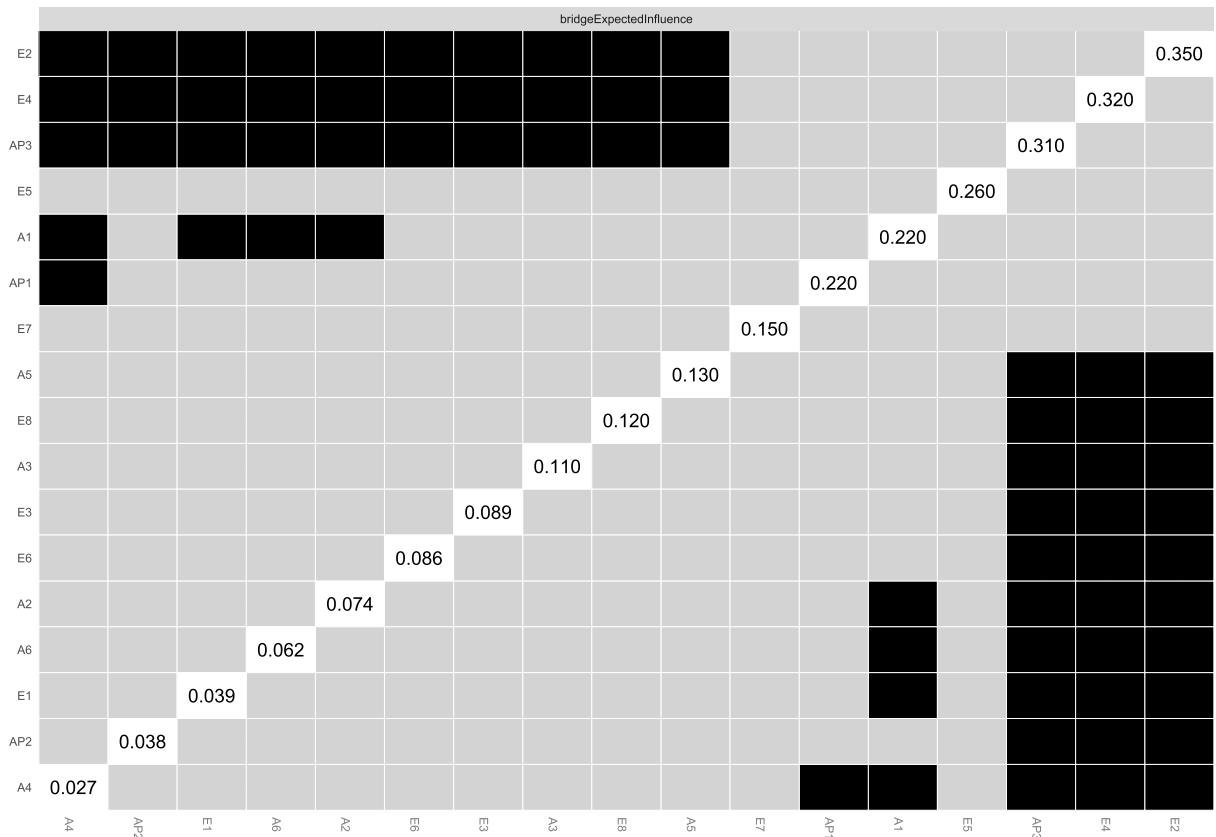


Fig. 6. Bootstrapped difference test for node expected influences in the network.

but also offers a novel perspective on theoretical models by identifying key nodes and bridge symptoms. This deepens our understanding of the mechanisms underlying the development and maintenance of psychological disorders. On a practical level, this method facilitates the development of precise intervention strategies, allows for the dynamic assessment and monitoring of symptom changes, and enables the provision of personalized mental health services. Additionally, its cross-cultural and situational applicability provides universal theoretical and practical guidance for mental health research across diverse cultures and environments, highlighting the significance of this study in both theoretical and clinical contexts.

4.3. Limitations

Our study had certain limitations that future research should address. First, the variables were based entirely on self-report scales from college students. Although we ensured anonymity and included lie-scale questions during the measurement process to minimize bias, this method cannot overcome all the biases associated with self-reporting that affect the accuracy of the data. Second, we utilized a cross-sectional design; therefore, we could not determine the causal relationships and temporal order between social media addiction, anxiety, depression, stress, and symptoms of academic burnout. Finally, the sample was limited to students from Chinese universities. Future studies should consider using more representative longitudinal data to reveal developmental changes and interactions between internal dimensions across different genders and groups.

5. Conclusion

This study utilized network analysis techniques to conduct interdisciplinary research on the relationships among these dimensions of communication studies, psychology, and psychiatry. We investigated social media addiction and academic burnout in the context of anxiety, depression and stress among college students. Our findings highlight that “Depression” may be the most critical core node. Within the context of academic burnout, A4 “My family or friends think I spend too much time on these short video apps” is considered a protective factor for psychological health recovery, while the negative impact of depression and E4 “After a whole day of academic research, I feel completely exhausted” are risk factors. By identifying the central and bridge nodes, our study offers valuable insights for social media professionals and college students, particularly when exploring the intricate relationships between social media addiction

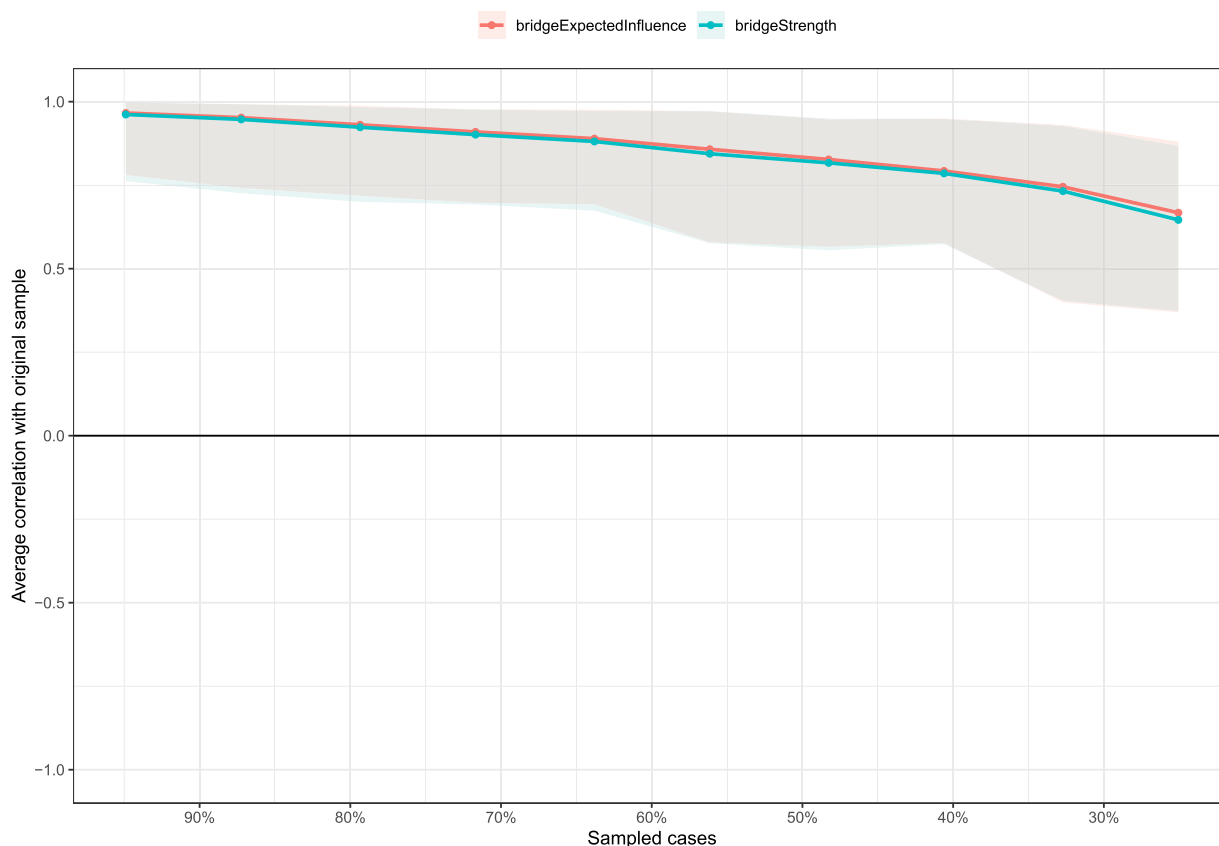


Fig. 7. Bootstrapped difference test for node bridge expected influences in the network.

and anxiety, depression, and stress on a finer scale. This study enriches theories in psychopathology and psychology, provides value to research in the field of psychology, and offers reliable references for clinical intervention practices.

CRediT authorship contribution statement

Tingwei Feng: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation. **Buyao Wang:** Supervision, Investigation. **Mingdi Mi:** Investigation. **Lei Ren:** Methodology. **Lin Wu:** Investigation. **Hui Wang:** Validation. **Xufeng Liu:** Funding acquisition. **Xiuchao Wang:** Validation.

Ethics statement

This study was approved by the Ethics Committee of the Xijing Hospital of Air Force Medical University (NO. KY20222135-C-1).

Data availability statement

Data will be made available on request.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2025.e41869>.

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