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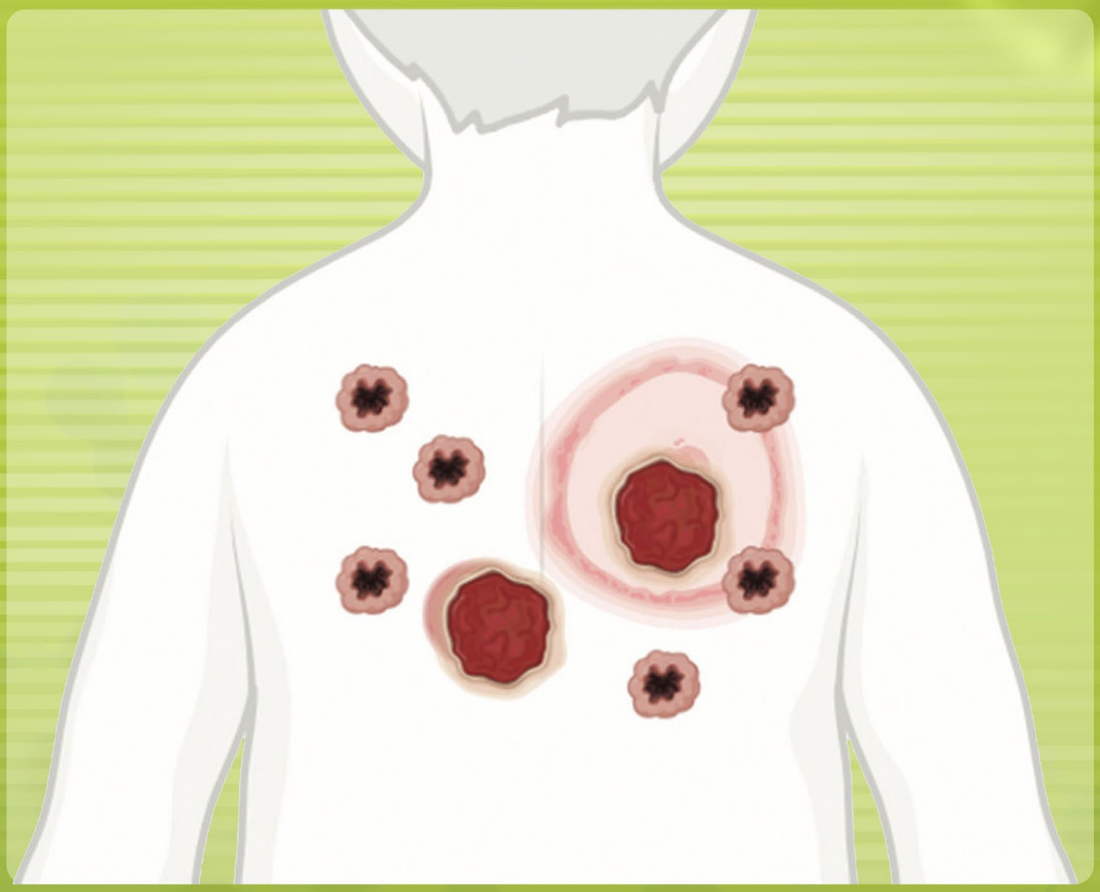

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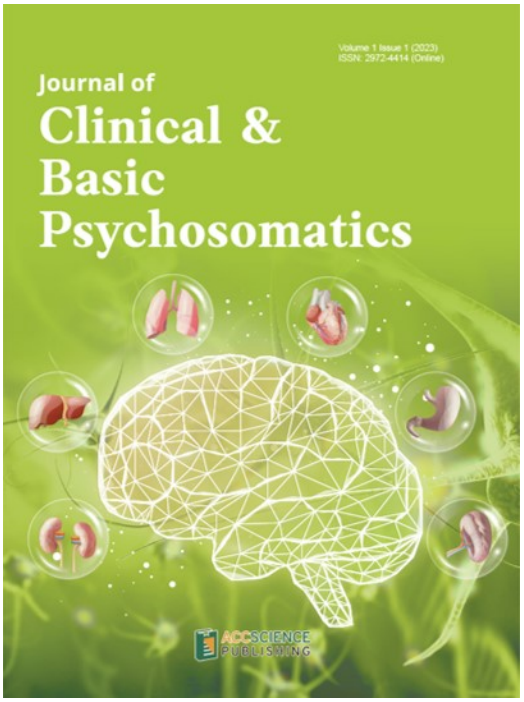

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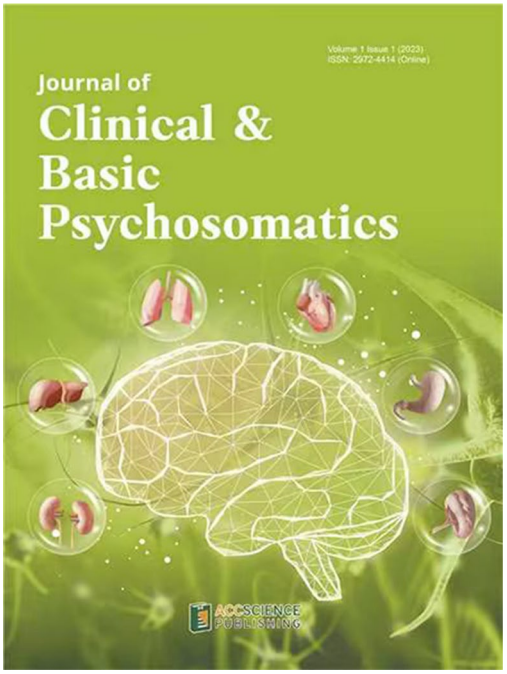

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Volume 3 | Issue 2 | April 2025 | Page 1 – 101 |

Journal of Clinical and Basic Psychosomatics

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CONTENTS

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REVIEW ARTICLE

Theoretical models, mechanisms, assessment methods, and intervention strategies for test anxiety: A narrative review

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Abstract

This study systematically explores the complexities of test anxiety and its effects on students' academic performance. Test anxiety is an immediate response to external stress and is closely linked to intrinsic factors such as personality traits, perfectionism, and metacognitive beliefs. These factors play crucial roles in the development and persistence of anxiety, particularly cognitive worry and intrusive thoughts, that significantly moderate the relationship between perceived control and academic outcomes. Moreover, this study evaluates various interventions for reducing test anxiety such as cognitive-behavioral therapy, imagery reframing, hypnosis, self-hypnosis, and biofeedback devices. Although these interventions have proven effective, their impact varies across discrete cultural contexts, educational levels, and individual traits; therefore, more personalized and adaptable strategies are needed. Moreover, the potential of pharmacological approaches such as prescribing placebos presents new opportunities for clarifying the psychological mechanisms of test anxiety and integrating these findings into practical treatments. Nevertheless, research gaps remain, particularly regarding causal relationships between test anxiety and academic performance. Anxiety is often viewed to cause poor performance, but the reverse can also occur. Future investigations should delve deeper into these dynamics and contemplate the roles of family and school environments, which are often overlooked. The sustainability and effectiveness of interventions can be enhanced by integrating family therapy with school collaborations. In summary, this study advances the existing knowledge of test anxiety and offers valuable insights for future investigations and interventions. It also emphasizes the need for optimized assessment tools and real-time, adaptive interventions to improve students' academic resilience and performance.

Keywords: Test anxiety; Theoretical models; Assessment methods; Intervention strategies

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1. Introduction

Students frequently experience psychological difficulties posed by text anxiety. Test anxiety was included in the Medical Subject Headings in 2021 under the category of performance anxiety. It was defined as anxiety related to situations that assess abilities or knowledge.[1] A

meta-analysis conducted by von der Embse *et al*. indicated that 15 – 20% of U.S. students experienced test anxiety.[2] A significant relationship was observed between gender and test anxiety: females reported significantly higher levels of test anxiety than males.[2] The comorbidity rate of test anxiety with other anxiety disorders is as high as 60%. Test anxiety is particularly associated with disorders such as social anxiety, separation anxiety, panic, and generalized anxiety.[3] Sarason and Mandler first posited the concept of test anxiety in 1952; since then, research on test anxiety has been conducted for more than 70 years and scholars have proposed various definitions of this term.[4] Spielberger postulated test anxiety as a personality trait incorporating cognitive, emotional, and behavioral components that were specific to certain circumstances.[5] Individuals with test anxiety in situations where they are assessed can exhibit symptoms such as excessive worry, intrusive thoughts, mental confusion, tension, and physiological arousal.[6] Zeidner also believed that test anxiety could exert multifaceted effects, encompassing a series of physiological and behavioral reactions accompanied by concerns about potential adverse outcomes such as failure in examinations or similar evaluative situations.[2]

Test anxiety is closely connected with the exam context and is influenced by individual traits. Spielberger classified test anxiety as state test anxiety (STA) and trait test anxiety (TTA) to probe this psychological state more intricately. STA refers to an individual's emotional state during a specific exam situation; meanwhile, TTA denotes a relatively stable component of personality.[6]

Ray Hembree conducted a seminal meta-analysis in 1988 that encompassed 562 studies examining the correlates, causes, effects, and treatments of test anxiety.[7] This work significantly influenced the subsequent understanding of differences observed in test anxiety (e.g., by gender, ethnicity, and age) and its associations (e.g., its consistent link to lower academic performance). Many of Hembree's findings were later corroborated by Seipp's meta-analysis.[8] Ergene's meta-analysis focused on interventions for test anxiety, finding that the most effective treatments ostensibly combined skills-focused approaches with behavioral or cognitive methods.[9] A meta-analysis performed by von der Embse *et al.* involving a systematic review of 238 studies conducted since 1988 revealed the negative impact of test anxiety on academic performance, observed particularly at the secondary school level.[2] Studies have also found that perceived test difficulty, self-esteem, and high-stakes test-taking situations are significant predictors of test anxiety. These findings support earlier models of interference and deficits and validate the modern concept of attentional control theory.

This study searched the literature published on test anxiety after 2018 to note recent developments in research on test anxiety and overview the results reported by current studies on test anxiety. The study objectives include systematically investigating the concept of test anxiety, elucidating the underlying mechanisms through which it manifests and impacts individuals, and exploring the factors contributing to its occurrence. In addition, this study aims to establish reliable methods for assessing the presence of test anxiety in individuals and identify effective strategies for mitigating its effects. Thus, this comprehensive analysis seeks to offer valuable insights that can assist mental health professionals in delivering more effective support to students experiencing test anxiety.

2. Methods

A systematic search was conducted of electronic databases including APA PsycARTICLES, Teacher Reference Center, Academic Search Premier, Medline, and the Educational Resource Information Center. The search encompassed articles published between January 1, 2019, and July 31, 2024. The initial search terms were "test anxiety," "test stress," "exam anxiety," and "exam stress," yielding 2,434 articles. Subsequently, dissertations and gray literature were excluded and only peer-reviewed, scholarly journals with full-text articles published in English were selected. A total of 990 articles remained after the application of these inclusion criteria. A further screening process was performed, requiring the inclusion of studies that identified test anxiety as either an independent, correlational, or dependent variable. The final selection of articles was restricted to journals ranked in the Journal Citation Reports Q1, Q2, and Q3 categories to ensure that the review incorporated high-quality and impactful research. After removing duplicates, the final analysis included 47 articles.

3. Theoretical model

Test anxiety is a complex, multidimensional construct encompassing varied aspects. Thus, its components must be delineated based on the specific manifestations of anxiety experienced during testing situations. Liebert and Morris prepared the groundwork for studying the dimensions of test anxiety by deconstructing the construct into two dimensions: worry and emotion.[10] Worry signifies cognitive concerns about personal performance and the consequences of failure; emotion denotes the autonomic responses of students in test-taking situations. Roos *et al.* built on this foundation and emphasized the importance of adopting an intra-individual approach to understanding test anxiety. They suggested that test anxiety can be divided into multiple components: cognitive, affective,

motivational, and physiological.[11] Their study revealed that these components are both independent and interrelated and that the cognitive component plays a particularly pivotal role in mediating the relationship between perceived control and test performance.

Roos *et al.* extended these findings further and examined how discrete components of test anxiety affect academic outcomes.[12] They highlighted the importance of combining physiological measures including electrodermal activity with traditional self-reports to more comprehensively understand anxiety. Their results confirmed that all anxiety components were negatively correlated with perceived control but only the cognitive component significantly mediated the effects of control on performance. This finding reinforced the importance of cognitive anxiety characterized by intrusive thinking and worry as the most critical determinant of academic success under stress.

4. Mechanism and influence factors

What mechanisms underlie the influence of test anxiety, and what factors contribute to its occurrence? An analysis of the 47 selected articles indicated that test anxiety is influenced by a range of factors including biological variables (e.g., gender and age), intrapersonal variables (e.g., personality traits, perfectionism, and metacognitive beliefs), and academic achievement.

4.1. Biological variables

A significant relationship exists between gender and test anxiety: women report significantly higher levels of test anxiety than men.[13-15] This outcome could be related to the gender discrimination perceived by women. Women can experience higher levels of anxiety because they often hope to prove their capabilities through excellent examination performance to mitigate potential unequal treatment. Results from cross-lagged path analyses indicated that being older and experiencing higher levels of needs frustration significantly predicted higher levels of test anxiety in this sample over time.[15]

4.2. Intrapersonal variables

4.2.1. Personality

Personality is defined as a set of stable, inherent traits and tendencies that determine individual psychological and behavioral patterns (McCrae, 1990).[16] The Big Five Personality Traits is a model representing the highest organizational plane of personality traits identified in contemporary psychological research. This model is widely utilized in the literature to investigate the impact of individual human differences.[17,18] These five fundamental and stable traits are neuroticism (N), extraversion (E), openness (O), agreeableness (A), and conscientiousness (C). Thomas and Cassady indicated that traits such as neuroticism, openness to experiences, and conscientiousness significantly impact the emotional responses of students to test situations. These traits influence students' perceptions of control and the value they assign to academic tasks. This study enriches the existing literature by demonstrating that cognitive test anxiety is not merely a reaction to external pressures; rather, it is deeply intertwined with enduring personality characteristics and differences in individual appraisal processes.

4.2.2. Perfectionism

Recent studies conducted on multidimensional perfectionism and test anxiety have consistently identified perfectionism as a significant predictor of test anxiety. Burcaş and Creţu conducted a meta-analytic review that presents a robust theoretical foundation for the construal of this connection.[19] Their analysis revealed significant positive correlations between dimensions of perfectionism, specifically perfectionist efforts, and concerns, and the cognitive (e.g., excessive worry) and affective (e.g., emotional distress) components of test anxiety. This finding implies that students with stronger perfectionist tendencies are more likely to experience heightened anxiety levels in testing situations, highlighting the detrimental impact of perfectionism on students' mental health.

However, perfectionism and test anxiety are not uniformly associated across different contexts. Lowe afforded this discernment by employing latent profile analysis to categorize U.S. undergraduate students into low, medium, and high test anxiety groups.[14] Lowe found that gender and specific types of perfectionism significantly influenced group classifications. Notably, females and individuals exhibiting heightened perfectionist concerns were more likely to be designated to the high anxiety group. This discovery underscores the importance of considering individual differences such as gender and degree of perfectionism in examining test anxiety. It also suggests that targeted interventions are required to effectively address such factors.

Stricker *et al.* conducted a longitudinal study on secondary school students to further explore the complexities of the perfectionism–test anxiety relationship.[20] They examined the concurrent and predictive relationships between two dimensions of perfectionism, concern over mistakes and personal standards, and test anxiety, measured through cognitive (worry) and affective anxiety (emotionality). Their study confirmed the positive association between perfectionism and current test anxiety but found that these

dimensions of perfectionism did not significantly predict future test anxiety beyond baseline levels. This result evokes questions about whether perfectionism truly drives the development of test anxiety or whether the observed correlations could occur because of overlapping constructs or other underlying factors. Thus, Stricker *et al.*'s study highlights the need for more nuanced investigations to disentangle the temporal and causal aspects of this relationship.

4.2.3. Metacognitive beliefs

Fergus *et al.*'s study offers significant insights into the relationship between metacognitive beliefs and adolescent mental health.[21] They revealed that negative metacognitive beliefs are significantly associated with varied dimensions of test anxiety in middle-school students. In particular, metacognitive beliefs related to the uncontrollability and risks of worrying are associated with dimensions of test anxiety such as cognitive, autonomic, and behavioral responses. These findings highlight the crucial role of negative metacognitive views in explaining test anxiety and imply that such beliefs should be a key focus in the design of psychological interventions for adolescents.

Other research initiatives have expanded upon these findings, indicating that negative metacognitive beliefs are significantly related to test anxiety across all educational levels; however, the specific manifestations of this association could vary depending on the ages and cultural contexts of students.[22]

4.3. Academic performance

Numerous studies have consistently demonstrated significant negative correlations between test anxiety and academic performance. Test anxiety tends to divert students' cognitive resources and thus impairs their examination-related performance. For instance, Alamri and Nazir reported the formation of a detrimental cycle: students with lower academic achievements exhibited higher levels of test anxiety that, in turn, further diminished their academic performance.[23] Plante *et al.* corroborated this finding by observing the close association between test anxiety and prior academic achievements – students who performed poorly in elementary school experienced a significant increase in test anxiety when they transitioned to secondary school, which further affected their academic outcomes.[24] However, this relationship is not always linear. Lower-achieving students typically exhibit higher levels of test anxiety, but high-achieving students can also experience heightened anxiety because of elevated external expectations. Thus, test anxiety is not exclusive to low-achieving students.

Jerrim extended this awareness by exploring the impact of test anxiety on student performance across different cultural contexts. He found that test anxiety can manifest in different ways internationally; however, its negative impact on academic performance is generally consistent.[25] Silaj *et al.* also highlighted the impact of test anxiety on cognitive functioning, revealing that anxiety can undermine students' metacognitive strategies and further compromise their academic performance.[23] In addition, psychological issues such as attention-deficit hyperactivity disorder can exacerbate test anxiety and complicate the relationship between test anxiety and academic outcomes.[26]

5. Assessment methods

Test anxiety is a prevalent issue in academic settings and has been extensively studied. As a result, various scales have been developed to accurately measure its multifaceted nature. These different scales emphasize distinct aspects of test anxiety; thus, assessments may vary depending on the utilized instruments and it is essential to analyze their focal points and limitations. Table 1 displays the dimensions and characteristics of the most employed tools, of which Spielberger's test anxiety inventory (TAI) remains one of the most widely recognized. This instrument is designed to assess the worry and emotionality dimensions of test anxiety. However, TAI presents limitations such as a substantial overlap between these dimensions. These drawbacks have stimulated the construction of more refined instruments.[27]

For instance, Sarason introduced the reactions to tests (RTT) scale to address the limitations of TAI, extending the scope of test anxiety measurement by including components such as test-irrelevant thoughts. However, like the TAI, the RTT faces challenges such as outdated norms and the need for clearer differentiation of its dimensions.[27] In response, researchers designed the revised test anxiety scale, integrating elements from TAI and RTT to maintain the breadth of the TAI while improving its dimensional clarity.[28]

Putwain *et al.*'s multidimensional test anxiety scale (MTAS) built on this foundation. MTAS includes four distinct dimensions: worry, cognitive interference, tension, and physiological indicators. It is a comprehensive tool for the assessment of test anxiety, displaying strong psychometric properties including factorial validity, internal consistency, and test-retest reliability.[27] Meanwhile, Sahin's STA scale further enhances the measurement of test anxiety by focusing on state-level anxiety, offering a more situational evaluation than trait-focused tools.[29]

Scholars have also focused on specific populations, resulting in the development of tailored scales such as

Table 1. The dimensions and characteristics of test anxiety scales

Scales	Developers	Time	Dimensions	Characteristics
TAQ	Sarason	1952	Unidimensional	• First scale used to measure test anxiety
TASC	Sarason	1960	Unidimensional	• Available to students in grades 1 – 6
TAI	Spielberger	1972	• Worry • Emotionality	• Assessment range for test anxiety is extensive and demonstrates high accuracy • Applicable to the recruitment of patients with varying severity of test anxiety • It can assess both TTA and STA depending on administration time
TAS	Sarason	1978	Unidimensional	• Appropriate for epidemiological studies of test anxiety and measurement of mild test anxiety • Suitable for measuring TTA • Revised from TAQ
RTT	Sarason	1984	Worry Test-irrelevant thinking Tension Bodily symptoms	• Sarason posits that test anxiety is characterized by tension rather than emotionality
RTA	Benson	1994	• Worry • Test-irrelevant thinking • Tension • Bodily symptoms	• The precision and breadth of TAI are retained while incorporating RTT's four-factor structure
FTA	Friedman	1997	• Tension • Social derogation • Cognitive obstruction	• Could be a good choice for the assessment of patients with moderate TA
CTAS	Wren, D.G and Benson, J	2004	• Thoughts • Autonomic reactions • Off-task behaviors	• Suitable for elementary school students attending grades 3 – 6
TEQ	Reinhard Pekrun	2004	Positive emotions: • Joy • Hope • Pride • Relief Negative emotions: • Anxiety • Anger • Shame • Hopelessness	• Transcends traditional measures of test anxiety to include a wider range of emotions such as joy, hope, pride, relief, anger, shame, and hopelessness • Based on Pekrun's control-value theory of achievement emotions, which proposes that such emotions are influenced by the test situation's perceived controllability and value
TAM-C	Lowe	2016	• Worry • Cognitive obstruction • Social concerns • Physiological hyperarousal • Task-irrelevant behaviors • Facilitating anxiety	• Aimed at university students
MTAS	Putwain	2021	• Worry • Tension • Cognitive interference • Physiological indicators	• The cognitive dimension is further divided into worry and cognitive interference • The affective dimension is further categorized into tension and physiological indicators

Abbreviations: CBT: Cognitive-behavioral therapy; CTAS: Test anxiety questionary; EDA: Electrodermal activity; ERIC: Educational Resource Information Center; FTA: FRIEDBEN test anxiety scale; IR: Imagery rescripting; MTAS: Multidimensional test anxiety scale; RTA: Revised test anxiety scale; RTT: Reactions to tests; STA: State test anxiety; TAI: Test anxiety inventory; TAM-C: Test anxiety measure for college students; TAQ: Test anxiety questionary; TAS: Test anxiety scale; TASC: Test anxiety scale for children; TEQ: Test emotions questionnaire; TTA: Trait test anxiety.

the Test Anxiety Measure for College Students to address the unique stressors experienced by college students.[30] Similarly, Wren and Benson's Children's Test Anxiety Scale focuses on younger students, refining the measurement of test anxiety to account for cognitive development differences among children.[31]

Besides these advancements, recent research has emphasized the importance of cross-cultural validation and measurement invariance. Studies by von der Embse *et al.* and Ober *et al.* have emphasized the need to ensure that test anxiety scales are applicable across different demographic groups and include considerations of gender, age, and cultural backgrounds.[2,32]

Moreover, Schneider compared measures of test anxiety in different disciplines, evaluating the two test anxiety factors of worry and emotionality across four school subjects (mathematics, physics, German, and English) to deliver insights into the comparability of test anxiety assessments across curricular disciplines.[33]

These developments reflect a broader trend toward sophisticated and context-sensitive tools for assessing test anxiety. These instruments should be refined further in future studies to ensure they remain relevant and effective across diverse educational environments.[29]

6. Interventions

Test anxiety is associated with physiological and psychological symptoms such as stress, fear of failure, and concentration difficulties, which can extend graduation times and cause students to drop out.[2] Various types of interventions have proven effective in reducing test anxiety. Cognitive-behavioral therapy (CBT), combined with study skills training, has consistently been identified as one of the most effective psychological interventions for mitigating test anxiety.[2] Traditional CBT entails weekly 1-h sessions. However, the practicality of extended interventions is often limited in academic settings, where students face heavy coursework and scheduling challenges. Consequently, recent test anxiety intervention designs have tended to focus on reducing the duration and simplifying the implementation of therapeutic approaches.

Imagery rescripting (IR) is a relatively novel intervention that has demonstrated its effectiveness in reducing anxiety in social evaluative situations when it is integrated with CBT over five sessions.[34] Notably, Prinz *et al.* examined the physiological activation and co-activation associated with a six-session IR therapy for test anxiety.[35] Their findings suggest that physiological synchrony between patients and therapists during IR sessions is significantly correlated with positive therapeutic outcomes. Thus, their study highlights the importance of empathic engagement by therapists.

Timely interventions administered shortly before examinations could also be effective. Usichenko *et al.* demonstrated that auricular stimulation targeting specific ear points such as the lungs, Shenmen (name of an acupuncture point in traditional Chinese medicine), kidneys, subcortex, and adrenal gland significantly reduced test anxiety in medical students and improved their sleep quality when applied 1 day before an examination.[36]

Further, scholarly attention has given attention to hypnosis and self-hypnosis techniques for managing test anxiety. Pachaiappan *et al.* conducted a randomized controlled trial that confirmed the efficacy of hypnosis in lowering test anxiety, boosting self-confidence, and enhancing examination performance.[37] Conversely, Dundas *et al.*'s exploration of perceived control during the learning of self-hypnosis identified potential challenges related to the sense of diminished agency, which could undermine the intervention's effectiveness.[38] These studies underscore the potential of hypnosis and self-hypnosis in managing test anxiety; however, they also indicate the need for customizing interventions to individual differences.

McLeod and Boyes' meta-analysis highlighted that social-emotional learning (SEL) strategies effectively reduced test anxiety in college students, leading to significant improvements in their emotional regulation and coping strategies.[39] Similarly, Rosenberg and Hamiel investigated the use of a biofeedback respiratory practice device and reported significant reductions in test anxiety, depression, and anxiety symptoms, along with enhanced psychological well-being.[40] Apostolidis and Tsiatsos explored the impact of anxiety awareness in science exams on the academic performance of college students.[41] They used biofeedback to monitor the anxiety levels of students in real time and found that biofeedback information significantly reduced their test anxiety and increased their self-efficacy. Collectively, these studies indicate that SEL strategies and biofeedback devices show promise as tools to help students better manage anxiety in high-stress academic environments.

In terms of pharmacological interventions, studies have shown that the placebo effect can help manage test anxiety. Buergler *et al.* examined the efficacy of imagined pills and open-label placebos (OLPs) and found that both treatments significantly reduced test anxiety in healthy participants compared with a control group.[42] A systematic review of OLPs revealed subjective benefits across various conditions including well-being, pain, stress, arousal, wound healing, sadness, itching, test anxiety, and physiological recovery; however, it did not note any significant impact on objective outcomes.[43] The review also highlighted that suggestive language influenced the efficacy of such interventions.

Graham *et al.* expanded the awareness of the dynamic nature of test anxiety by studying anxiety fluctuations during an examination.[44] Their study emphasized the non-static nature of test anxiety: it varies throughout

an examination and can thus significantly impact performance. Such temporal inconsistencies imply that interventions to mitigate test anxiety should be adaptable and should target anxiety as it changes over time.

7. Discussion

Gaps remain in the extant research on test anxiety. First, significant correlations have been established between test anxiety and numerous other factors; however, correlation does not imply causation. It is generally assumed in the context of the relationship between test anxiety and academic performance that test anxiety results in poor academic performance; however, poor performance may also trigger test anxiety.[45] Thus, future research initiatives could explore the differential impact of test anxiety at various stages of a semester and ascertain the psychological mechanisms that underpin such disparities.

Furthermore, test anxiety is related to individual aspects as well as external factors such as parenting styles and school environments. Although various intervention methods now exist to mitigate test anxiety, most approaches do not incorporate support from families and schools, which could undermine the sustainability of their effects. Many people consider the college admission rate to be a key indicator of a school's educational quality and the sole driver of the advancement of a school. Such unilateral perceptions instigate societal emphasis on "scores above all" thinking and overplay the importance of examinations for individual development. Intervention designs that entail classroom and school cooperation can help reduce test anxiety more effectively. Likewise, harmonious family relationships and understanding parents can help reduce the negative impact of test anxiety on students. Previous research has indicated that family therapy is effective in enhancing adolescents' psychological states.[46] Notably, Lebowitz *et al.*[47] found that parent-based treatment alone was as effective in mitigating children's anxiety as child-centered CBT. Therefore, more research could be conducted in the future on the efficacy of family therapy for test anxiety.

Prospective research ventures should also focus on refining and validating test anxiety scales across diverse educational and cultural contexts to ensure that they accurately capture the complexities of this psychological phenomenon. In addition, longitudinal studies are needed to explore the temporal dynamics of test anxiety and investigate the fluctuation of anxiety levels over time and during high-stakes examinations. Such studies could inform the development of real-time interventions that can adapt to students' changing emotional states and thus enhance their academic resilience and performance.

8. Limitations

First, in terms of literature sources, the utilized databases are extensive and provide a wide range of academic papers but may not encompass all relevant studies, particularly those published in less accessible or non-indexed journals. Thus, this study could have overlooked important findings from other databases or gray literature such as dissertations, conference proceedings, and government reports. Therefore, this review may not fully represent the existing research on test anxiety.

Second, this study employed a narrative review, which cannot offer comprehensive quantitative evidence. Therefore, the persuasiveness of its results could be limited. Unlike systematic reviews or meta-analyses, narrative reviews do not employ rigorous and transparent methods for literature search and data synthesis. Thus, potential biases could occur in the selection and interpretation of studies. The conclusions derived from narrative reviews are intrinsically more subjective and less robust without the performance of quantitative analyses such as effect size calculations or statistical comparisons. Hence, the generalizability of the findings of this study is limited and the strength of the presented evidence may be undermined.

9. Conclusion

This study's analysis of research on test anxiety conducted from 2018 to the present addresses questions regarding the nature of test anxiety, mechanisms through which it exerts its effects, methods for measuring test anxiety, and strategies for interventions. The findings underscore the importance of considering both cognitive and emotional dimensions in addressing test anxiety. In particular, cognitive concerns and intrusive thoughts have been shown to significantly mediate the relationship between perceived control and academic outcomes; thus, their influence requires further attention. In addition, this review underlined the influence of personality traits, perfectionism, and metacognitive beliefs on test anxiety, indicating that these factors contribute to the development and persistence of anxiety in academic settings.

Analyses of interventions employing methods such as CBT, IR, and biofeedback devices demonstrate that a range of psychological and physiological approaches can effectively reduce test anxiety. However, such interventions vary in efficacy across different contexts and populations. Thus, mental health practitioners should adopt individualized and adaptive treatment strategies and interventions that are tailored to the specific needs of individual students. Moreover, test anxiety is dynamic and fluctuates throughout the duration of an examination; therefore, real-time interventions are essential. For instance, students could better regulate their emotions

at peak anxiety moments using biofeedback devices immediately before or during an examination. Further, recent explorations of pharmacological interventions, such as the application of placebos, offer novel insights into the psychological mechanisms of test anxiety and present new opportunities for incorporating such approaches into therapeutic practices.

Educators play a crucial role in addressing test anxiety. Teachers can cultivate supportive learning environments to mitigate its impact by reducing the emphasis on grades and prioritizing process-oriented learning and personal development. This shift in focus has been evidenced to reduce performance pressure and anxiety. Further, educators should encourage accessible, evidence-based interventions, such as relaxation training, to reduce test anxiety, particularly as examinations approach. Regular mental health assessments can also enable personalized support by identifying students who experience high test anxiety levels and learners who are more achievement-oriented. Finally, positive self-efficacy should be fostered and effective emotional regulation strategies should be inculcated in students as essential components of reducing test anxiety.

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Conflict of interest

Yonggui Yuan is an Editor-in-Chief of this journal but was not in any way involved in the editorial and peer-review process conducted for this paper, directly or indirectly. Separately, other authors declared that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Author contributions

Conceptualization: Yonggui Yuan
Writing – original draft: Run Shi
Writing – review & editing: Yonggui Yuan

Ethics approval and consent to participate

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REVIEW ARTICLE

Assessment tools and factors associated with relapse among patients with alcohol use disorders: A narrative review

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Abstract

Alcohol is a highly addictive substance, and long-term alcohol consumption can lead to mental disorders. Many patients with alcohol use disorders (AUDs) often relapse shortly after receiving treatment following a brief period of abstinence. Identifying the factors influencing relapse is crucial for follow-up treatment and nursing. At present, academic research on AUD and relapse primarily focuses on summarizing clinical symptoms and drug and non-drug treatment methods, with limited analysis of the factors that contribute to relapse. This paper reviews the current understanding of AUD and relapse, along with the assessment tools used, and examines the factors influencing relapse. The aims are to identify key relapse factors in patients with AUD after abstinence and to provide guidance for relevant research, as well as for developing individualized treatment and care plans.

Keywords: Alcohol use disorder; Relapse; Influencing factors

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1. Introduction

Alcohol use disorders (AUDs) are chronic, recurrent mental disorders characterized by compulsive alcohol abuse and a loss of control over alcohol intake.[1] With economic development, the incidence of AUDs continues to rise worldwide, now accounting for 4.9% of substance abusers.[2] From 2010 to 2012, the drinking rates for men and women over the age of 15 in China were 54.6% and 13.3%, respectively, with daily drinking rates reaching 25.7% and 10.9%, respectively. These trends pose significant risks to personal health and social stability.[3] Tucker *et al.*'s[4] survey in 2020 showed that approximately one-third of the United States population had received a lifelong diagnosis of AUDs. Chou *et al.*'s[5] research in 2023 revealed that the prevalence of AUDs in the United States was as high as 9.7% in December, whereas in South Korea, it was 7.1%. According to the Global Burden of Disease 2013 Risk Factors Collaborators, approximately 95 million people worldwide suffer from alcohol dependence.[6] While most patients with AUDs can successfully quit drinking after treatment, a considerable number experience relapse shortly after discharge, leading to a recurrence of the disorder.

Relapse refers to the return to alcohol consumption after successfully quitting during the acute withdrawal period,[7] despite maintaining abstinence for some time. Various factors contribute to this failure to control drinking, ultimately leading to the restoration of AUDs.[7] At present, the mechanisms underlying relapse in AUD patients remain unclear, but it is well-established that long-term heavy drinking causes significant damage to the central nervous system and leads to various mental disorders. Therefore, accurate assessment of alcohol withdrawal, early identification of relapse risks, and an understanding of the factors influencing relapse are essential for maintaining abstinence, reducing relapse rates, and improving patients' quality of life. This review aims to provide an update on the latest research regarding established assessment tools and relapse determinants, as well as to identify novel tools and factors. Our findings may contribute to current treatment practices and serve as a reference for health-care professionals in promoting successful abstinence for AUD patients.

2. Methods

2.1. Literature search and selection

PubMed, Web of Science, PsycINFO, and the Cochrane Library were searched using terms such as "alcohol use disorder," "relapse," "factors," and "tools or questionnaires" for English-language literature published from January 1990 to August 2024. In addition, Chinese databases, including China National Knowledge Infrastructure and Wanfang, were searched using relevant terms to identify Chinese-language literature.

Inclusion criteria were established to select literature that comprehensively considers studies from China and other countries, focusing on research related to AUDs, relapse factors, and care. The selected studies should cover population characteristics in different regions, the impact of cultural backgrounds on AUDs and relapse, as well as corresponding care measures and outcomes. Literature that was duplicated, of low quality, had unreasonable research designs, or solely focused on a single country without cross-country comparisons or comprehensive analyses was excluded.

2.2. Data extraction

Information was extracted from the selected literature, including patients' basic information, characteristics of AUD, relapse-related factors, care measures, and outcomes.

2.3. Comprehensive review

The review was conducted from three perspectives: sociodemographic, individual, and social factors.

For sociodemographic factors, differences in AUDs and relapse across various age, gender, and occupation groups were examined. For example, young people, due to their active social lives, have more opportunities to drink. In some occupations, frequent social engagements increase the risk of relapse.

For individual factors, the impact of genetic susceptibility, psychological states (such as anxiety and depression), and drinking habits on the disorder and relapse were explored. For instance, individuals with a family history of AUD and vulnerable psychological states are more likely to relapse.

For social factors, the roles of social support systems, cultural customs, and policies and regulations were examined. For example, a strong social support system can reduce relapse rates, while regions with a strong drinking culture may present a higher risk for developing AUD.

2.4. Content review

The relevance of the literature to care for AUDs and relapse-influencing factors was evaluated. The review assessed whether the literature comprehensively elaborated on the three types of influencing factors and their corresponding care strategies. Innovation, such as the identification of new influencing factors or unique care strategies, was also examined. The accuracy of the data was verified to ensure the reliability of the underlying research.

2.5. Structural review

For structural review, we assessed whether the title accurately reflected the theme and whether the abstract summarized the key points. The introduction was examined for its explanation of the background and purpose, whereas the logic of the main body was evaluated for clarity. The conclusion was assessed to determine whether it reasonably summarized the key content.

2.6. Methodological review

The literature search process was appraised for comprehensiveness, the screening methods were assessed for scientific rigor, and the overall review process was evaluated to ensure that the quality of the review was maintained.

3. Current situation and assessment instruments for AUDs

According to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a patient can be diagnosed with AUD if they have experienced significant distress or impairment due to alcohol consumption within 12 months, and meet at least two of the 11 clinical symptoms outlined. According to the International Classification of Diseases (ICD-10), AUDs can be categorized into the following types: acute alcohol poisoning, harmful use of alcohol, alcohol dependence syndrome, alcohol withdrawal syndrome, alcohol-induced psychiatric disorders, alcohol-induced mood disorders, alcohol-induced neurocognitive disorders, and other related conditions (Table 1).

3.1. Current situation of AUDs

A comparative risk assessment study[8] in 2018 revealed that approximately 3 million people worldwide die each year due to harmful alcohol use, accounting for 5.3% of all causes of death. In addition, about 132.6 million people experience a reduction in life expectancy due to disability caused by alcohol consumption. Drinking has thus become one of the leading causes of death, disability, and disease burden globally.[9] A cross-sectional study[10] conducted in 2019 reported that the annual prevalence rate of AUDs in the general population of China was 1.8%, with a lifetime prevalence rate of 4.4%.

3.2. Assessment instruments for AUDs

The assessment of the severity of AUDs includes both subjective and objective instruments. Clinically, multiple assessment tools, developed by different organizations, are often used in combination to comprehensively evaluate the severity of AUDs in patients. These tools include the following: (i) AUD Identification Test (AUDIT): the AUDIT is a semi-structured rating scale that assesses three dimensions: alcohol consumption and frequency, alcohol dependence, and alcohol-related issues, with a total of 10 items. The World Health Organization began the collaborative development of AUDIT in 1982. Nearly 2,000 drinkers from six countries participated in its testing, and its use has been promoted globally since 1989. The AUDIT was first introduced and translated into Chinese by the Institute of Mental Health at Peking University in 1999. It was tested on male workers and cadres in 2000 and confirmed to have good reliability and validity in China. (ii) Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR): According to the DSM-5, AUD severity is classified based on the number of clinical symptoms. Two to three symptoms indicate mild AUD, four to five symptoms indicate moderate AUD, and six or more symptoms indicate severe AUD (Table 2). (iii) The ICDs, Tenth Revision, Clinical Modification (ICD-10-CM): The ICD-10 coding system labels AUDs as follows: F10.10 for mild AUD and F10.20 for moderate and severe AUD.

4. Assessment tools for alcohol relapse

Patients with AUDs are often prone to relapse after receiving treatment and successfully quitting drinking. The relapse rate of AUDs patients following abstinence is extremely high, with most relapses occurring within 3 months after discharge. The main reason for this is that alcohol-related cues and the stress induced by consuming even small amounts of alcohol can significantly undermine the patient's determination to quit and negatively affect their quality of life.[11,12] The severity of relapse can be evaluated across multiple dimensions, such as the frequency and amount of alcohol consumption, the degree of alcohol craving, and the impact of relapse on the patient's daily life and social functioning.

4.1. Current situation of relapse

Research from multiple expert and scholar teams worldwide indicates that, after professional treatment and care, the relapse rate for AUD patients who have quit drinking for one year generally remains around 60%.[12-14] Studies on the relapse rate of AUD patients in China are also ongoing. Zhao *et al.*[15] found a relapse rate of 63.7%. A study by Yuan *et al.*[16] reported a 1-year relapse rate close to 50%, with 27.2% of patients relapsing within 1 month of discharge. According to a survey by Wang *et al.*,[17] the relapse rates for AUDs patients who had quit drinking and were discharged from the hospital were 35.1%, 50.3%, and 60.3% at 1 month, 3 months, and 6 months, respectively, with a 6-month mortality rate of 1%. A survey by Shao *et al.*[18] found that relapse occurred between 42 and 75 days

Table 1. Types, onset characteristics, and symptoms of alcohol use disorders in the International Classification of Diseases

Types	Onset characteristics	Symptoms
Acute alcohol poisoning	Occurs shortly after a single large-volume alcohol intake	Initially characterized by excitement, followed by slurred speech, ataxia, confusion, and other symptoms. Generally resolves within a few hours to days without long-term dependence-related effects
Harmful use of alcohol	Repeated alcohol consumption leads to adverse consequences	Physically, it may cause issues such as gastritis and liver disease. Socially, it can affect work performance and family relationships. No increase in tolerance or withdrawal symptoms occurs, and the degree of dependence is not reached
Alcohol dependence syndrome	Develops over prolonged periods of alcohol use	Tolerance increases, requiring a higher amount of alcohol; withdrawal symptoms occur. There is a strong craving for alcohol, difficulty controlling drinking behavior, and alcohol assumes an important role in the person's life
Alcohol withdrawal syndrome	Triggered by abruptly stopping or reducing alcohol intake after long-term heavy drinking	Physical symptoms include tremors, palpitations, sweating, and mental symptoms such as anxiety, insomnia, hallucinations, and delusions. In severe cases, delirium tremens or epileptic seizures may occur
Alcohol-induced psychiatric disorders	Occurs during alcohol use or withdrawal	Mainly characterized by psychotic symptoms such as hallucinations and delusions, including hearing non-existent voices or firmly believing in being persecuted. These symptoms are closely related to alcohol use
Alcohol-induced mood disorders	Emerges during alcohol use or withdrawal	Primarily presents with mood symptoms such as depression and anxiety, which are related to the impact of alcohol on neurotransmitters
Alcohol-induced neurocognitive disorders	Results from prolonged heavy drinking	Characterized by memory loss, cognitive decline, and, in severe cases, symptoms similar to dementia, affecting daily life

Table 2. Eleven clinical symptoms and their specific manifestations of alcohol use disorders in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision

Clinical symptoms	Specific manifestations
Tolerance	There is a need to increase the amount of alcohol consumed, or the effect is reduced when the same amount is consumed
Withdrawal	Withdrawal symptoms occur when alcohol use is stopped, or alcohol is consumed to alleviate withdrawal discomfort
Excessive drinking	The amount of alcohol consumed often far exceeds the planned or intended amount
Lack of control	There are repeated attempts to control alcohol use, but these efforts are unsuccessful
Spending excessive time	A significant amount of time is spent obtaining, consuming alcohol, or recovering from its effects
Giving up important activities due to drinking	Social, work, and other activities are abandoned or reduced due to alcohol use
Continuing to drink despite the harm	Despite being aware that alcohol use causes physical and psychological harms, drinking continues
Craving	There is a strong desire or impulse to drink alcohol
Neglecting other hobbies	Alcohol use takes precedence over other hobbies or interests, subsequently neglected
Drinking in dangerous situations	Drinking continues in dangerous situations, such as when driving
Continuing to drink despite knowing the harm	Although recognizing that alcohol use is harmful, drinking continues

after treatment and discharge, with an average relapse time of 58.12 ± 2.45 days and a relapse rate of 70.00%.

The high relapse rate during the early stages presents a significant challenge in treating AUDs. Repeated drinking severely affects the patient's confidence in retreatment and the effectiveness of withdrawal interventions, leading to further deterioration of their condition and a significant increase in mortality. Identifying the factors contributing to the early high relapse rate in AUD patients who have successfully quit drinking after treatment is crucial. This

knowledge will be used to develop targeted medical and nursing interventions, reduce relapse rates, and prevent the recurrence of AUDs.[19]

4.2. Relapse assessment instruments

4.2.1. Penn alcohol craving scale (PACS)

PACS, developed by Flannery *et al.*,[20] is a single-factor, multidimensional scale consisting of five items across three dimensions. Questions 1 – 3 assess the frequency, intensity, and duration of alcohol consumption, question 4 evaluates the ability to resist drinking, and question 5 measures the average craving level after 1 week of abstinence. The scale uses a 7-point Likert rating system, with scores ranging from 0 to 6, corresponding to the following levels of craving: 0 (no symptoms), 1 (very mild symptoms), 2 (mild symptoms), 3 (noticeable symptoms), 4 (controllable severe symptoms), 5 (difficult-to-control severe symptoms), and 6 (intolerable severe symptoms). A higher score indicates a greater level of alcohol craving. Wang *et al.*[21] confirmed the reliability and validity of the PACS, demonstrating that its content is sound, its structure is consistent, and it meets the standards for psychological assessment. This scale can be used for the clinical assessment of alcohol cravings in AUD patients in China.

4.2.2. Alcohol urge questionnaire (AUQ)

The AUQ developed by Michael *et al.*,[22] is designed to assess the level of alcohol craving in patients. It consists of eight items across three dimensions: craving for a single glass of alcohol, craving when alcohol is available, and difficulty resisting the urge to drink. The scoring system ranges from 1 to 7, with scores from l (completely disagree) to 7 (completely agree). A higher total score indicates the more eager to drink alcohol.

MacKillop[23] confirmed the practicality of the AUQ through experimental studies; however, he noted that the scale could not fully explain the significant differences between AUQ scores and actual alcohol consumption.

4.2.3. Obsessive-compulsive drinking scale (OCDS)

The OCDS, compiled by Anton *et al.*,[24] contains eight items. The scale uses a line segment method for self-assessment, with responses from 1 (completely disagree) to 7 (completely agree). Items 2 and 7 are reverse-scored, which is common practice for assessing alcohol cravings. Wang *et al.*[25] conducted the translation, reliability, and validity assessment of the OCDS, confirming that it has high internal consistency and good retest reliability. These findings support the OCDS as a reliable tool for assessing the severity of AUDs and an effective instrument for screening AUD patients.

4.2.4. Michigan alcohol screening test (MAST)

The MAST is a self-report questionnaire developed by Selzer[26] for screening AUDs. This instrument covers various aspects, such as health status, family problems, and interpersonal relationships affected by alcohol consumption. It also assesses physical and psychological dependence, as well as the effects of drinking on psychological, physical, occupational, and social functioning. The test consists of 25 items, with the first item serving as an introductory question and the remaining 24 items being common questions for patients with alcohol use problems. Each item has only two response options: "yes" or "no." A higher total MAST score indicates more behaviors related to AUDs.

4.2.5. Visual analog scale

The Visual Analog Scale is a single-factor, one-dimensional scale that uses a straight line, corresponding to a score of 0 – 10, to indicate the level of alcohol craving. The scale ranges from "completely unwilling to drink" to "difficult to control the urge to drink." The patient draws a line segment from left to right to indicate their craving level, with the score based on the length of the segment. To minimize bias from visible numerical markers, no specific numbers are marked on the scale.

Among the assessment instruments mentioned above, the PACS demonstrates the best reliability and validity. There are no apparent flaws, and it features fewer questions, lower difficulty, and shorter response time, making it easier for patients to use and providing good feedback. As a result, it is currently the most frequently used and widely employed assessment tool in psychiatry.

5. Factors influencing relapse in AUDs

The mechanism behind relapse in AUD patients remains unclear. A survey conducted by Beijing Anding Hospital Capital Medical University shows that relapse is closely related to factors such as gender, age, employment, residence, education level, drinking habits, family situation, economic status, prior mental illnesses, and medication use.[27] In other words, sociodemographic, individual, and societal factors may all have an impact on the relapse rate among patients.

5.1. Sociodemographic factors

5.1.1. Gender factors

At present, research on relapse in AUD patients, both domestically and internationally, has predominantly focused on males, with limited studies examining the impact of gender on relapse rates. A study by Aguiar *et al.*[28] found that being male is associated with a poorer

prognosis during AUD outpatient treatment. According to a follow-up survey,[17] among the 449 AUD patients, 425 (94.7%) were male, whereas only 25 (5.3%) were females, highlighting the significantly higher proportion of male patients. Although clinical data consistently show that males have a higher incidence of AUDs than females, with increasing social pressures, the prevalence of alcohol abuse and AUDs among females has been rising year by year, which warrants greater attention.[29] After reviewing 24 original studies, Newberry *et al.*[30] concluded that no systematic gender differences in treatment response were found. At present, males remain the primary population affected by AUDs, and further research is needed to clarify the relationship between gender and AUDs.

5.1.2. Age factor

The impact of age on relapse is relatively complex, and there is currently no definitive conclusion regarding its effect. Zhang *et al.*[29] suggest that there is no significant relationship between age and relapse. However, a logistic regression analysis conducted by Cao *et al.*[31] found that being older (odds ratio [OR] = 1.026, 95% confidence interval [CI] = 1.005 – 1.047) is a protective factor against relapse, possibly due to the decline in elderly patients' ability to develop tolerance and withdrawal reactions. On the other hand, a large number of studies have indicated that starting to drink at a young age (OR = 0.94, 95% CI = 0.91 – 0.98) is a significant risk factor for relapse.[27,32] This particular finding highlights the importance of public education, with parents taking responsibility for guardianship and society as a whole working to prevent minors from drinking alcohol, thus reducing the risk of AUDs in youth.

5.1.3. Addiction severity factor

The severity of a patient's addiction, including factors such as the duration of alcohol use, drinking methods, and daily consumption, is an important determinant in relapse risk. Studies by Zhang *et al.*[33] and Shao *et al.*[18] have shown that the more severe the addiction, the higher the likelihood of relapse. Specifically, longer drinking periods (OR = 1.243, 95% CI = 1.082 – 1.404), a higher frequency of drinking on an empty stomach (OR = 1.380, 95% CI = 1.124 – 1.636), and greater daily alcohol consumption (OR = 0.875, 95% CI = 0.645 – 0.978) contribute to more severe psychological problems and greater social harm, which in turn increase the relapse risk.

5.1.4. Family factors

Family-related factors such as the patient's place of residence, family environment, and family history of alcoholism significantly impact the relapse rate. Studies[17,34,35] have shown that AUD patients who live in rural areas (hazard ratio [HR] = 0.674, 95% CI: 0.532 – 0.852), have a broken marriage (OR = 1.76, 95% CI: 1.20 – 2.59), exhibit low family intimacy (OR = 0.872, 95% CI: 1.236 – 5.187), or have a family history of alcoholism (OR = 1.82, 95% CI: 1.24 – 2.69) are more likely to experience higher relapse rates. These patients often face challenges such as limited access to medical care, lower health-care quality,[36] and inadequate emotional support, and necessary supervision and management. In addition, they are more likely to encounter alcohol-related cues, further increasing the risk of relapse.

5.2. Individual factors

5.2.1. Physical disease factors

Long-term heavy drinking can lead to various physical diseases, including liver and cardiovascular conditions. Some AUD patients may, due to worsening physical symptoms and concerns about further alcohol consumption exacerbating their health problems, actively choose to reduce or quit drinking. Therefore, the treatment of AUD patients should not be limited to the cessation of alcohol use alone. Other physical diseases should also be treated simultaneously.[17] In addition, health education should be strengthened to help AUD patients recognize the benefits of quitting alcohol. This awareness can enhance their subjective intention to quit, which is beneficial in prolonging the withdrawal period and significantly reducing the relapse rate.

5.2.2. Sleep factors

Patients with AUDs often experience poor sleep quality (OR = 1.158, 95% CI = 1.024 – 1.324). After consuming alcohol, the blood alcohol concentration rises with the amount ingested, leading to feelings of pleasure and excitement. However, as alcohol is metabolized, blood alcohol level decreases, producing a sedative effect. This phenomenon causes many AUD patients to mistakenly believe that alcohol helps them fall asleep. Wen *et al.*[37] confirmed that AUD patients who scored higher on the Self-Rating Scale of Sleep were more likely to relapse. The worse the sleep quality, the more frequent the alcohol consumption, and the higher the relapse rate among AUD patients seeking high-quality sleep.[27] Therefore, improving the sleep quality among AUD patients can help reduce their cravings and dependence on alcohol.

5.2.3. Personality and mental illness factors

Many AUD patients exhibit personality characteristics that deviate from the norm, such as being solitary, self-centered, nervous, irritable, aggressive, impulsive, sensitive, and suspicious, and often have poor self-control.[38-40] In

addition, a high proportion of AUD patients suffer from other mental disorders, such as anxiety[5] (OR = 1.48, 95% CI = 1.04 – 1.20), depression[41] (OR = 1.1, 95% CI = 1.02 – 1.18), paranoid[42] (OR = 1.154, 95% CI = 1.053 – 1.264), and personality disorder[43] (OR = 1.89, 95% CI = 1.29 – 1.77). These individuals often display emotional apathy and habitual dishonesty and are only interested in drinking alcohol.[34] Consequently, the more severe the mental disorder and the more deviated the patient's personality traits from normal, the lower the subjective motivation of AUD patients to seek treatment, resulting in poorer treatment efficacy and a higher relapse rate.

5.2.4. Treatment compliance factors

Treatment compliance can predict the likelihood of relapse in patients. Adherence to outpatient follow-up (OR = 0.29, 95% CI =0.13 – 0.63) has a positive effect on maintaining abstinence and reducing the relapse rate in AUD patients.[44] On one hand, regular participation in outpatient treatment indicates that the patient has a firm intention to quit drinking and can adhere to the treatment plan prescribed by the healthcare facility. On the other hand, consistent outpatient visits provide personalized, scientifically-based advice, helping them follow oral medication regimens and participate in psychotherapy, exercise therapy, music therapy, and other forms of treatment. Both pharmacological[45] and non-pharmacological[46] approaches can assist in shaping a positive psychological state, alleviating stress from various life and work-related pressures, and improving the patient's mental outlook, which helps them cope with the challenges of life and reduce alcohol cravings. At the same time, doctors and nurses are among the few sources of social support for patients, helping them feel less emotionally isolated,[17] boosting their confidence in quitting alcohol, and providing supervision and management.

5.2.5. Educational level factor

The educational level can affect the relapse rate in AUD patients. Patients with higher levels of education (OR = 0.785, 95% CI = 0.543 – 1.027) have a lower relapse rate, while those with an education level below high school have a higher relapse rate.[33] This occurrence is primarily because patients with lower education levels may not fully understand the harms of alcohol.[47] In contrast, patients with higher education levels tend to have a greater knowledge base and are more receptive to new information related to AUDs. They possess a comprehensive understanding of the potential damage[48] that prolonged and excessive alcohol consumption can cause to the liver, nervous system, etc., which helps them restrain their desire to drink and reduce their relapse risk. Thus, it is important for health-care professionals to provide educational outreach in an accessible manner, raising awareness of AUDs among patients and the general public and emphasizing the dangers of alcohol misuse.

5.2.6. Employment and economic factors

Research by Yang *et al.*[49] shows that employment (HR = 0.61, 95%CI 0.41 – 0.92) acts as a protective factor for alcohol cessation. AUD patients who continue to work after discharge are at a lower risk of relapse, which may be because stable, moderate work enhances patients' self-identity and increases their confidence during rehabilitation. The demands of work often prevent drinking, and the work itself, along with colleagues and supervisors, can play a supervisory and management role. In addition, employment occupies patients' free time, distracts their thoughts of alcohol, and leaves them with less energy for drinking-related behavior.[15] Meanwhile, research indicates that patients with AUDs who are unable to work and maintain only a low income (OR = 1.252, 95% CI = 1.074 – 3.426) face higher relapse rates.[50] Unstable income prevents them from covering basic living expenses or treatment costs, leading them to drink alcohol as a means of avoiding reality. Therefore, patients who are unemployed or have low incomes are more likely to relapse.

5.3. Social factors

5.3.1. Social support factors

In addition to individual factors, social factors also play a significant role in influencing the relapse rate among patients. Related studies show that the level of social support in AUD patients (HR = 0.891, 95% CI = 0.832 – 0.954) is negatively correlated with negative automatic thinking patterns, suggesting that a lack of social support is a primary factor contributing to negative thinking in AUD patients.[51] AUDs severely impair patients' social functioning, with many lacking stable employment and experiencing reduced economic income. Moreover, patients' abnormal personality traits and mental health issues contribute to a lack of emotional support from family and friends, often resulting in strained relationships and a significant decline in objective social support. In addition, AUD patients tend to have low self-confidence and frequently adopt negative coping strategies to deal with difficulties encountered in their work and personal lives.[52] These patients are less able to fully utilize external supervision and emotional support, resulting in decreased utilization of social support and increased relapse rate.

5.3.2. Alcohol-suggestive factor

Compared to ordinary suggestions, AUD patients exhibit a greater desire to drink alcohol after receiving alcohol-

related suggestions. Schacht *et al.*'s[53] meta-analysis indicated that the ventral striatum, anterior cingulate gyrus, and ventromedial prefrontal cortex were activated in AUD patients during alcohol-related suggestions. Another experiment[54] conducted abroad confirmed that when AUD patients were given alcohol-related suggestions and ordinary suggestions separately, they responded more strongly to the former ($F[1,45] = 5.54$, $P = 0.023$, $\eta_p^2 = 0.11$, $r[22] = 0.50$). This response significantly enhanced their craving for alcohol and was not helpful in reducing relapse rates.

5.3.3. Stress factor

Multiple studies,[31,37,55] both domestically and internationally, have shown that negative events in daily life and work (OR = 0.983, 95% CI = 0.970 – 0.995), as well as stress and negative emotions caused by protracted withdrawal syndrome, can significantly increase the relapse rate in AUD patients. To avoid stress and negative emotions, patients may develop a strong desire for alcohol, which significantly strengthens their drinking behavior. Alcohol craving represents the psychological dependence of AUD patients on alcohol,[56] characterized by an internal and uncontrollable desire for alcohol. Repeated drinking in search of pleasure or euphoria is an important factor leading to sustained drinking and relapse in AUD patients after quitting drinking.

5.3.4. Social development factors

The development of AUDs is closely related to the degree of social development. Economic and industrial growth has provided the material foundation for increased alcohol production, and the availability of alcohol has been rising year by year. Various types of alcohol can now be easily purchased in supermarkets, convenience stores, bars, private karaoke rooms, and other venues.[57] Some patients lack determination and are easily tempted to resume drinking. With the accelerated pace of modern life, many interpersonal relationships are often formed around alcohol consumption, and the negative influence of public opinion in television and online media has contributed to a growing number of drinkers. This trend objectively increases the likelihood of developing AUDs.

To summarize, there are currently few relevant studies in China, which are limited to cross-sectional surveys. There is no unified or clear research consensus on the factors influencing relapse in AUD patients after quitting drinking. However, numerous social risk factors, including sociodemographic, individual, and social factors, affect patients from multiple angles, resulting in a high relapse rate after cessation. Both domestic and international studies have indicated that factors such as the degree of addiction, family dynamics, underlying health conditions, work, and economic pressures, stress, and social support play significant roles and should receive special attention.

6. Conclusion

AUDs are a widely recognized substance addiction disorder that not only adversely affects the physical and mental health of patients but also poses significant harm to families and society.

In China, drunk driving and severe racing behavior are classified as "dangerous driving crimes" under the Eighth Amendment to the Criminal Law, which was approved on February 25, 2011, and came into effect on May 1 of the same year. The "Threshold and Testing of Blood and Breath Alcohol Content for Vehicle Drivers," implemented on July 1, sets the threshold for blood alcohol content ≥80 mg/100 mL. This threshold is also used in Criminal Law to define the crime of drunk driving and dangerous driving, effectively deterring some individuals from drinking and ensuring public safety.[58]

Despite these legal measures, there are still several gaps in the research on the influencing factors of relapse in AUD patients: (i) current studies primarily focus on male AUD patients, with limited research on female patients and small sample sizes; (ii) most studies have primarily been conducted in urban areas, with little attention given to the relapse of AUD patients in rural regions after quitting drinking; (iii) the majority of studies concentrate on severe AUD patients, making it difficult to monitor mild cases and resulting in a lack of early-stage research on AUDs; (iv) the survey methods and approaches for studying relapse in AUD patients are generally limited, relying mainly on scales, questionnaire, and face-to-face interviews, which may hinder data collection and compromise its authenticity. Future research should employ diverse methodologies to investigate the influencing factors of relapse in AUD patients across different regions, allowing for targeted interventions to reduce relapse rates.

At present, the factors and pathological mechanisms underlying AUDs and relapse after cessation remain incompletely understood. Treatment methods predominantly focus on substitution therapy, which can only partially reduce the patients' desire to drink. There is currently no targeted, effective cure for AUDs.

Our team is preparing a longitudinal mixed-methods study on AUDs and the influencing factors of relapse, inspired by the literature review conducted in this paper. This research will adopt a longitudinal mixed-methods approach, collaborating with experts from multiple disciplines and integrating new technologies such as

information technology, digitization, big data, and artificial intelligence. Through these diverse channels, we aim to investigate the current situation of relapse among AUD patients and identify key factors that contribute to relapse, ultimately providing insights into the pathological mechanisms of AUD. In addition, we will mobilize and integrate resources from various sectors to develop new drugs, instruments, and nursing therapies, and create personalized treatment plans to help AUD patients fully quit drinking. Finally, it is necessary for families and society to collaborate in creating a safe and supportive environment for AUD patients, providing necessary supervision and emotional support, and improving their compliance with alcohol cessation. This collaboration would help reduce relapse rates, improve patients' quality of life, and alleviate the pressure on both families and society.

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Conflict of interest

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ACCSCIENCE PUBLISHING

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REVIEW ARTICLE

An in-depth critical analysis of Morgellons: Delusion or disease?

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Abstract

Morgellons is a poorly understood entity and is characterized by cutaneous findings such as fibers emerging from the skin, which can cause secondary symptoms such as formication and itching. Morgellons is an understudied area with conflicting results; this imposes challenges to clinicians while navigating consultations and understanding, diagnosing, and treating Morgellons. This literature review summarizes the available data on the etiology, epidemiology, clinical presentation, treatment, and social media influence within Morgellons. Medical Subject Headings terms were used to systematically search PubMed, Medline, and EMBASE, and two independent reviewers screened the selected articles, revealing that Morgellons is poorly understood among the scientific community, with a population prevalence of 3.65/100,000. The etiology of Morgellons is controversial, and opinions among psychiatrists and dermatologists are conflicting. Some studies propose a biological origin linked to Lyme disease, whereas others view Morgellons as a delusional disorder without an underlying pathology. The conflicting views can be attributed to the lack of robust research with no consensus on an established pathophysiology, disease classification, or treatment guidelines. Herein, the majority of literature views Morgellons as a delusional disorder, wherein an underlying pathology triggers the delusional experience. However, further studies are required to accurately classify the disease and direct patients to the right specialists to ensure effective treatment and development of treatment guidelines. Nevertheless, a holistic treatment approach, integrating psychosomatic and dermatological modalities, is lacking.

Keywords: Morgellons disease; Delusional infestation; Delusional disorder

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1. Introduction

Morgellons is a poorly understood condition that is sometimes characterized as a type of delusional infestation (DI), which predominantly believes that one's skin is infested by foreign pathogens.[1] It usually manifests as non-healing lesions that are frequently ulcerated and superficially infected. Patients often present samples of fibers, hairs, or other materials to their physician, claiming that they have extruded them from their

skin; this has often been referred to as the "matchbox sign".[2,3] In addition, patients often report neuropsychiatric symptoms, ranging from muscle pain to burning and stinging foreign body sensations.[2-4]

"Morgellons" was first coined in 1674 by Sir Thomas Browne while describing a skin disease in French children. This description of Morgellons referred to a group of heterogeneous skin conditions that manifested with animate and inanimate objects. There was a brief mention of Morgellons by Emslie; however, this was immediately rejected. In 1983, Lyell published a survey in The Lancet, reporting that dermatologists were treating patients who presented specimens in matchboxes, and the term "matchbox sign" was coined.[5] Recently, Morgellons was reclaimed by the biologist Mary Leitao in 2002. She observed that her son had frequent episodes of itchiness accompanied by visible fiber protrusions from the skin,[4] This was further explored by the Centers for Disease Control (CDC). They published their study results in 2012 and linked the condition to DI.[5]

Some authors have identified Morgellons as a somatic delusional disorder, characterized by a strong belief that one's skin is infested with foreign pathogens.[6] The Diagnostic and Statistical Manual of Mental Disorders defines the somatic delusional disorder as a patient's persistent belief regarding their physical health or bodily sensations.[7] These bodily sensations can be induced by inanimate objects, such as filaments or living organisms such as parasites. Unusual tactile sensations and a strong belief in an infestation by materials,SSSS such as hair, fibers, crystals, and other substances are the reported features of Morgellons.[6,8-12] These filaments resemble textile fibers and are available in several colors, including white, red, blue, green, and black.[13]

Morgellons can be classified as primary and secondary. Distinguishing between these two types in a clinical setting will help determine clinical outcomes and tailor treatment approaches. In primary Morgellons, the delusional symptoms appear in the absence of any other underlying medical conditions. Thus, psychiatric support and appropriate medication are emphasized for managing the delusional component. Notably, the complexity of treatment increases when Morgellons is categorized as a secondary disorder. The symptoms are observed alongside psychiatric disorders, brain injuries, substance intoxication, and nutritional deficiencies.[8,9] Recognizing this distinction is vital for clinicians to appropriately refer, manage, and treat patients.[7]

Literature supports the importance of accurate disease classification.[14] Disease classification improves the identification and treatment of Morgellons, encourages a multidisciplinary approach, and prevents delayed referrals, thereby managing Morgellons disease easily for primary healthcare practitioners and making it less challenging for tertiary referrals.[9] Patients with Morgellons have reported "doctor-hopping" – occurring when the patient may reject the diagnosis of delusion or a psychiatric cause – which may be attributed to the stigma associated with the label "Morgellons." Thus, the patient may consult multiple physicians across various specialties and institutions.[7,15]

Morgellons diagnosis and management continue to be controversial. Our literature search revealed a lack of treatment guidelines for Morgellons. Herein, while considering all angles of the conflicting debate, we aimed to provide a comprehensive overview of Morgellons, including its epidemiology, etiological theories, clinical presentation, diagnosis, and therapy.

The complexity of Morgellons presentation has hindered the development of diagnostic criteria and effective therapies.[16] Furthermore, the intertwined physical and psychological manifestations pose a challenge. Thus, the literature review can synthesize the existing knowledge and highlight areas that require further research, potentially improving the understanding and treatment of this enigmatic condition. Herein, we will examine whether Morgellons is a delusion, disease, or result of neuropsychiatric factors or drug use.

2. Methodology

A comprehensive literature review was conducted through PubMed, MEDLINE, and EMBASE using the keywords "Morgellons," "Morgellons disease," and "Morgellons syndrome." Medical subject headings were employed as search terms when available and additional keywords were used where appropriate. The search was limited to articles published in English.

One reviewer conducted the initial search and identified potentially relevant studies meeting the inclusion criteria. Subsequently, two independent reviewers evaluated the articles based on the established inclusion and exclusion criteria; the articles were assessed for their use of an appropriate source population, methods of measuring exposure and outcomes, strategies to address design-specific issues such as bias and loss to follow-up, application of analytical methods, and approaches for the primary statistical analysis of effects.

The studies were selected based on their level of evidence, according to the 2011 guidelines of the Oxford Centre for Evidence-Based Medicine.[11] We prioritized the highest levels of evidence and systematically reviewed systematic reviews, meta-analyses, randomized controlled

trials, cohort studies, case-control studies, and case series. In addition, we included observational studies and expert opinions that lacked high levels of evidence.

Studies that directly addressed the pathogenesis, clinical features, diagnosis, and treatment of Morgellons and provided insights into the neurobiological and psychological aspects of Morgellons were included. However, studies that did not meet the minimum quality standards or were unrelated to the primary focus of the review were excluded.

3. Epidemiology and current literature

There is a substantial gap in the epidemiology of Morgellons.[17] To date, the largest study on the Morgellons epidemiology is a retrospective cohort study conducted by the CDC in 2006 – 2008. They analyzed 115 patients in Kaiser Permanente Northern California (KPNC), reporting that the prevalence of Morgellons was 3.65/100,000, and the median age of the patients was 55 years. In addition, the disease was predominant in Caucasian people (77%) and women (77%).[1] Comparatively, a smaller study in London yielded similar results and found that Morgellons predominantly affected women and was diagnosed around the age of 54 years, with symptoms lasting 3.8 years.[2]

There were no statistically significant differences in age, sex, marital status, employment, or duration of the condition between patients who did (n = 51) and ho did not (n = 19) report the emergence of fibers in the KPNC study. Both groups were predominantly Caucasian (fibers group, 76.5%; non-fibers group, 79%). A homogenous sample indicates less variability in the dataset, making it challenging to generalize the findings to other populations. There were slightly more African–American participants in the non-fibers group (15.8%) than in the fiber group (7.8%). As the small sample size was insufficient power to detect a true difference, determining if there was a significant difference in both groups was difficult. Furthermore, because the study was conducted in California, there was a lack of national and international representation. Thus, the full spectrum of manifestations in patients with Morgellons may not have been included, considering it reduces the validity of the study.

Psychiatric assessments were used in the KPNC study to identify potential mental health and confounding factors. This overemphasis on psychiatric aspects may introduce a potential confirmation bias, which prioritizes DIs in this and any subsequent studies referencing it while neglecting other causes for Morgellons.

The CDC study and another case series have highlighted the urgent need for a universally accepted definition of Morgellons.[16] Until then, subsequent studies will considerably have flaws in their methodology, as evidenced by the inclusion criteria of the CDC study. Although the CDC study included patients with Morgellons-like symptoms, primarily the emergence of fiber-like materials from the skin reported by 70.4% of the patients, it did not exclude individuals with skin lesions and other physical manifestations. A combination of compromised inclusion criteria and the case definition overlapping with that of delusional parasitosis reduced the validity of validity of the study.

Large-scale, population-based, cohort studies with registry-based surveillance are required to comprehend the incidence and prevalence of Morgellons, identify its risk factors, and improve diagnosis by collaborating between dermatologists and psychiatrists. Furthermore, large-scale, prospective, observational studies are required to collect detailed clinical data from patients presenting with Morgellons. To achieve this, a universal definition for Morgellons must be recognized. Establishing a Morgellons disease registry could facilitate the creation of a centralized database for systematically collecting patient data, identifying trends, and determining future studies. This can be achieved by implementing standardized data collection methods, obtaining informed consent, and ensuring data privacy and security. Consequently, researchers can work toward understanding Morgellons disease and developing effective management strategies.

4. Clinical presentation of Morgellons disease

4.1. Symptoms and patient descriptions

The clinical presentation of Morgellons is predominately centered around cutaneous findings reported by patients and associated cutaneous and systemic symptoms. Morgellons disease is a rare condition with characteristic objective findings of filaments, fibers, or spheres underneath or extruding from the skin that generate uncomfortable sensations.[12] Other commonly reported parallel symptoms include formication, burning or stinging, and intense itching. Some patients report skin ulcers that suddenly appear and heal slowly, which develop hyperpigmented scars.[18]

Individuals who report fibers or filaments within the skin may present with such evidence for examination (Figure 1),[15,18] which is characteristically called "matchbox sign" or "specimen sign." The evidence may include samples of dust, skin, and fibers. Often, the materials are sent to different laboratories for examination, revealing no signs of a parasitic manifestation.[19] On a complete skin examination, signs associated with the repeated picking,

including pathological painful ulcerations, prurigo nodularis, and secondary infections, may be observed (Figure 2).[15,18]

Patients with Morgellons may exhibit associated systemic symptoms, including neurological (e.g., headaches, fatigue, short-term memory deficits, and emotional lability), cardiovascular (e.g., irregular heart rates, tachycardia, and intolerance to changes in blood pressure), respiratory (e.g., coughing and shortness of breath), and musculoskeletal (e.g., diffuse musculoskeletal pain, fibromyalgia, and chronic fatigue syndrome) symptoms.[20]

In addition, patients with Morgellons may present with several psychological symptoms, including mood disturbances, delusions, paranoia, cognitive impairments, and suicide attempts.[21] In addition, Morgellons is

Figure 1. Secondary rash highlights embedded fibers (shown with an arrow) linked to Morgellons. Image created using BioRender.com.

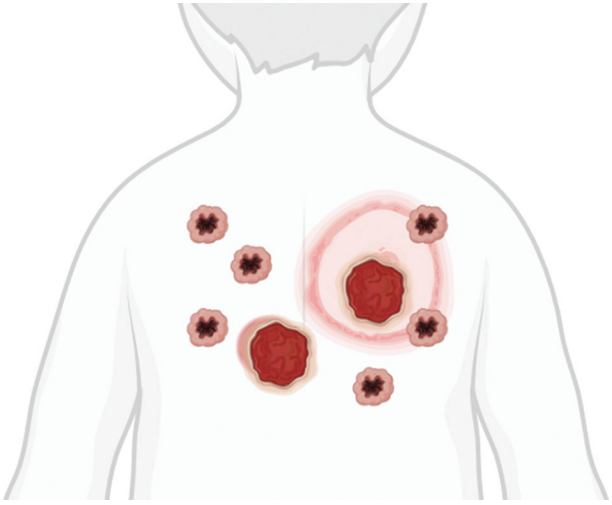

Figure 2. Ulcerated erosions on a patient's back similar to those with Morgellons. Image created using BioRender.com.

associated with schizophrenia, bipolar affective disorder, and obsessive-compulsive disorder.[17,22] These psychological disturbances can arise anytime during the course of the disease, particularly in the later periods.

4.2. Objective findings in clinical studies

Several studies have aimed to clarify the objective symptoms of Morgellons. Recently, most authors have realized that the disease is debilitating and centered around the symptom of finding fibers in the skin, which can cause secondary symptoms such as itching and picking. Reportedly, the histological analysis of filaments presented by the patients is not textile fibers but biofilaments of human cellular origin;[20,23,24] the filaments comprise collagen and keratin, hypothesizing that they may be the product of cutaneous filament overproduction in response to a spirochetal infection,[25,26] namely *Borrelia burgdorferi* (causative organism of Lyme disease).[20,24]

However, recent studies investigating the association between *B. burgdorferi* and Morgellons through laboratory assessments have yielded conflicting results. Four studies have yielded no evidence linking Morgellons to *B. burgdorferi* or any other infectious agents.[27-30] However, some authors believe that Morgellons is caused by *B. burgdorferi*.[31,32] Internal and external validation of such findings cannot be generalized and may not be reproducible. Moreover, CDC studies have reported that there is no common underlying medical condition or infectious organism in patients with Morgellons.[1]

Recognizing the interplay between Morgellons disease and the associated clinical outcomes is crucial. The severity of symptoms reported in patients cannot be understated. The diverse somatic and psychiatric comorbidities and the challenge of establishing a consensus on causality ultimately impact the affected individuals' quality of life. The Dermatology Life Quality Index assesses a patient's quality of life. However, studies assessing the Dermatology Life Quality Index within a Morgellons-affected population are limited. Future studies are required to navigate a bottoms-up approach by assessing and evaluating the experiences of affected individuals, understanding how the disease affects their quality of life, and what clinicians can do to relieve their symptomology.

5. Delusion versus disease

Herein, we aim to examine the theories regarding Morgellons in the current literature. We will explore the delusional hypothesis, neurological hypotheses, infectious agent hypothesis, and the impact of certain drugs, in addition to the multifactorial approach in managing Morgellons. A substantial portion of the literature equates

Morgellons with a DI; one of these studies has been included in our discussion.[33]

5.1. Morgellons as a delusional disorder

A delusional disorder is characterized by the presence of one or more delusions for a month or longer in a person who, except for the delusions and their behavioral ramifications, does not appear odd and is not functionally impaired.[34] Morgellons has been described as a DI/parasitosis, which is a subset of delusional disorders.[25]

Most studies have highlighted a few key reasons, mentioned in the below subsections, for Morgellons being considered a delusional disorder.

5.1.1. Lack of medical evidence

Numerous studies have failed to identify any infectious agents or parasites in patients reporting Morgellons symptoms. Some researchers have demonstrated an association between Lyme disease and Morgellons. However, these studies are often limited in size, with little correlation.[35] When examined by histopathologists, the lesions, and fibers are often self-inflicted or environmental contaminants rather than fibers of biological or pathological origin.[36] Thus, the condition is considered a psychosomatic manifestation rather than an actual skin infestation.[37]

5.1.2. Psychiatric associations

Although there is much debate whether Morgellons is a psychiatric or dermatological problem, most evidence suggests that Morgellons disease is a psychosomatic disorder.[38] Many patients diagnosed with Morgellons exhibit characteristics similar to delusional or other psychotic disorders, such as schizophrenia. These delusions primarily revolve around the belief of being infested with parasites or foreign material.[15]

5.1.3. Response to treatment

Many patients with unresolved symptoms have been successfully convinced by the first dermatologist to be consulted to try psychiatric therapies after unsuccessfully administering dermatological therapies.[35] Those treated with antipsychotic medications have reported improved symptoms.[39] When patients are treated with psychotropic medications rather than antiparasitic drugs, symptoms are reportedly reduced,[40] potentially supporting that the origin of Morgellons is a psychosomatic manifestation.

5.1.4. Clinical observations

Dermatologists and psychiatrists treating patients with Morgellons frequently report that the physical manifestations, such as skin lesions, align with behaviors associated with self-inflicted wounds rather than any known dermatological condition.[37] The fibers and other materials often presented by patients as evidence of Morgellons have been identified through forensic analysis as common environmental fibers such as those from clothing.[41] However, some lesions can be present in areas that do not correlate to self-inflicted lesions.

The CDC conducted a large study because of the increasing enquiries regarding the symptoms described by patients with Morgellons and highlighted the consistent common psychiatric etiologies in patients with Morgellons. Furthermore, there was no significant evidence of clinical abnormalities that strongly supported an infectious etiology.[42] In one adult, woman with ulcerative lesions on her face, arms, and trunk, numerous investigations, including microscopic visualizations of fibers and biopsy, were performed.[26] However, the authors concluded that the patient had a DI in the form of Morgellons; they found no evidence of a *Borrelia* infection, which would demonstrate a link between Morgellons and Lyme disease. The aforementioned findings will be further explored in later sections. In several patients with previous skin conditions, after the initial symptoms such as those of seborrheic dermatitis were treated, patients continued to experience symptoms leading to the classical excoriations and symptoms as described;[35] this indicated that several patients with Morgellons may exhibit a combined dermatological and psychological origin.

5.2. Psychological and neuropsychiatric hypotheses

Histopathological examination of lesions from patients with Morgellons does not demonstrate consistent spirochetal findings, making it an unreliable diagnostic feature. A CDC-supported study examining 115 patients with Morgellons did not report any parasites in the biopsy samples.[1]

Some studies report Morgellons as a psychosomatic condition, a somatic type of DI.[27] In this condition, the patient is unarguably convinced of the severity of their symptoms, and their perception of reality is impaired

Studies have highlighted structural brain differences in patients with delusional disorders, including differences in the "*volume of grey and white matter, cortical thickness, surface area, folding patterns, and the presence of lesions*" on magnetic resonance imaging.[28] Thus, one theory proposes that the brain's neuronal pathways could be disturbed in patients with Morgellons, potentially altering how they perceive external stimuli. Reportedly, the "*fronto-striato-thalamo-parietal network*" could be affected in patients with delusions,[37] entailing a disturbance in the frontal cortex and

further governing the reasoning, which could be followed by an abnormality in the striato-thalamo-parietal region responsible for proprioception and somatosensation.

Considerably, a patient with Morgellons may experience abnormal somatosensations exacerbated by misinterpretations in the frontal cortex, resulting in the false belief of being infested and a delusion of skin infestation. This can be evaluated by structurally analyzing gray matter volume, reductions in cortical surface area, gyrification, or pathological lesions, in addition to functionally assessing decreases in blood flow to these regions. Kessler *et al.* proposed that the findings of neuroimaging for the underlying pathologies could be corroborated with the manifestations of DI symptoms, which may help understand Morgellons.[43]

Studies have also correlated the manifestation of Morgellons to the hyperactivation of certain brain regions.[44] Increased activity in the right posterior insula and secondary somatosensory cortex in response to tactile and visual stimuli has been linked to the pruritic urge experienced by patients with Morgellons.[17]

5.3. Environmental and toxic exposure hypotheses

A case series have demonstrated that the inhibition of the dopamine transporter may contribute to the pathogenesis of Morgellons, resulting in its classification as a DI.[41] There have been reports of patients developing Morgellons symptoms because of methamphetamine use.[42] Another study has identified that antiparkinson drugs, antidepressants, antiepileptics, antibiotics, and prescription stimulants are commonly associated with Dis.[22] However, there is insufficient evidence to support a similar etiology in patients with Morgellons.

Pearson's study revealed that drug use was detected in 50% of the participants.[1] However, some of these medications may have been prescribed to manage the symptoms of Morgellons. Thus, clinicians should consider factors such as substance use in their clinical assessment because a link between Morgellons and substance abuse has been identified.[2,45] Further controlled or observational trials are required for assessing the causation between drug use and Morgellons.

6. Morgellons: A genuine disease

6.1. Infectious agents hypothesis

The pathogenesis of Morgellons has been linked to skin healing. Furthermore, histological examination of the lesions has revealed microscopic filaments embedded in the skin. These filaments usually contain keratin and collagen, which is a part of the skin's healing response to an infection.[46]

Reportedly, the pathogenesis of Morgellons largely arises from tick-borne infections.[1,18] Histopathological examination of the skin lesions has revealed spirochetes, genetically identified as *B. burgdorferi* sensu stricto, as the predominant infective agent. Two separate cohort studies have demonstrated that Morgellons affects approximately 6% of patients with Lyme disease.[10,47] Although Fesler *et al.* did not identify elevated rates of psychiatric disorders among patients with Morgellons, the study limitations, such as its small sample size and specialized patient population, limit the generalizability of its findings. In addition, the lack of a control group and potential confirmation bias raise concerns about the validity of the study findings. Because the study sample included only 60 patients with Morgellons from 1,000 screen patients with Lyme disease, the statistical power and generalizability of the study were further reduced.

The clinical manifestations observed in one case series closely resembled those reported in patients with Lyme disease.[18] Although the reported symptoms such as fatigue, joint pain, and neuropathy were non-specific, a subsequent study found that 98% of patients with Morgellons were positive for Lyme disease;[17] this finding was observed in four other case series in which polymerase chain reaction was used, followed by Sanger sequencing.[26] Although a positive serology test may suggest a potential link between Morgellons and Lyme disease, it is not definitive proof of an association because the body can retain immunity against the bacterium, even after the infection has cleared.[48]

In some studies, culture, histological, immuno histochemical, electron microscopic, and molecular testing have demonstrated that Morgellons could be associated with a systemic spirochetal infection.[27] Furthermore, the filaments detected in patients exhibited a collagen component and melanin pigment, indicating that spirochetes may have activated keratinocytes and fibroblasts to express keratin and collagen.[40]

A case report demonstrated promising results with doxycycline administration for Morgellons, with patients experiencing remission within 2 weeks. However, further studies are required to determine the efficacy and safety of antibiotic therapy for Morgellons disease due to limited evidence.[32] Although the infectious theory suggests a clinical association between Morgellons disease and spirochetal infection, the phenomenon may be multifactorial, such as genetics, hormones, and immune status.

6.2. Multifactorial approach to management

Studies support a multifactorial approach to Morgellons disease, indicating that the symptoms may result from a combination of infectious agents (e.g., *Borrelia*) and

psychological factors. The lack of treatment options for Morgellons can exacerbate psychological distress, reinforcing the self-limiting belief of patients that lack autonomy when it comes to managing their condition;[27,39,41] this hinders recovery and highlights the need for a patient-centered approach focusing on the patient's perspective and well-being.

An interplay may exist between genetic susceptibility and immune dysregulation in patients with Morgellons. An exaggerated immune response to infectious agents such as *Borrelia* or an environmental trigger might trigger unusual fiber formation and skin symptoms characterized by Morgellons disease, particularly in genetically predisposed individuals.[27,39,41]

7. Diagnosis and differential diagnosis

Current studies mostly emphasize that Morgellons is a type of DI. However, it has not been included in the 10th edition of the International Classification of Diseases. Furthermore, DIs are currently diagnosed based on the Diagnostic and Statistical Manual of Mental Disorders criteria for somatic delusional disorders.[49,50]

In patients with Morgellons, although testing for *infectious organisms* can be challenging, some known pathogens can be excluded, potentially supporting the diagnosis of a DI. However, the possibility of an unknown or newly emerging infectious agent cannot be completely ruled out.

Screening patients with Morgellons for major psychiatric disorders (e.g., disorders with body and space-related delusions, hallucinations, catatonia, and self-inflicted skin lesions), organic and substance-induced DI (e.g., neurological disorders and illicit substances), delusional parasitosis, hypochondriasis, and schizophrenia (Schneider's first rank symptoms) is crucial.[51] This can be achieved through a thorough history-taking, focused clinical examination (skin and mental health examinations), and appropriate investigations. Certain symptoms – such as formication, a sensation of insects crawling on or under the skin that is not characteristic of Morgellons – are likely to occur in individuals with a history of cocaine use.[52] Similarly, other psychodermatological conditions can be misdiagnosed. For instance, dermatitis artefacta, a type of factitious disorder, can be misdiagnosed as Morgellons due to similarities between the two conditions, including skin lesions, psychological factors, and strong patient beliefs about the origin of their symptoms.[53] To ensure an accurate diagnosis, considering the possibility of self-inflicted injuries and adopting a holistic approach that acknowledges the nuances between these conditions is crucial.

Accurate diagnosis of Morgellons can be achieved through a thorough history elicitation, clinical examination, and investigation. These investigations include full blood screening, a 4-mm skin punch biopsy, and in some cases, imaging studies such as brain and spinal magnetic resonance imaging.[54,55] A multidisciplinary approach is key to interpreting and managing these findings. An approach in which dermatologists can work closely with psychiatrists, histopathologists, and perhaps neurologists to analyze the clinical information would be beneficial. In addition, this approach could distinguish Morgellons from conditions that may mimic Morgellons or other complex psychocutaneous disorders such as DI, malingering, psychogenic excoriation, or dermatological conditions (scabies).

One way to achieve an accurate diagnosis is by implementing an algorithm that can guide clinicians toward a diagnosis. Proposed models, such as the two-stage clinical pathway, aim to support the diagnosis of DI[56] when a thorough and detailed diagnostic investigation/examination (step 1) is needed for treating a specific cause (step 2).[22] However, these models are yet to be evaluated for sensitivity, specificity, and cost-effectiveness. Experienced clinicians must be involved in decision-making and model creation to ensure their expertise and experience have maximum benefits.

8. Treatment approaches

The management of Morgellons continues to be a controversial topic due to multiple etiological theories and viewpoints on its classification. Current literature describes mixed reports of antimicrobials, antidepressants, and antipsychotics for managing Morgellons.

8.1. Pharmacological interventions

Evidence supports the potential effectiveness of antipsychotic medications in patients with Morgellons, especially if the disease is considerably a DI. A retrospective analysis of 24 patients with Morgellons assessed the effectiveness of trifluoperazine. Of 24 patients, 15 exhibited an improvement of at least 50% and 7 exhibited a return to baseline, where at least 90% lesion clearance and no patient-reported distress from perceived skin infiltrates. An average of 2.4 and 6.6 months was required to attain 50% and 90% of the disease control, respectively.[57]

Because of their cardiotoxic and extrapyramidal side effects, second-generation antipsychotics are gradually replaced by first-generation antipsychotics. Low-dose risperidone and other second-generation antipsychotics, such as quetiapine and olanzapine, have also been recommended by some studies.[9,58]

In another retrospective analysis of 35 patients with Morgellons, 29 were administered phototherapy, supplementary oral antibiotics, an antipsychotic or antidepressant, and an antiseptic wash. Of 26 individuals prescribed with antipsychotics, 14 exhibited improved mental and physical health and 12 demonstrated stabilized symptoms with sporadic episodes of fiber eruption. The study also determined that combining low-dose antipsychotics, narrow-band phototherapy, and a topical antiseptic was the most effective treatment. The most commonly used antipsychotics were quetiapine, risperidone, olanzapine, aripiprazole, and amisulpride.[2]

Antipsychotics such as risperidone, pimozide, and olanzapine, in addition to hypnotherapy, have exhibited promise in reducing anxiety and pruritus symptoms.[37,58-60] These antipsychotics also improve skin healing once secondary picking and excoriating behavior have stopped. Similar to the antidepressant doxepin (either oral or topical), antipsychotics are utilized in certain situations to improve the patients' itch or ease their illness-related anxiety.[59] Antihistamines, such as cyproheptadine, can reduce pruritis and itch. However, there is a lack of studies supporting their use in Morgellons.[61]

Antipsychotics have demonstrated improved symptoms after 2 weeks of use, with maximum effectiveness being observed after 6 – 10 weeks. Once the delusion resolves, maintenance therapy with an effective dose is required for 3 months before progressively reducing it every 2 weeks for approximately 6 months. Approximately 60 – 100% of patients administered with any antipsychotic treatment undergo remission. However, relapse is seen in approximately 25% of those who undergo the treatment again.[58]

Although antipsychotics are undeniably crucial in the psychopharmacotherapy of DI, viewing them as the only treatment option or assuming that their importance is consistent in every case would be an oversimplification. Antipsychotics are primarily indicated when there are recurrent or chronic psychotic symptoms such as overvalued beliefs, delusions, or hallucinations. However, they are not necessary for simple formication. In patients with depression and concurrent symptoms of DI, combining a simple antidepressant with electroconvulsive therapy or imipramine can effectively resolve the condition without using an antipsychotic.[58,60,62]

Antipsychotic medications are the primary pharmacologic treatment for Morgellons. However, other psychotropic drugs, including antidepressants, may be beneficial as complementary therapies. For patients experiencing Morgellons symptoms and major depressive disorder, antidepressants alone, such as amitriptyline, doxepin, and maprotiline, may effectively alleviate symptoms without requiring antipsychotics. In one of the first studies evaluating various treatments in patients with both conditions, all individuals with depression exhibited improvement with antidepressant therapy, with 75% and 25% of them achieving remission and demonstrating a significant response.[22]

If an infectious etiology is suspected, particularly the presence of *Borrelia* species, antibiotic therapy can be considered. For instance, in a middle-aged Caucasian woman who developed the symptoms of Morgellons shortly after a tick bite in the woodlands, treatment with a 14-day course of oral doxycycline (100 mg twice daily) led to remarkable clinical improvement.[58] At the 2-week follow-up, her existing lesions were completely healed, with no new ulcerations observed.

For individuals who cannot or will not take antipsychotics, palliative therapies such as topical steroids, emollients, and sedating or non-sedating antihistamines can be an alternative for itching or sleep issues. Although these treatments may lessen the symptoms, they do not slow the progression of the condition. Furthermore, medications, such as steroids are associated with some side effects.[58] Antimicrobials, including oral doxycycline and topical clindamycin, have been used in patients with Morgellons in whom the etiology or trigger was suspected to be infectious in origin.[32]

8.2. Non-pharmacological interventions

For Morgellons, several non-pharmacological treatment options are available. Cognitive behavioral therapy, particularly after administering antipsychotics, can enhance patient acceptance and the effectiveness of medication in patients with Morgellons. It helps patients cope with the uncertainty of their condition, improves social functioning, promotes constructive symptom management strategies, and strengthens the patient–doctor relationship.[12,58,62]

Morgellons disease, characterized by compulsive skin manipulation and sensations of itching or discomfort, may also benefit from non-pharmacological interventions such as habit reversal training (HRT). HRT, a structured component of cognitive behavioral therapy, has been effective in treating body-focused repetitive behaviors such as skin-picking and hair-pulling by helping patients recognize and control their triggers. In five key steps, HRT guides patients to increase awareness of their behaviors, establish healthy alternative actions, build motivation, use relaxation techniques to manage stress, and practice these skills until they become habitual. Given its success with other similar behaviors include depression, smoking, gambling problems, anxiety, procrastination, OCD, and other behavioral problems, HRT is a promising therapeutic

approach for reducing the compulsive behaviors and distress observed in Morgellons.[63]

Another technique used to treat Morgellons is hypnotherapy, which reduces the associated physical and psychological symptoms. This approach involves six 1-h hypnotherapy sessions in a week, supplemented by listening to two CDs of recorded hypnosis sessions daily between sessions or as often as desired. However, the effectiveness of this approach is based on the findings of a single case study; therefore, further studies are required to determine whether these results can be generalized to a large population.[64]

Finally, regular follow-up of the patients enhances adherence to pharmacotherapy and improves treatment outcomes.[42] Each patient responds differently to therapeutic interventions.[1] Although some treatments may improve and alleviate the symptoms in some patients, they provide minimal improvement in others. Thus, perhaps a more patient-centered approach is required while dealing with Morgellons. A novel approach incorporating precision psychiatry should be considered, in which a combination of genetic, environmental, and lifestyle factors can be used, adopting the same principles of precision medicine as that used in personalized care.[65]

9. Additional factors to consider

9.1. Social and cultural factors

Social media has permeated the patient and public sectors, providing access to information on a wide range of diseases. There are several Morgellons-centered communities across Facebook, Reddit, and other online forums. These communities enable individuals to share their experiences and validate their feelings. Reddit threads have highlighted the underlying debate between whether Morgellons is a delusion or a true disease, with affected individuals and families expressing the perpetuating cycle of being reviewed by a dermatologist and therapist without receiving any real conclusive answer on how to support and cope with the long-term.[66,67]

Social media and cultural perceptions about the diagnosis can be informative as well as misleading. Information shared on the Internet can influence the spread of Morgellons-related information positively and negatively because patients seek explanations for their symptoms.[8,68] The Internet, with its abundant information, allows patients to learn about their condition and find answers that clinicians struggle to provide in detail. This has resulted in the creation of the Morgellons Research Foundation, an online community where the affected individuals can discuss their condition.[67,69]

Morgellons has been described as an "Internet-transmitted disease," emphasizing the role of online communities in spreading misinformation and promoting unproven treatments.[8] This has increased self-diagnosis and the use of non-evidence-based medical practices, including potentially harmful substances.[70] Conspiracy theories may have further stigmatized the disease, preventing patients from accessing appropriate medical care.[71]

9.2. Patient–doctor dynamics

Morgellons are considered underdiagnosed because patients typically consult dermatologists and other medical specialists instead of psychiatrists, delaying the diagnosis and treatment. Even when patients visit a psychiatrist, many fail to follow through with the therapy, leading to poor follow-up.[7,9]

The uncertainty surrounding Morgellons and its origin poses a threat to the foundations of a strong doctor–patient relationship and patient trust. To construct a robust therapeutic doctor–patient relationship, a collaborative effort is paramount. Collaboration between multidisciplinary teams and the doctor and patient ensures a level of trust. When patients are frustrated because of a lack of clarity, there is a risk of non-adherence to treatment and seeking alternative options. Non-adherence to treatment must be minimized at all stages because of the risk of adverse clinical outcomes, long and complex treatment pathways, and an increased cost of care. According to clinicians, taking a neutral stance with patients where their symptoms are acknowledged and validated is advisable while admitting the absence of observable organisms.[31]

The stigma associated with the diagnosis of a mental health disorder should also be considered because it can lead to harmful effects such as poorer outcomes of symptoms, non-adherence to treatment, and difficulty in building strong social relationships, including a professional doctor–patient relationship.[72] Given the rarity and poorly understood nature of Morgellons, patients can have little insight into their condition, resulting in hesitancy based on the societal stigma attached with a psychiatric diagnosis. The lack of studies on Morgellons indicates that patients may not always have their questions answered by clinicians. This can affect treatment adherence despite a referral from a dermatologist.[73]

Psychodermatology services such as those provided by the Royal London Hospital allow a consultant dermatologist and liaison psychiatrist to see patients with Morgellons together.[74] This will enable them to deal simultaneously with dermatological diseases and psychosocial comorbidities, allowing holistic medical input from other team members such as child and adolescent psychiatrists in managing these conditions, shared decision-making, empowering the patient, and the liaison psychiatrist and dermatologist to devise a shared care plan and clear follow-up direction.

10. Controversies and future directions

An analysis of relevant studies highlights several gaps and potential directions for future studies. At present, Morgellons lacks a specific ICD code, resulting in the absence of clear diagnostic criteria (Diagnosis and differential diagnosis), which can result in misdiagnosis and misidentification and prevent us from conducting large-scale population-based cohort studies. Recruiting patients for a study is a major challenge considering the condition is rare; this makes it even vital to differentiate Morgellons from other psychodermatological conditions or factitious disorders to enroll patients in studies.[1,75]

Further studies on genetic predispositions, neuroimaging studies, or novel treatment options can improve our current understanding of Morgellons. There is a lack of emphasis on the quality of life of individuals with Morgellons. Administering questionnaires such as the Dermatology Life Quality Index is crucial for assessing the impact of Morgellons on the patient when they initially present to the dermatologist's clinic.[1,75]

The most critical areas that require further studies are the pathophysiology, detailed toxicology, wound healing in patients with chronic Morgellons, and underlying neuropsychiatric mechanisms. Prioritizing these areas may help understand the condition.

Appropriate study types should be used for ensuring robust studies on Morgellons. Furthermore, a national Morgellons registry should be created to enable a database for research and foster temporal regression. Due to the rarity of the disease, these data should be globally accessible for international collaboration; this would aid in reaching a consensus regarding a clear definition, diagnostic criteria, and subsequent treatment evaluation of Morgellons. Furthermore, the development of cohort studies would enable the identification of risk factors and epidemiological analysis.

11. Conclusion

The current literature does not support a direct causative link between Morgellons and Lyme disease or any other pathological disease processes. Furthermore, the method of diagnosing Lyme disease was not valid, and the patient selection in the CDC study potentially introduced a selection bias. Even though there was limited evidence during this literature review, a causal association with pathological diseases cannot be excluded. Thus, further case-controlled studies with larger samples are required. Morgellons is a debilitating illness that requires a patient-centered management approach and further studies on its genetics, pathogenesis, and treatment. Given the complexities and lack of clarity regarding Morgellons, a multidisciplinary approach is important for ensuring that clinical inputs from all specialists are considered. Until the pathology of Morgellons is further studied, it is better to maintain a full psychodermatology view for managing this condition. By segmenting the Morgellons manifestations into a dermatologic or psychiatric issue, we cannot provide holistic care, especially because both systems are involved in patients with Morgellons. Although this condition needs to be categorized as a "delusion" or "disease" to advocate for improved studies and a definition for Morgellons, the condition should not be treated as one or the other. Patients with Morgellons respond to different treatments and describe varying symptoms, indicating considerable variations in Morgellons. Thus, a combined approach is required. In the future, Morgellons may fall into one category. However, at present, it should be treated using a psychodermatology approach, as exemplified by the Royal London Hospital.

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ACCSCIENCE PUBLISHING

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ORIGINAL RESEARCH ARTICLE

Mental health status and influencing factors among Chinese college students in the post-COVID-19 pandemic period

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Abstract

After almost 3 years of battling against the coronavirus disease 2019 (COVID-19) pandemic, the static infection prevention had evolved to a dynamic management model at the end of 2022. However, the considerable rebound from pandemic in some areas is generally accompanied by increasing public pressure and depression. Hence, we investigated the impacts of the pandemic on the mental health and sleep quality of college students in China by conducting a cross-sectional survey on undergraduate, graduate, and doctoral students (n = 1105) through the Questionnaire Star survey platform. Demographic data, COVID-19-related stressors, information from four standardized scales (namely anxiety, depression, stress, and sleep), and other information were gathered through the survey. A total of 1120 questionnaires were collected, of which 1105 met the inclusion criteria. Most respondents were medical students (64%), and almost all of them had received the COVID-19 vaccine (99%). More people had been infected with COVID-19 (75%), with 33% showing mild to severe anxiety. A total of 54% of the respondents had mild to severe depression, 70% had moderate to severe perceived stress, and 28% had sleep disturbances. Further, analysis showed that the level of mental health was correlated with sleep. In addition, respondents from the medical specialty experienced more severe depression and anxiety (P < 0.01), and the increase in stress after the outbreak, in terms of anxiety and depression, became significantly more pronounced (P < 0.001). After the lifting of COVID-19 restrictions, the mental health level of college students was affected to some extent. The COVID-19 cases surge in some areas also resulted in psychological pressure and negative mental health among college students to a large extent even after the easing of COVID-19 restrictions. Despite the exigency to address the COVID-19 cases, attention must also be focused on the associated mental health problems, which require more systematic resolution from relevant authorities or departments.

Keywords: COVID-19; Mental health; Anxiety depression; College students; Stress

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1. Introduction

Coronavirus disease 2019 (COVID-19) is an acute respiratory infectious disease caused by a novel coronavirus, primarily transmitted through the direct aerosol and contact routes.[1] The virus incubation period and symptoms vary with individuals. The main clinical symptoms are fever, dry cough, fatigue, *etc.* Some patients suffer nasal congestion, runny nose, diarrhea, and other upper respiratory and digestive tract symptoms.[2] Despite their effectiveness, the control and treatment approaches for COVID-19 have aroused concern in societies, sparking debates about their implications for social progress and development.

The transmission of severe acute respiratory syndrome coronavirus 2 – the virus responsible for COVID-19 – was first reported in Wuhan, China, in December 2019 before its rapid spread worldwide.[3] Since January 2020, the global spread of this novel coronavirus has been defined as an international public health event, marking the time that brought huge ramifications to people's lives.[4] For college students, their social activities became hindered. Changes in learning style increased the difficulty of learning and led to significantly irregular daily behaviors.[5,6] A survey showed that social interaction and social function were hindered by the pandemic, which increased the prevalence of anxiety and depression.[7] Some studies suggest that online learning heightens stress among students, and the exacerbated learning difficulty eventually leads to increased mental health problems.[8] Irregular daily behaviors, such as getting up early, staying up late, and spending more time online, may lead to the interruption of the biological rhythm, which is considered an important clinical feature and pathophysiological mechanism of mental illness[9] and is closely related to the onset, symptoms, and social functions of depression.[10] College students with sleep problems tend to feel tired, lethargic, and irritable and suffer from other negative emotions.[11] According to some statistical data, during the COVID-19 pandemic, approximately 9 – 54% of college students or young people suffered from different mental health problems.[12] Some studies have shown that the COVID-19 pandemic has a widespread effect on individual mental health, marked by mental disorders arising in individuals, including acute stress disorder, depression, and anxiety.[13]

After 3 years of restrictions due to the pandemic, COVID-19 restriction mode shifted mode from closed to open control in China back in December 2022. Following the easing of the restrictions in China, many people became infected with COVID-19, which is expected to have a further bearing on the mental health of all citizens, including college students. Son *et al.* found that after the pandemic, the level of anxiety and depression among college students has increased significantly.[14] Interestingly, the easing of pandemic restrictions intensified or created new sources of pressure, including worries and fears about the risk of infection of oneself and family members,[3] the anxiety of whether COVID-19 prevention-related materials will be obtained in time, and the correct methods to prevent COVID-19 infection. At the same time, incorrect information further increases people's anxiety, depression, and stress. Hence, there is an urgent need to assess the pandemic's effects on college students' mental health.

The purpose of this study was to conduct a survey-based mental health assessment of Chinese college students after the easing of COVID-19 restrictions to determine their levels of anxiety, depression, and stress. Stress-related factors after the easing of restrictions and whether college students could cope with the pressure after restrictions were lifted were explored.

2. Methods

2.1. Recruitment of study participants

A cross-sectional survey was designed and conducted by Sichuan Provincial People's Hospital and Sichuan Mental Health Center at the beginning of December 2022 during the initial stage of the lifting of COVID-19 restrictions. This study was approved by the Human Research Ethics Committee of Sichuan Provincial People's Hospital, Sichuan Academy of Medical Sciences, and the University of Electronic Science and Technology review committee (Protocol No. 2023-47). Informed consent of the study participants was obtained by digital means. Participants were recruited from the University of Electronic Science and Technology student group in Sichuan Province, China. At the beginning of December 2022, COVID-19 restrictions were eased while the students in this university were on semester break. Thus, some students were at home with their families, some were preparing for final examinations and entrance examinations at school, and some were interning at different units or companies. The questionnaire was released through the Questionnaire Star survey platform (https://www.wjx.cn/wjx/design/previewmobile) on December 16, 2022, and the questionnaire remained open until no report was completed for two consecutive days. During this period, the questionnaire was distributed to more than 2000 students at the University of Electronic Science and Technology through WeChat.

2.2. Measurements

2.2.1. Demographics

Demographic information included age, sex, residence, educational background (undergraduate, master's,

doctorate), year of study (freshman, sophomore, junior, senior, and 5th year), whether students were medical professionals, whether students were interns at the time of survey, whether students had been vaccinated with the COVID-19 vaccine, and whether students had ever been infected with the COVID-19.

2.2.2. Problems related to COVID-19 pressure

The survey dissected various pressure factors caused by the uncontrolled pandemic situation by interrogating the following questions:

- Did your overall pressure increase/decrease or remain unchanged after the easing of the COVID-19 restrictions? (Answer: Increased/decreased/remained unchanged)
- Could you fully cope with the pressure after the restrictions were eased? Do you think other students feel pressure/anxiety because of the easing of the restrictions? (Answer: Yes/no)
- After the COVID-19 pandemic restrictions were relaxed, did you reduce your interactions with others? (Answer: No/slightly/somewhat/very much)
- Since the restrictions were relaxed, have you been worrying about your highly vulnerable families and relatives being infected? (Answer: No/slightly/somewhat/very much)
- Did you worry about being infected after the restrictions were relaxed? (Answer: No/slightly/somewhat/very much)
- Was it more difficult to purchase COVID-19 prevention materials after the restrictions were eased? (Answer: No/slightly/somewhat/very much)
- Did you pay more attention to the treatment methods for COVID-19 after the restrictions were relaxed? (Answer: No/slightly/somewhat/very much)
- Do you lack knowledge of COVID-19 transmission or infection? (Answer: No/slightly/somewhat/very much)
- Were you afraid of taking public transport after the COVID-19 restrictions were relaxed? (Answer: No/slightly/somewhat/very much)
- What do you think is the health barrier to mental health? (Answer: Lack of information on existing resources/limited resources/social discrimination/economy/others)

2.3. Mental health problems

The Patient Health Questionnaire-9 (PHQ-9) depression symptom screening scale evaluates depression symptoms within 2 weeks. The scale consists of 9 items with a total score of 4 points ranging from 0 to 3 for each item, and a total score of more than 4 points indicates that there may be clinical depression.[15]

The Generalized Anxiety Disorder-7 (GAD-7) scale, composed of 7 items, has a score range of 4 points from 0 to 3 for each item. A total score of more than 4 points reflects the clinical level of anxiety.[16]

The Perceived Stress Scale (PSS-10), a self-assessment questionnaire consisting of 10 items for stress assessment, has a total of 5 points from 0 to 4 for each item. A total score of more than 13 points indicates abnormal pressure. The higher the score, the greater the pressure felt.[17]

2.4. Sleep-related factors

The self-rating scale of sleep (SRSS) is suitable for screening people with sleep problems in different populations. This scale has 10 items, each scored with 5 points (1 – 5). The higher the score, the more serious the sleep problem. The lowest score on this scale is 10 points (basically no sleep problems); a score of more than 22 points indicates sleep disorders, and the highest score of 50 points indicates the most serious condition.[18]

2.5. Statistical analysis

Statistical analysis was conducted using the Statistical Package for the Social Sciences version 23.0 (IBM). Descriptive analysis of the distribution of all measured variables was performed. The Chi-square test was used to test the bivariate correlation between mental health and stress-related problems after the lifting of pandemic restrictions, and Pearson's correlation was used to assess mental health factors. Then, standardized odds ratio regression coefficients, 95% confidence intervals, and *P*-values were reported by binary logistic regression analysis to evaluate the relationship of independent variables to depression, anxiety, stress, and sleep disturbances.

3. Results

3.1. Sample demographics

A total of 1120 questionnaires were collected, of which 1105 were valid, including 630 (57%) from women. The age of recruited subjects ranged from 17 to 30 years (average 20.26 years, standard deviation 2.92 years). The sample included undergraduate (n = 984, 89%), graduate (n = 117, 11%), and doctorate students (n = 4, 0.4%), which were further divided into first academic year (n = 586, 53%), second academic year (n = 197, 18%), third academic year (n = 173, 16%), and fourth academic year (n = 118, 11%) students. The students in this study were from the medical (n = 705, 64%) and nonmedical disciplines (n = 400, 36%). The vast majority of the sample collected had been vaccinated (n = 1092, 99%); 13 subjects (1%) were not vaccinated; 827 individuals (75%) had been infected; and 278 individuals (25%) had never been infected with

COVID-19. Table 1 lists the detailed descriptive statistics regarding sex, residence, level of study, major, year of study, internship status, vaccination status, and history COVID-19 infection.

3.2. Descriptive statistics

Table 2 shows that sex had a significant effect on anxiety and depression ($P < 0.01$). For women, the prevalence rates of anxiety and depression, as determined by the GAD-7 and PHQ-9, were 21% and 34%, respectively, whereas the rates were 12% and 20%, respectively, for men. No difference in the level of anxiety and depression across different residential areas was observed. The prevalence rates of anxiety and depression, as determined by the GAD-7 and PHQ-9, in rural and urban areas were 11% and 18%, 10% and 18%, and 11% and 18%, respectively. A difference in anxiety and depression levels between medical and nonmedical students ($P < 0.01$) was observed. Whether students had ever been or were at the time of the survey infected with COVID-19, could cope with pressure, had reduced interactions with others, worried about infection in their family or themselves, and worried about the difficulty in obtaining COVID-19 prevention materials after the easing of pandemic restrictions had a significant impact on the prevalence of depression ($P < 0.001$). In addition, the lack of knowledge of COVID-19 and the fear of taking public transportation when going out significantly affected mental health ($P < 0.001$).

Table 1. Demographics

Demographic variables	*n*	%
Sex		
Female	630	57
Male	475	43
Place of residence		
Village	365	33
Town	362	33
City	378	34
Level of education		
Bachelor's	984	89
Master's	117	11
Doctorate	4	0.4
Year of study		
First	586	53
Second	197	18
Third	173	16
Fourth	118	11
Fifth	31	3
Field of study		
Medical specialty	705	64
Nonmedical specialty	400	36
Internship status at the time of survey		
Yes	142	13
No	963	87
COVID-19 vaccination status		
Yes	1092	99
No	13	1
History of COVID-19 infection		
Yes	827	75
No	278	25
Total	1105	100

Figure 1 shows that after the pandemic restrictions were relaxed, the perceived pressure of Chinese college students was high (70%), and the incidence of sleep disorders was low (28%). Nearly one-third of the students showed symptoms according to the GAD-7 (33%), and more than half of the students showed symptoms according to the PHQ-9 (54%).

Figure 1 further shows that participants knew about the spread or infection of COVID-19. Only a small number of people (13%) lacked knowledge about the transmission and infection of COVID-19. After the easing of the restrictions, people's attention to the treatment of COVID-19 increased to varying degrees: slight (33%), somewhat (41%), and very much (10%). In addition, few people (20%) did not believe that it would be difficult to purchase COVID-19 prevention items at the stage when the COVID-19 restrictions were lifted. Most people (53%) claimed that they had reduced initiative to go out and interact with others. According to the participants, among the obstacles to mental health care, the most apparent hindrance was the lack of information on existing resources (35%), followed by limited resources (31%), and some believed that social discrimination (12%) and economic concerns (11%) were also the main deterring factors. Most students reported feeling anxious and depressed (58%) after the restrictions were eased. The most frequently mentioned concern was the fear that their highly vulnerable family members and relatives became infected with COVID-19 (88%), followed by the fear that they themselves became infected (72%). Moreover, 40% of the students who participated in the survey believed their pressure augmented after the pandemic, and 10% of the students believed that they could not fully cope with the stress after restrictions were lifted.

3.3. Correlations

We used the Pearson coefficient (Table 3) to verify the associations between variables. The correlation between

Table 2. Bivariate relationship between sociodemographic variables of college students' mental health burden after the lifting of pandemic restrictions and stress-related issues (*n*=1105)

Variables	Categories	Generalized anxiety disorder-7 scale		Patient health questionnaire-9		Perceived stress scale -10		Self-rating scale of sleep	
		n	%	*n*	%	*n*	%	*n*	%
Sex	Female	230	21**	380	34***	452	41	159	14
	Male	130	12	221	20	325	29	101	9
Place of residence	Village	124	11	205	19	268	24	82	7
	Town	115	10	199	18.	250	23	82	7
	City	121	11	197	19	259	23	96	9
Level of education	Bachelor's	313	28	532	48	692	63	226	21
	Master's	45	4	66	6	82	7	33	3.
	Doctorate	2	0.2	3	0.3	3	0.3	1	0.1
Field of study	Medical specialty	109	10**	197	18*	274	25	83	8
	Nonmedical specialty	251	23	404	37	503	46	177	16
Are you interning at this stage?	No	308	28	522	47	665	60	228	21
	Yes	52	5	79	7	112	10	32	3
Have you ever been vaccinated with the COVID-19 vaccine?	No	8	0.7*	9	0.8	12	1	9	0.8***
	Yes	352	32	592	53.6	765	69.2	251	23
Have you ever been or are you currently infected with COVID-19?	No	76	7*	122	11***	195	18	50	5*
	Yes	284	26	479	43	582	53	210	19
After the easing of the COVID-19 restrictions, did your overall pressure increase/decrease or remain unchanged?	No	219	20	295	27***	339	31	137	12***
	Yes	141	13	306	28	438	40	123	11
Could you fully cope with the pressure after the lifting of the pandemic restrictions?	No	76	7	94	9***	102	10***	65	5.9***
	Yes	284	26	507	46	675	61	195	18
Do you think other students feel pressure/anxiety in the wake of the relaxation of the pandemic restrictions?	No	94	9	205	19***	303	27***	84	8***
	Yes	266	24	396	36	474	41	176	16
After the easing of the COVID-19 restrictions, have you reduced your interactions with others?	No	88	8	190	17***	295	27	79	7**
	Yes	272	25	411	37	482	44	181	16
After the COVID-19 restrictions were relaxed, did you worry that your highly vulnerable families and relatives would be infected with COVID-19?	No	27	2**	52	5***	106	10*	26	2
	Yes	333	30	549	50	671	61	234	21
Did you worry about being infected after the pandemic restrictions were lifted?	No	50	5	123	11***	193	17*	54	5**
	Yes	310	28	478	43	584	53	206	19
After the COVID-19 restrictions were relaxed, did you feel that it has become more difficult to purchase COVID-19 prevention materials?	No	40	4	95	9***	149	14	36	3**
	Yes	320	29	506	46	628	57	224	20
After COVID-19 restrictions were relaxed, did you pay more attention to the treatment of COVID-19?	No	38	4	78	7*	125	11	44	4
	Yes	322	29	523	47	652	59	216	20
Do you find yourself lacking the knowledge of COVID-19 transmission or infection?	No	83	8***	194	18	281	25***	83	8***
	Yes	277	25	407	37	496	45	177	16
Were you afraid of taking public transport after the COVID-19 restrictions were relaxed?	No	98	9***	228	21***	333	30***	89	8***
	Yes	262	24	373	34	444	40	171	16

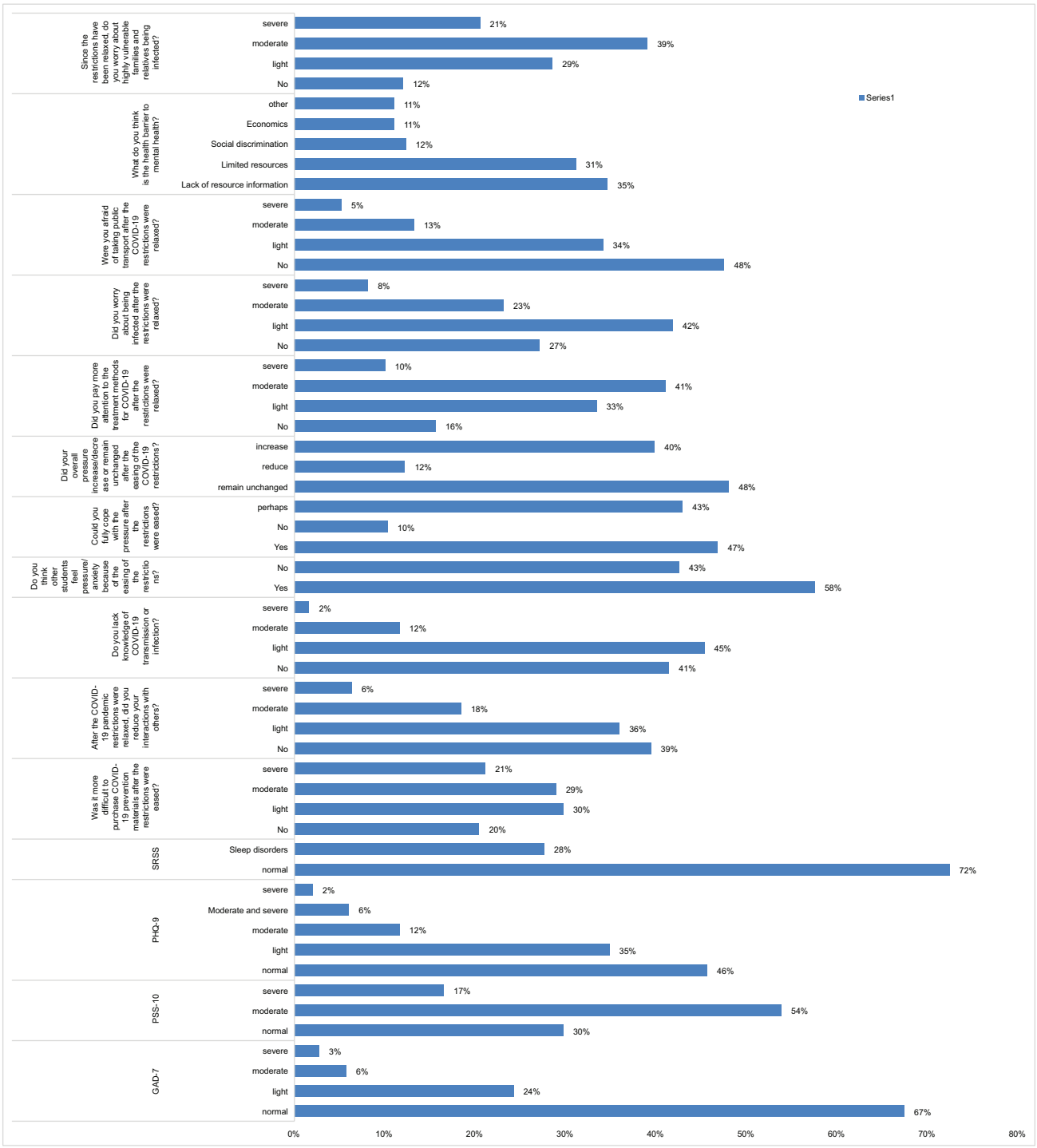

Figure 1. Coronavirus disease 2019 stress-related problems and psychological variables (depression, generalized anxiety disorder, perceived stress, sleep status) (n = 1105)
Abbreviations: GAD-7: Generalized anxiety disorder-7 scale; PHQ-9: Patient health questionnaire-9; PSS-10: Perceived pressure scale; SRSS: Self-rating scale of sleep.

perceived stress (PSS-10) and other variables was significant. The correlations of the PSS with GAD-7 and depressive symptoms (PHQ-9) were considered positive and high. Besides, the PSS was slightly positively correlated with sleep disorders (SRSS). The correlation between the GAD-7 and PHQ-9 effect intensity can be described as

Table 3. Correlation matrix and Pearson coefficients between perceived stress, generalized anxiety, depressive symptoms, and sleep disorders (*n*=1105)

Variable	1	2	3	4
PSS-10	-			
GAD-7	0.571**	-		
PHQ-9	0.576**	0.679**	-	
SRSS	0.390**	0.563**	0.622**	-

Abbreviations: GAD-7: Generalized anxiety disorder-7 scale; PHQ-9: Patient health questionnaire-9; PSS-10: Perceived pressure scale; SRSS: Self-rating scale of sleep. *p < 0.05;b **p < 0.01; ***p < 0.001.

positive and large. Both the GAD-7 and SRSS had large effects. The PHQ-9 was positively correlated with the SRSS.

3.4. Binary logistic regression

A binary logistic regression analysis was carried out to establish a prediction of the influencing factors of college students' mental health after the relaxation of COVID-19 restrictions (Table 4). The analysis showed that among the respondents, the increase in stress, ability to cope with stress, and lack of knowledge about the spread or transmission of COVID-19 were the most important predictors of generalized anxiety (P <0.001), followed by being a medical student and perceived anxiety of others (P < 0.010). The main predictors of high scores on the PHQ-9 were the pressure of past or ongoing infection with COVID-19 and inability to cope with the pandemic (P < 0.001), followed by sex, medical specialty, increased pressure, anxiety, and lack of knowledge of COVID-19 transmission or infection (P < 0.01). Interestingly, the level of anxiety and depression among medical students was more significant than that among nonmedical students. The main predictor of perceived stress was the fear of family members and relatives being infected with COVID-19 and the lack of knowledge of COVID-19 transmission or infection (P < 0.001). The second predictor was the fear of taking public transportation when going out (P < 0.05). Finally, stress after the pandemic was the main predictor of sleep disorders (P < 0.001). Furthermore, vaccination and COVID-19 infection had a certain effect on sleep disorders (P < 0.010).

4. Discussion

4.1. Main findings

Among the 1105 participants, 33% showed mild to severe anxiety, 54% underwent mild to severe depression, 70% felt moderate to severe perceived stress, and 28% experienced sleep disorders. The majority of them suffered from a significant effect, as shown by the severity of depression and anxiety (P < 0.01). More than half of the participants (58%) said that other students felt pressure/anxiety due to the easing of COVID-19 restrictions. Less than half of the respondents (47%) said that they could fully cope with the pressure following the outbreak. Most participants (88%) worried about the high vulnerability of their families and relatives to COVID-19 infection at varying degrees in the wake of the relaxation of COVID-19 restrictions.

A previous study has shown that sudden large-scale public health events significantly affect college students' mental health.[19] A study showed that the proportion of participants who had depression was significantly higher than that during the COVID-19 pandemic. For example, Ma *et al.* found that approximately 21% of the 746,217 college students they analyzed showed different degrees of depression during the COVID-19 pandemic in China.[20] In a separate study, after surveying 933 college students during the COVID-19 pandemic in China, Xiao *et al.* determined that the prevalence of depression in this demographic group was 25%.[21] In addition, 33% of the study participants had different anxiety levels. These findings are similar to those of previous studies. Wang *et al.*[22] and Liu *et al.*[23] found a high proportion of anxiety in a cross-sectional survey of college students' mental health during the COVID-19 pandemic in China, with anxiety affecting 25% (4754 people) and 29% (652 people), respectively. Some studies showed that students and people aged 18 – 24 years are at higher risk of anxiety and depression.[24] Therefore, active provision of support and help to vulnerable students to manage their mental health should be conducted immediately.

The survey results showed that most participants' perceived pressure (70%) increased significantly after the pandemic restrictions were eased. The proportion of stress among Chinese college students during the pandemic was 20% (out of 508 people),[25] and the perceived stress was 14% (out of 3092 people)[26] when Wang *et al.* investigated the anxiety and sleep problems of college students during the COVID-19 pandemic. Their results concord with the current set of findings, evidenced by the sources of pressure stemming from the lack of knowledge regarding the treatment of COVID-19, the difficulty in purchasing COVID-19 prevention materials, and the fear of infection of oneself or family members. The survey found that the proportion of sleep disorders increased after the pandemic restrictions were eased. For example, in a study on anxiety and sleep problems during the COVID-19 pandemic, sleep disorders affected 14% of the college students (out of 3092 people).[26] In a cross-sectional study on the sleep quality of college students during the COVID-19 pandemic in China, sleep disorders affected 16% (3416 people).[27] This may be caused by increased stress, which is an important influencing factor of sleep disorders and insomnia.[28]

Table 4. Summary of binary logistic regression analysis of students' mental health variables after the lifting of COVID-19 restrictions (*n*=1105)

Variable	Generalized anxiety disorder-7			Patient health questionnaire-9			Perceived stress scale-10			Self-rating scale of sleep		
	P	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI
Sex (Female=1)	0.282	1.18	0.87 – 1.59	0.002**	1.54	1.17 – 2.01	0.81	1.04	0.78 – 1.38	0.57	1.10	0.80 – 1.50
Discipline (Medical specialty=1)	0.005**	0.65	0.48 – 0.88	0.002**	0.65	0.49 – 0.85	0.86	0.97	0.73 – 1.30	0.24	0.82	0.60 – 1.13
Have you ever been vaccinated with the COVID-19 vaccine? (Yes=1)	0.02*	4.44	1.26 – 15.64	0.27	2.07	0.58 – 7.40	0.16	4.45	0.55 – 36.20	0.002**	7.64	2.11 – 27.64
Have you ever been or are you currently infected with COVID-19? (Yes=1)	0.06	0.72	0.51 – 1.01	0.000***	0.57	0.42 – 0.77	0.79	0.96	0.70 –1 .31	0.005**	0.59	0.40 – 0.85
After the COVID-19 restrictions were eased, did your overall pressure increase or decrease? (Increase=1)	0.000***	2.16	1.59 – 2.93	0.010*	1.47	1.10 – 1.97	0.09	1.36	0.97 – 1.81	0.08	1.40	0.97 – 1.89
Could you fully cope with the pressure after the pandemic restrictions were relaxed? (Yes=1)	0.000***	2.700	1.72 – 4.23	0.000***	2.81	1.67 – 4.75	0.001**	2.80	1.49 – 5.28	0.000***	3.87	2.52 – 5.93
Do you think other students feel stressed because of the easing of the COVID-19 restrictions? (Yes=1)	0.003**	0.61	0.44 – 0.85	0.009**	0.69	0.52 – 0.91	0.14	0.80	0.60 – 1.07	0.21	0.80	0.57 – 1.13
After the restrictions of COVID-19 were eased, have you reduced your interactions with others? (Yes=1)	0.18	0.79	0.57 – 1.11	0.19	0.82	0.61 – 1.10	0.26	1.20	0.87 – 1.64	0.57	0.90	0.63 – 1.29
Were you worried about your family and relatives being infected after the easing of COVID-19 restrictions? (Yes=1)	0.65	1.14	0.65 – 2.02	0.28	0.78	0.49 – 1.23	0.000***	2.73	1.61 – 4.65	0.97	1.01	0.58 – 1.77
After the easing of COVID-19 restrictions, were you aware of the treatments for COVID-19? (Yes=1)	0.92	1.03	0.63 – 1.68	0.49	1.15	0.77 – 1.73	0.33	1.24	0.81 – 1.91	0.025*	1.72	1.07 – 2.76
Do you find yourself lacking the knowledge of COVID-19 transmission or infection? (Yes=1)	0.000***	0.45	0.32 – 0.62	0.001**	0.61	0.46 – 0.81	0.000***	0.53	0.39 – 0.71	0.14	0.77	0.55 – 1.09
Were you afraid to take public transportation after the easing of COVID-19 restrictions? (Yes=1)	0.010*	0.64	0.46 – 0.90	0.13	0.79	0.58 – 1.07	0.032*	0.70	0.51 – 0.97	0.16	0.77	0.53 – 1.11

Note: All dichotomous variables were coded 0 or 1. ns: not significant; *P<0.05; **P<0.01; ***P<0.001.
Abbreviations: CI: Confidence interval; OR: Odds ratio.

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Our research found differences in the level of depression/anxiety among students of different majors. Compared with nonmedical majors, medical students were more affected after the easing of the restrictions of the pandemic. The results of this study are similar to those of previous studies. The prevalence of anxiety among medical students worldwide is much higher than that in the general population.[29] Moreira *et al.*[30] also found that the prevalence of anxiety and depression among medical students was higher than that among nonmedical students. During the pandemic, the proportion of anxiety and depression among Chinese medical students was also higher than that among nonmedical students,[31] and the specific influencing factors need further study. In addition, male students have lower levels of anxiety and depression than female students. In general, the prevalence of anxiety and depression among female students is significantly higher than that among their male counterparts.[32] Biological factors, such as genetic and epigenetic susceptibility, stress, immune system, neural plasticity, and hormone environment, are all factors that affect women when suffering from anxiety and depression.[33] Some data show that with increased age, women experience higher levels of stress than men do, and the degree of aggravation is also significantly stronger than that among men.[34] Therefore, after the easing of COVID-19 restrictions, female students may be more likely to show stress internalization disorder, which leads to stress-related diseases. Women are more likely to have depression than men due to life stress.[35]

After the easing of the pandemic restrictions, people's behaviors underwent shifts to some extent. The survey showed that people were afraid of taking public transportation and became more attentive to the treatment of COVID-19. Although the fear for being infected with COVID-19 is commonly cited as the probable cause of behavioral changes, other factors such as having an enhanced understanding of COVID-19 and its implications if infected and feeling trepidation over COVID-19 infection in themselves or their families also stand out as prominent causes.

According to our survey results, the intensification of stress, the ability to cope with stress, the lack of knowledge about the spread or infection of COVID-19, and the worry about taking public transportation were significantly related to the increase in depression and anxiety ($P < 0.001$). These findings are consistent with previous research results. Excessive stress changes the circadian rhythm of sleep, which is the main factor leading to anxiety and depression.[36,37] The pressure caused by sudden changes in society, the fear or lack of knowledge of COVID-19 transmission, and the fear of going out to take public transportation may cause trauma or stress-related diseases. Our survey found that the mental health status of college students worsened significantly after the easing of the restrictions of the pandemic. It may be that the mental health problems of college students are becoming increasingly serious, and the pressure caused by COVID-19 had further adverse effects on their learning and mental health. To cope with the psychological health challenges faced by many college students as a result of the easing of the COVID-19 restrictions, different authorities and departments such as universities, governments, and even the society should heighten their attention regarding the psychological health of this demographic group.

5. Study limitations

This study has several limitations as follows: first, the study is of cross-sectional design, which is not feasible for establishing a causal relationship. Second, certain factors could affect the generalizability of our findings. Third, the respondents were free to respond to each survey question with the answer of their choice, potentially constituting bias in the survey results. The high number of cases with depression, anxiety, and perceived stress in this survey are probably stemming from this presumed bias. In addition, we did not investigate whether the respondents had mental health diseases or received relevant treatment before the pandemic restrictions were eased. Next, the respondents in this survey were all recruited from the same regions; such geographical limitation poses challenges for the findings to be extrapolated to students in other regions. Finally, the self-reported mental health level determined in this survey was not evaluated and confirmed by mental health professionals.

6. Conclusion

Our survey results support the view that easing pandemic restrictions significantly affected the mental health of college students in a negative fashion. College students from families with vulnerable individuals may be particularly susceptible to a greater number of mental health problems. The easing of pandemic restrictions may have further compounded the stress on the students who already have psychological health problems. After the pandemic restrictions were relaxed, the mental health of many students was adversely affected by their persistent worries and fears of the uncertainties in the reinstitution of restrictions, which had taken a toll on both their physical and mental well-being. Addressing the many negative consequences of poor mental health requires the cooperation of the government, schools, and families working to address the risk factors in this demographic group. Our results showed that college students lacked relevant information on mental health protection

and had limited resources. The relevant departments in schools should make more channels available for psychological health consultation. In addition, it is critical to elevate the role of school in safeguarding their students' psychological health, by implementing early consultation and prevention, setting up compulsory courses of psychological education, strengthening the ability of self-learning about psychological health, constructing campus culture conducive to psychological health, and creating a good psychological and social environment for the healthy growth of college students. All of these measures can potentially reduce the burden of psychological health following the easing of pandemic restrictions. Importantly, the universities should proactively develop strategic plans in response to public health emergencies, where many fraught students will find themselves needing mental health support in face of emerging challenges.

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Conflict of interest

The authors declare no conflicts of interest.

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Ethics approval and consent to participate

This study was approved by the Human Research Ethics Committee of Sichuan Provincial People's Hospital, Sichuan Academy of Medical Sciences, and the University of Electronic Science and Technology review committee (Protocol No. 2023-47). Informed consent was obtained from participants in the form of an e-book before participating.

Consent for publication

Informed consent was obtained from participants to publish their data and images in this article in the form of an e-book.

Availability of data

The datasets analyzed in the current study are available from the corresponding author upon reasonable request.

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ORIGINAL RESEARCH ARTICLE

Reliability and validity of the Interpersonal Relationship Rating Scale in a Chinese population

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Abstract

Interpersonal relationships are of great significance to individuals, as positive relationships contribute to enhanced life satisfaction and mental health. To develop an effective scale for assessing interpersonal relationships, the Interpersonal Relationship Rating Scale was developed, and its reliability and validity were examined in a Chinese population. The initial items for the scale were formed through a literature search, clinical investigation, and expert interviews. A total of 461 valid responses were collected through the Questionnaire Star platform for exploratory factor analysis, leading to the extraction and naming of common factors. In addition, an offline questionnaire survey was conducted at a secondary vocational school in Nanjing, yielding 882 valid responses. Confirmatory factor analysis was performed using Mplus 8.0 to assess the model fit. The comprehensive evaluation of the scale confirmed its reliability and validity. The Interpersonal Relationship Rating Scale was ultimately divided into four dimensions. Validated factor analyses indicated a well-fitted model ($\chi^2/df = 7.59$, Comparative Fit Index = 0.860, Tucker–Lewis Index = 0.838, and root mean square error of approximation = 0.086). The scale demonstrated good internal consistency reliability, with an alpha coefficient of 0.903 and dimension-specific coefficients ranging from 0.674 to 0.909. Test–retest reliability for the total scale was 0.401, and for the dimensions, it ranged from 0.269 to 0.381 ($P < 0.01$). The scale also exhibited strong construct validity, criterion-related validity, and discriminant validity ($P < 0.01$). Overall, the Interpersonal Relationship Rating Scale is a reliable and valid tool for assessing interpersonal relationships in the Chinese population.

Keywords: Interpersonal relationships; Scale development; Reliability; Validity

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1. Introduction

Interpersonal activity is a central component of an individual's daily life. Positive interpersonal relationships play a key role in improving life satisfaction and maintaining both physical and mental health.[1] Interpersonal relationships are emotional

connections established between individuals through dynamic interactions,[2] serving as a relatively stable emotional accumulation and bond that forms through communication.[3] Individuals gradually establish and develop their interpersonal relationships as they engage emotionally and interact more deeply, usually progressing through four stages: the orientation stage, emotional exploration stage, emotional communication stage, and stable communication stage. As relationships deepen, mutual trust increases and the degree of emotional involvement becomes more significant.[4]

Various methods have been employed to evaluate interpersonal relationships, including sociometric methods, reference measures, and Bell's measures, among others.[5] A range of questionnaires has been developed, each with a different theoretical focus, to measure interpersonal relationships across diverse groups. Researchers have concentrated on measuring different aspects of interpersonal relationships. For example, the Interpersonal Reactivity Index (IRI), developed by Davis,[6] measures empathy based on multidimensional theoretical constructs. The IRI consists of 22 items scored on a 5-point scale ranging from 0 (completely inconsistent) to 4 (completely consistent) and is divided into four subscales: viewpoint selection, imagination, empathetic concern, and personal sadness.[6] The Interpersonal Trust Scale (ITS), developed by Rotter,[7] is widely used to measure trust within interpersonal relationships. The ITS was first translated into Chinese by Dai[5] and subsequently validated and revised by Xu[8] and Ding and Peng[9] among college students and adults from various professions, demonstrating good reliability and effectiveness for evaluating individual trust. However, the ITS focuses on a single dimension of measurement, limiting its ability to capture the comprehensive status of individual interpersonal relationships.

In Chinese culture, there is a strong emphasis on establishing and maintaining "relationships," with empathy regarded as a key ability. Empathy refers to putting oneself in another person's position, identifying with and understanding their situation and feelings,[10] and plays an enormous role in interpersonal interaction. At the same time, interpersonal trust is an important topic in the process of building and maintaining interpersonal communication and relationships. Studies have shown that interpersonal trust among college students fully mediates the effect of warm parental upbringing on interpersonal distress in dormitory settings.[11] In addition, previous research has identified self-esteem as a significant predictor of interpersonal relationships, with findings indicating that the self-esteem levels of high school freshmen negatively predict their interpersonal relationships. Furthermore, self-esteem partially mediates the relationships between perceived social support and interpersonal relationships.[12] These findings suggest that empathy and self-esteem are closely related to an individual's interpersonal relationships.[10-12] However, the current instruments measure a certain aspect of interpersonal relationships through a single dimension of empathy and self-esteem.

Considering the significance of interpersonal relationships to an individual's physical and mental health and social adjustment, there is a critical need for comprehensive assessment tools that evaluate the overall status of interpersonal relationships, identify the presence of distress within interpersonal relationships, and guide effective intervention strategies. Previous research on interpersonal relationship scales has predominantly focused on measuring specific dimensions or verifying the reliability and validity of existing scales. There is a lack of comprehensive, multidimensional tools that incorporate various dimensions of interpersonal relationships. In addition, most existing scales are designed to diagnose interpersonal distress, such as the Interpersonal Relationships Comprehensive Diagnostic Scale compiled by Zheng[13] and the Interpersonal Circumplex Scale revised by Hao.[14] These tools do not provide a comprehensive and effective measure of the general status of an individual's interpersonal relationships.

Therefore, the current study builds on established theories and scales of interpersonal relationships, focusing on five dimensions: general social competence, empathetic support, interpersonal trust, self-esteem level, and heterosexual interactions. The goal is to develop a comprehensive, multidimensional, and reliable interpersonal relationship assessment scale from a psychological perspective.

2. Method

2.1. Participant

This study was conducted in two stages (Figure 1):

- Stage 1: For the preliminary measurement, the questionnaire was distributed through a Quick Response code on the Questionnaire Star platform. A total of 500 responses were collected. Questionnaires that were completed too quickly or contained identical answers were considered invalid and excluded, resulting in 461 valid responses, with a validity rate of 92.20%. The sample included 178 males (38.61%) and 283 females (61.39%), with participants ranging in age from 14 to 70 years (mean age = 34.86 ± 13.09 years).
- Stage 2: The second stage involved two separate samples. First, 617 questionnaires were collected from a secondary vocational school in Nanjing using convenience sampling. After excluding invalid

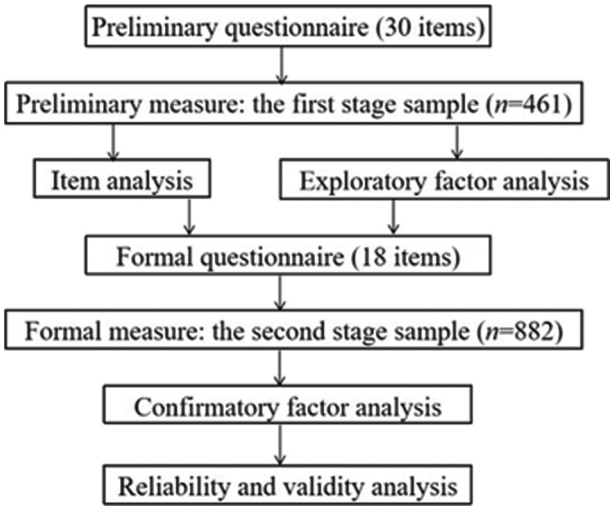

Figure 1. The flowchart of scale development

responses due to incomplete answers or identical responses, 547 valid questionnaires were retained (Sample 1). Subsequently, the questionnaires were distributed nationwide through the Questionnaire Star platform, yielding 335 valid responses (Sample 2). The total sample size for the second stage was 882 valid questionnaires, with a validity rate of 92.65%. Among these participants, 278 (31.52%) were male and 604 (68.48%) were female, with ages ranging from 14 to 78 years (mean age = 24.61 ± 13.72 years).

2.2. Questionnaire development

The Interpersonal Relationship Rating Scale, initially developed for the current study, consists of 30 items (Table A1) and is structured around five dimensions derived from theoretical conceptualization: general social competence (Items 1, 3, 9, 14, 21, 25), self-esteem level (Items 2, 7, 12, 17, 23, 28), interpersonal trust (Items 4, 8, 13, 18, 22, 29), empathetic support (Items 6, 11, 16, 20, 24, 27), and heterosexual interactions (Items 5, 10, 15, 19, 26, 30), as detailed in Table 1. Each item is rated on a 5-point Likert-type scale, with 1 = "completely inconsistent," 2 = "comparatively inconsistent," 3 = "unsure," 4 = "comparatively consistent," and 5 = "completely consistent." Higher scores indicate a better interpersonal status of the individual.

The development of the items was based on the following sources:

i. Reference to existing scales: Items were adapted from existing interpersonal relationship assessment tools, with linguistic adjustments and corrections made to fit the current theoretical framework. Sources included the Interpersonal Relationships Comprehensive Diagnostic Scale compiled by Zheng,[13] the Chinese version of the IRI, the ITS, and the Interpersonal Relationship Adaptation subscale from the Chinese College Student Adaptation Scale (CCSAS) compiled by Fang *et al.*[15] Specifically, Items 3, 5, 10, 15, 19, 21, 26, and 30 were adapted from the Interpersonal Relationship Comprehensive Diagnostic Scale; Items 8 and 25 were references from the Interpersonal Adaptation subscale of the CCSAS; Items 11 and 24 were compiled from the IRI with modifications; and Items 13, 18, and 29 were modified from the ITS.
ii. Open-ended surveys: Data were collected from open-ended surveys of clinically observed individuals with significant interpersonal difficulties, healthy individuals, and their family members. Representative information collected from interviews was selected, and written language adjustments and meaning summaries were made to align with measurement requirements, contributing to Items 1, 2, 4, 6, 7, 9, 12, 14, 16, 17, 20, 22, 23, 27, and 28.
iii. Expert review and modification: Adjustments and modifications were made based on theoretical structure and expert opinions. Two experts in psychology and three in psychiatry were consulted to analyze the scale's structural system and item expression. The scale was modified based on their feedback and suggestions for improvement.

2.3. Criterion measures

2.3.1. Generalized Anxiety Disorder-7 (GAD-7)

The GAD-7 is an operable, simple, and convenient self-assessment scale for anxiety symptoms, consisting of seven items. Each item is rated on a 4-point Likert-type scale ranging from 0 ("never") to 3 ("almost every day"), with total scores ranging from 0 to 21. The scale has been validated to demonstrate good reliability and validity.[16] In this study, GAD-7 was used to identify emotional problems, categorizing participants with moderate or higher anxiety (GAD ≥ 10) as the emotional disorder group.[16] The discriminant validity of the scale was examined by comparing the differences in scores between the emotional disorder and non-disorder groups.

2.3.2. Patient health questionnaire-9 (PHQ-9)

The PHQ-9 is a widely used tool for identifying depressive symptoms and assessing their severity.[17] It includes nine items, each rated on a 4-point Likert-type rating scale ranging from 0 to 3, with higher total scores reflecting more severe depressive symptoms. The scale has been validated to have good reliability and validity in both special and general populations.[18,19]

The PHQ-9 was used in this study to differentiate and screen for emotional problems, with participants scoring

Table 1. Retained items after initial scale testing

Items	1	2	3	4	5
1. I don't feel rushed or nervous in social situations.	□				
2. I can understand the different views of others when I disagree with them.	□				
3. I am willing to take the initiative to make new friends.	□				
4. I don't worry about people having a bad opinion of my performance.	□				
*5. I often struggle with how to communicate with others, and I often feel that I can't get a word in edgewise at gatherings.	□				
6. Sometimes, I think about things from other people's points of view so that I can better understand their feelings.	□				
7. I'm willing to let my new peers know the truest side of me.	□				
8. I am on an equal footing with the opposite sex when interacting with them.	□				
9. I don't feel shy and uncomfortable around the opposite sex.	□				
10. When someone needs help, I can offer advice and support in a way that he is comfortable with.	□				
11. I believe that socializing with the opposite sex is an indispensable part of human relationships.	□				
12. I am able to sincerely listen when others talk about topics that do not interest me.	□				
13. I don't avoid gatherings of many people, and I don't feel anxious or apprehensive.	□				
14. When others tell me their troubles, I can understand their feelings and give them encouragement.	□				
15. When I am in trouble, I feel sure that someone will be willing to help me.	□				
16. I don't get jealous or fall into self-denial when I find out that someone else has something better than me.	□				
17. I am good at using language to communicate with others.	□				
18. I know how to advance a conversation with the opposite sex.					

Note: *Is a reverse scoring item.

10 (PHQ ≥ 10) or above classified as having moderate or higher levels of depression, forming the emotional disorder group.[17] Discriminant validity was examined by comparing the Interpersonal Relationship Rating Scale scores between the emotional disorder and non-disorder groups.

2.3.3. Interpersonal relationship comprehensive diagnostic scale

This scale consists of 28 items and assesses the degree of interpersonal relationship distress across four dimensions: interpersonal communication difficulties, interpersonal friendship difficulties, interpersonal interaction difficulties, and heterosexual communication difficulties. Each item is rated on a two-point scale, with "yes" scoring 1 and "no" scoring 0. Higher scores indicate more severe interpersonal behavioral distress. Previous studies have demonstrated that this scale possesses good reliability and validity.[13]

2.4. Statistical processing

The validity of the questionnaire was assessed, and invalid responses – such as those with omissions or patterns of highly regular answers – were eliminated. Data from the first stage sample (n_1 = 461) were analyzed using the Statistical Package for the Social Sciences (SPSS) 22.0, including question-total correlation analysis and exploratory factor analysis. Principal component analysis was then used to extract common factors and generate the initial loading matrix, followed by maximum variance rotation to refine the final factor loading matrix. The appropriateness of the factor analyses was examined using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity, and the final number of factors was determined with the aid of a scree plot.

Validated factor analysis was conducted on the second-stage sample (n_2 = 547) using Mplus 8.0 to examine model fit. The scales were further examined for reliability and validity using SPSS 22.0, including assessments of internal consistency reliability, test–retest reliability, construct validity, criterion-related validity, and discriminant validity.

3. Results

3.1. Preliminary questionnaire analysis and factor naming

3.1.1. Item analysis

The present study used the correlation between individual items and the total score to analyze item differentiation. In general, the total score reflects the participants' level of the measured trait, and a high correlation between a single item and the total score indicates good differentiation. Pearson correlation analysis was performed between each item and the total score to screen the items. Items with correlation

coefficients below 0.4 were considered insufficiently differentiated and were removed from the scale.[20]

After statistical analysis, eight items did not meet the requirements and were excluded: Item 10 (0.364), Item 13 (0.298), Item 18 (0.381), Item 20 (0.170), Item 22 (0.315), Item 23 (0.230), Item 29 (−0.041), and Item 30 (0.375). The remaining items demonstrated a good degree of differentiation. The 22 retained items and their correlation coefficients with the total score are listed in Table A2.

3.1.2. Exploratory factor analysis

Exploratory factor analysis was conducted on the first stage of sample data. The results of Bartlett's test of sphericity were significant, with a KMO = 0.914, χ^2 = 3,802.636, df = 231, P < 0.001, indicating that the scale was suitable for factor analysis. Principal component analysis was used to extract common factors, and items were iteratively analyzed and excluded step by step based on the following principles: (i) items with similar factor loadings on two or more common factors and (ii) items with maximum factor loadings on common factors below 0.4 and commonalities <0.4. Four items (Items 2, 9, 12, and 28) were removed for not meeting these requirements, resulting in a refined scale of 18 items (Table 1).

The criteria for determining the number of dimensions included (i) An eigenvalue of the factor >1 and (ii) a minimum of three items per dimension. Exploratory factor analysis of the 18 retained items identified four factors based on eigenvalues and the scree plot. Factor 1 included Items 3, 14, 19, 21, 25, and 26; Factor 2 included Items 6, 11, 24, and 27; Factor 3 included Items 1, 4, 5, and 8; and Factor 4 included Items 7, 15, 16, and 17. The cumulative variance explained by the factors was 53.737%, with factor loadings ranging from 0.411 to 0.775 (Figure 2).

Based on the initial dimensions and item meanings, the four newly identified factors were renumbered and renamed as follows: Factor 1 (Items 1, 5, 9, 13, 17, and 18) was labeled "general social skills"; Factor 2 (Items 2, 6, 10, and 14) was labeled "empathic support"; Factor 3 (Items 3, 7, 11, and 15) was labeled "interpersonal trust"; and Factor 4 (Items 4, 8, 12, and 16) was labeled "self-esteem level."

3.1.3. Confirmatory factor analysis

A confirmatory factor analysis was conducted on the second stage sample (n_2 = 882) using Mplus 8.0. The results indicated that the model had good fit indices, as presented in Table 2.

The Chi-square test for goodness of fit (χ^2/df) is the most commonly reported indicator of goodness of fit, particularly when used in conjunction with degrees of freedom to assess the probability of model correctness. The χ^2/df statistic directly tests the similarity between the sample covariance matrix and the estimated variance matrix, with a theoretical expected value of 1. In practical research with large sample sizes, values of χ^2/df up to 5 or even 8 are generally considered acceptable.

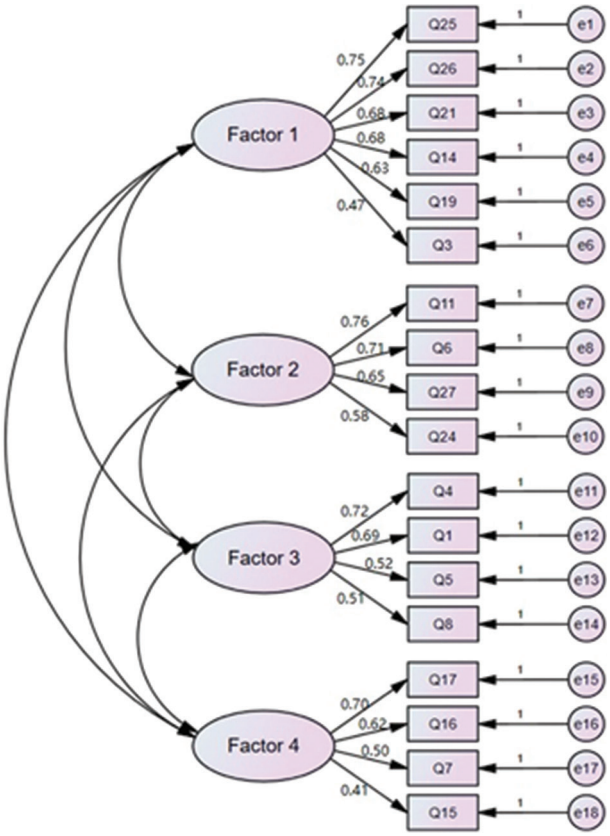

Figure 2. Items and factor loadings for each dimension

Table 2. Confirmatory factor analysis fit indicator values for formally administered tests (n=882)

Fit indicator	χ^2/df	P	GFI	CFI	TLI	RMSEA
Values	7.59	0.000	0.831	0.860	0.838	0.086

Abbreviations: CFI: Comparative Fit Index; GFI: Goodness of fit index; RMSEA: Root mean square error of approximation; TLI: Tucker–Lewis Index.

The goodness of fit index (GFI) assesses how well the model fits the observed values of the sample. A GFI ≥ 0.90 is typically interpreted as indicating a good fit.[21]

The comparative fit index (CFI) assesses how well the hypothetical model fits compared to an independent model, with values ranging from 0 to 1. Higher CFI values, particularly those closer to 1 (e.g., CFI ≥ 0.90), indicate a good model fit.[21]

The Tucker–Lewis Index (TLI), another fit index, also ranges from 0 to 1, with higher values (closer to 1) reflecting a better fit. A TLI value >0.90 is typically considered indicative of a good model fit.[21] However, some less stringent standards suggest that values of GFI, CFI, and TLI >0.80 are acceptable.

The root mean square error of approximation (RMSEA) assesses model fit by measuring how well a model approximates the data; lower values (closer to 0) indicate a better fit. The p of close fit (PCLOSE) is a one-sided test of the null hypothesis that RMSEA = 0.05, representing a close-fitting model.[22] In addition, the PCLOSE statistic provides the probability that the RMSEA is <0.05, indicating a close fit.

In our study, the indices were as follows: GFI = 0.831 (>0.80), CFI = 0.860 (>0.80), TLI = 0.838 (>0.80), and RMSEA = 0.086 (<0.10). These results from the confirmatory factor analysis indicate that the model fit for the Interpersonal Relationship Rating Scale is generally acceptable (Table 2).

3.2. Reliability and validity analysis of the formal questionnaire

3.2.1. Internal consistency reliability

Internal consistency reliability was analyzed for Samples 1 and 2 as well as the total sample. The total scale consisted of 18 items, with an overall Cronbach's alpha coefficient of 0.903. The alpha coefficients for the four dimensions across both samples and the total sample, as well as the total scale, ranged from 0.674 to 0.909 (Table 3), indicating good internal consistency reliability.

3.2.2. Test–retest reliability

Eighty-four participants were randomly selected from Sample 2 (n_2 = 335), and the Interpersonal Relationship Scale was administered again 2 months after the first measurement. The results showed that the correlation coefficient of the total score between the two measures was 0.401. The correlation coefficients for the scores of the dimensions between the two measures ranged from 0.269 to 0.381 (Table 3).

3.2.3. Construct validity

Correlation analyses were conducted between the dimensions of the scale as well as between the dimensions and the total scale for both samples. The results showed that the correlation coefficients between the four factors ranged from 0.465 to 0.693 (all $P < 0.01$), and the correlation coefficients between the factors and the total scale ranged from 0.792 to 0.881 (all $P < 0.01$). These results, detailed in Table 4, indicate that the factors of the scale were significantly correlated.

3.2.4. Criterion-related validity

The Interpersonal Relationship Comprehensive Diagnostic Scale, with an alpha coefficient of 0.900 in the sample of this study (n = 882), was used as the validity criterion. Pearson's product-difference correlation analysis was performed to assess the correlation between this scale and the Interpersonal Relationship Rating Scale.

The results of correlation analysis showed that the correlation coefficients between the factors of the two

Table 3. Cronbach's alpha coefficients and test–retest reliability for the total scale and dimensions

	Total scale	Factor 1	Factor2	Factor 3	Factor 4
Sample 1 (n_1=547) alpha coefficient	0.899	0.806	0.819	0.711	0.674
Sample 2 (n_2=335) alpha coefficient	0.909	0.775	0.805	0.744	0.741
Total sample alpha coefficient	0.903	0.794	0.815	0.718	0.701
Test-retest reliability	0.401**	0.312**	0.344**	0.381**	0.269*

Notes: *P<0.05, **P<0.01.

Table 4. Correlation coefficients for dimensions and total scale

	Sample 1 (n_1=547)				Sample 2 (n_2=335)			
	F1	F2	F3	F4	F1	F2	F3	F4
F1								
F2	0.465**				0.539**			
F3	0.527**	0.605**			0.606**	0.693**		
F4	0.593**	0.681**	0.662**		0.681**	0.684**	0.680**	
Total	0.836**	0.792**	0.820**	0.862**	0.869**	0.815**	0.853**	0.881**

Note: **P<0.01.

scales ranged from −0.111 to −0.394, and the correlation coefficients between the total score of the Interpersonal Relationship Rating Scale and the validity criterion scores ranged from −0.226 to −0.352 (all $P < 0.01$), indicating good criterion-related validity. Detailed results are presented in Table 5.

3.2.5. Discriminant validity

Participants were classified into groups based on the criteria of GAD ≥ 10 or PHQ-9 ≥ 10. In Sample 1, 430 participants were in the emotional disorder group, while 117 (21.39%) were in the non-emotional disorder group. In Sample 2, there were 255 participants in the emotional disorder group and 80 (23.88%) in the non-emotional disorder group. An independent samples *t*-test was conducted to compare the scores on the Interpersonal Relationship Rating Scale between the emotional disorder and non-emotional disorder groups in both samples to determine if the differences were statistically significant. The results indicated significant differences between the two groups in Sample 1 for the total score and all dimension scores (all $P < 0.001$). In Sample 2, significant differences were found between the groups for Factor 2 at the 0.05 level, while the remaining factors were significant at the 0.001 level. Detailed results are presented in Table 6.

4. Discussion

The Interpersonal Relationship Rating Scale was empirically verified to have good reliability and validity in the Chinese population. Specifically, the scale demonstrated good internal consistency and test–retest reliability. Moreover, the scale exhibited acceptable construct validity, criterion-related validity, and discriminant validity. In terms of criterion-related validity, the dimensions of the Interpersonal Relationship Rating Scale were significantly correlated with the dimensions and total scores of the Interpersonal Relationship Comprehensive Diagnostic Scale, indicating good criterion-related validity and internal consistency between this scale and existing measures of interpersonal relationships. For discriminant validity, significant differences were observed in interpersonal relationship status between the emotional disorder and non-emotional disorder groups. This finding suggests that individuals with poor interpersonal relationships are more likely to experience higher levels of anxiety or depression and, consequently, lower levels of mental health.[22]

This scale assesses the comprehensiveness of an individual's interpersonal relationships, focusing on four dimensions: general social competence, empathetic support, interpersonal trust, and self-esteem level.

Table 5. Correlation of total scale and dimensions with validity criterion (r)

	Sample 1 (n_1=547)				Sample 2 (n_2=335)			
	Criterion factor 1	Criterion factor 2	Criterion factor 3	Criterion factor 4	Criterion factor 1	Criterion factor 2	Criterion factor 3	Criterion factor 4
F1	−0.360**	−0.391**	−0.166**	−0.394**	−0.477**	−0.617**	−0.358**	−0.532**
F2	−0.214**	−0.143**	−0.161**	−0.111**	−0.306**	−0.249**	−0.230**	−0.254**
F3	−0.297**	−0.240**	−0.205**	−0.225**	−0.434**	−0.419**	−0.333**	−0.293**
F4	−0.253**	−0.271**	−0.230**	−0.220**	−0.397**	−0.493**	−0.411**	−0.409**
Total	−0.352**	−0.336**	−0.226**	−0.312**	−0.484**	−0.549**	−0.396**	−0.460**

Note: **P<0.01.

Table 6. Comparison of scores on Interpersonal Relationship Rating Scales between emotional disorder and non-emotional disorder groups

	Sample 1 (n_1=547)				Sample 2 (n_2=335)			
	Emotional disorder group (n=430)	Non-emotional disorder group (n=117)	t	p	Emotional disorder group (n=255)	Non-emotional disorder group (n=80)	t	p
F1	19.88 (4.86)	17.53 (5.27)	4.556	0.000	20.74 (4.65)	17.93 (4.78)	4.619	0.000
F2	15.76 (3.00)	14.49 (3.16)	4.030	0.000	16.11 (2.75)	15.30 (2.75)	2.308	0.023
F3	14.34 (3.15)	12.73 (3.38)	4.832	0.000	14.59 (3.17)	13.09 (3.29)	3.605	0.000
F4	14.65 (2.98)	12.94 (3.06)	5.473	0.000	14.85 (3.10)	12.90 (3.34)	4.631	0.000
Total	65.72 (12.01)	59.34 (10.87)	5.724	0.000	66.29 (11.59)	59.21 (12.16)	4.595	0.000

Note: The values are expressed as mean (standard deviation).

The general social competence dimension refers to an individual's interactions with others and their positive engagement in the group emotions and behaviors, such as actively participating in activities and socializing with others. This dimension is consistent with the interpersonal communication and friendship components of the Interpersonal Relationship Comprehensive Diagnostic Scale,[19] providing a more comprehensive assessment of an individual's general social status.

Empathetic support measures an individual's ability to spontaneously notice, understand, and respond to the emotions and reactions of others in interpersonal interactions. It reflects a capacity for empathy and caring for others' feelings. This dimension aligns with the Chinese Interpersonal Reactivity Pointer Scale[23] and assesses an individual's ability to empathize with others in interpersonal interactions.

The interpersonal trust dimension refers to the degree of trust an individual has in others during interactions, including honest and reliable beliefs about others, as well as the willingness to rely on and trust each other. This is an important psychological quality in interpersonal communication. In contrast to Rotter's[24] Interpersonal Trust Scale, which measures trust across interpersonal, political, and social domains, this dimension focuses specifically on trust within personal interactions.

The self-esteem level dimension relates to the emotional experiences formed through self-evaluation, such as self-respect, self-appreciation, acceptance of one's own shortcomings, and correct perception of others' evaluations. It reflects how individuals position themselves and interact within interpersonal relationships. This dimension is consistent with the Interpersonal Adaptation subscale of the CCSAS by Fang *et al.*[15] When individuals manage their self-evaluations and others' evaluations well, they tend to adapt better to interpersonal interactions. In summary, an analysis of each dimension's meaning and comparison with existing scale structures suggests that the four dimensions of this scale broadly encompass the comprehensive nature of interpersonal relationships and offer a representative evaluation.

Compared with existing instruments, the scale developed in this study offers several advantages. First, it comprehensively covers almost all aspects of interpersonal relationships, including general social competence, empathetic support, interpersonal trust, and self-esteem level. This multidimensional approach addresses the limitations of other interpersonal relationship scales that focus solely on specific areas, such as interpersonal trust, opposite-sex interactions, or interpersonal reactions, thereby providing a more holistic assessment of interpersonal relationships. Second, the age range of participants in this study spans from 14 to 78 years, including adolescents, adults, and the elderly. This broader age range makes the scale applicable to a wider demographic compared to previous instruments, which often target specific age groups. Finally, this scale was developed within the context of Chinese culture and language, making it particularly suited for assessing interpersonal relationships in localized Chinese research.

However, this study has some limitations. First, in terms of sample representativeness, the study used random sampling for Sample 1, which was tested nationwide, and convenience sampling for Sample 2, which involved students from a secondary vocational school in Nanjing. These differences in sample nature and size mean that the scale's results have not been fully validated across diverse populations and age subgroups. Second, despite assurances of anonymity and confidentiality, participants may have been influenced by "social desirability" bias during the response period, potentially affecting the objectivity of the results. Finally, although the scale demonstrated high discriminant validity, the internal mechanisms underlying the relationship between anxiety, depression, interpersonal relationships, and their dimensions remain unexplored. Furthermore, the diagnostic potential of the scale has not been definitively established.

Future research should include a broader demographic range to explore the scale's performance across various age groups and other demographic variables, ensuring its applicability. In addition, efforts should focus on adapting and validating the scale across different cultural contexts to enhance its generalizability. To control for social desirability bias, future studies could incorporate indirect questioning techniques and validated social desirability scales.

Further research is needed on a representative sample of the general Chinese population or specific sub-populations to verify the diagnostic use of this scale. Moreover, studies should aim to elucidate the internal mechanisms underlying the relationship between anxiety, depression, interpersonal relationship status, and the various dimensions of the scale. It is also necessary to propose effective measures for enhancing individual interpersonal skills, which would provide valuable guidance for clinical interventions.

5. Conclusion

The 18-item Interpersonal Relationship Rating Scale developed in this study was empirically verified to have good reliability and validity, making it suitable for assessing interpersonal relationships at the individual level. However, it is important to consider that due to sample limitations,

the applicability of the instrument for individuals over 50 years old was not validated in this study. Overall, this research contributes to the enrichment and development of instruments for assessing interpersonal relationships. In addition, the scale can effectively differentiate between individuals with and without emotional disorders based on their interpersonal relationship states, offering practical value and potential for broader application in clinical settings.

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Conflict of interest

Yonggui Yuan and Wenhao Jiang are the Editor-in-Chief and Associate Editor of the journal, respectively, but were not involved in any way, directly or indirectly, in the editorial and peer-review process of this paper. Separately, the other authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Author contributions

Conceptualization: Xiao Yuan
Formal analysis: Yueqiu Zhao, Xiao Yuan, Yuqun Zhang, Wenhao Jiang
Investigation: Yonggui Yuan
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Writing – original draft: Xiao Yuan
Writing – review & editing: Yuqun Zhang, Wenhao Jiang

Ethics approval and consent to participate

The study design, informed consent form, participant information survey form, and other materials have been submitted for ethical review before the study officially begins. This study has been approved by the Clinical Research Ethics Committee of Southeast University Affiliated Zhongda Hospital. The entire research process strictly adhered to the principles of information confidentiality and informed consent. Before the start of the study, participants were provided with a detailed explanation of the research objectives, methods, procedures, and potential risks. Personal wishes were respected and informed consent forms were signed. All participants voluntarily participated in this study.

Consent for publication

The participants gave consent to publish their data in this study.

Availability of data

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available because of local ethical restrictions and the protection of the privacy of study participants.

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Appendices

Table A1. Initial Interpersonal Relationship Rating Scale (30 items)

Items	1	2	3	4	5
1. I am willing to take the initiative to make new friends.					
2. I am more confident when interacting with others.					
3. I don't feel rushed or nervous in social situations.					
4. I am willing to let my new peers know the truest side of me.					
5. I believe that socializing with the opposite sex is an indispensable part of interpersonal relationships.					
6. I can understand the different views of others when I disagree with them.					
7. I don't worry about people having a bad opinion of my performance.					
8. When I am in trouble, I feel sure that someone will be willing to help me.					
9. I can get along with new peers easily and naturally.					
*10. My interest in interacting with the opposite sex has waned.					
11. Sometimes, I think about things from other people's points of view so that I can better understand their feelings.					
12. Faced with the rejection of others, I usually look at and analyze the reasons objectively.					
13. I am not always on guard against being taken advantage of in my dealings with others.					
*14. I often struggle with how to communicate with others, and I often feel that I can't get a word in edgewise at gatherings.					
15. I am on an equal footing with the opposite sex when interacting with them.					
16. I am able to listen sincerely when others talk about topics that do not interest me.					
17. I don't get jealous or fall into self-denial when I find out that someone else has something better than me.					
18. I believe that others are usually trustworthy in keeping their promises and do not break them without good reason.					
19. I don't feel shy and uncomfortable around the opposite sex.					
*20. I often blame the unpleasantness I experience in my interactions with others for what they are not.					
21. I don't avoid gatherings of many people, nor do I feel anxious and apprehensive.					
22. I can confide very personal things to close friends and trust them not to make jokes about it.					
*23. I always pander to the views of others and agree with them.					
24. When someone needs help, I can offer advice and support in a way that he is comfortable with.					
25. I am good at using language to communicate with others.					
26, I know how to advance a conversation with the opposite sex.					
27. When others tell me their troubles, I can understand their feelings and give them encouragement.					
28. I can see my own uniqueness while appreciating the strengths of others					
*29. I think that no matter how much goodwill is expressed by others, most people are still concerned with their own interests and well-being.					
30. I know the boundaries of being with the opposite sex and know when to stop.					

Note: *is a reverse scoring item.

Table A2. Deleted items and their correlation coefficients with the total scale (22 items)

Items	r
1. I am willing to take the initiative to make new friends.	0.633**
2. I am more confident when interacting with others.	0.684**
3. I don't feel rushed or nervous in social situations.	0.571**
4. I am willing to let my new peers know the truest side of me.	0.499**
5. I believe that socializing with the opposite sex is an indispensable part of interpersonal relationships.	0.532**
6. I can understand the different views of others when I disagree with them.	0.466**
7. I don't worry about people having a bad opinion of my performance.	0.551**
8. When I am in trouble, I feel sure that someone will be willing to help me.	0.580**
9. I can get along with new peers easily and naturally.	0.708**
10. Sometimes, I think about things from other people's points of view so that I can better understand their feelings.	0.419**
11. Faced with the rejection of others, I usually look at and analyze the reasons objectively.	0.518**
*12. I often struggle with how to communicate with others, and I often feel that I can't get a word in edgewise at gatherings.	0.484**
13. I am on an equal footing with the opposite sex when interacting with them.	0.524**
14. I am able to listen sincerely when others talk about topics that do not interest me.	0.477**
15. I don't get jealous or fall into self-denial when I find out that someone else has something better than me.	0.524**
16. I don't feel shy and uncomfortable around the opposite sex.	0.590**
17. I don't avoid gatherings of many people, nor do I feel anxious and apprehensive.	0.695**
18. When someone needs help, I can offer advice and support in a way that he is comfortable with.	0.495**
19. I am good at using language to communicate with others.	0.658**
20. I know how to advance a conversation with the opposite sex.	0.573**
21. When others tell me their troubles, I can understand their feelings and give them encouragement.	0.497**
22. I can see my own uniqueness while appreciating the strengths of others.	0.683**

Note: *Is a reverse scoring item, **$P<0.01$.

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ORIGINAL RESEARCH ARTICLE

Biopsychosocial factors in cancer pain: A multidimensional evaluation of quality of life, mental health, and mortality

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Abstract

Patients with cancer pain are often subjected to a range of biopsychosocial conditioning factors, although the extent of their interactions remains unclear. This study aims to assess specific biopsychosocial dimensions using multidimensional questionnaires. Specifically, it analyzes the impact, correlation, and collinearity of factors such as pain, anxiety, depression, activities of daily living, and quality of life (QoL). The study focuses on the relationship between individual autonomy, depression, and anxiety, and their subsequent impact on mortality. This prospective, observational, cross-sectional study was conducted over 1 year with 120 cancer patients. Data were collected utilizing the Brief Pain Inventory, the Hospital Anxiety and Depression Scale, and the Short-Form-36 questionnaire and subsequently analyzed. The results reveal collinearity among the questionnaires and indicate that the loss of individual autonomy significantly worsens depression, though it does not have a comparable effect on anxiety. Statistically significant correlations were observed between depression and anxiety with mortality. The findings underscore the importance of early recognition of distress symptoms during the management of oncologic patients, alongside effective pain management. Mortality was strongly associated with high scores for depression and anxiety. Family caregiver support and social network involvement should be prioritized, and healthcare providers should promote individual autonomy to improve treatment outcomes. Although further research is needed, this study suggests that adopting a holistic approach to cancer care could not only improve QoL but also potentially extend life expectancy.

Keywords: Depression; Anxiety; Mental health; Cancer pain; Personal autonomy; Marital status; Surveys and questionnaires; Quality of life

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1. Introduction

Oncological pain plays a predominant role in impairing patients' quality of life (QoL).[1] Biopsychosocial factors, such as chronic pain, sleep disturbances, changes in daily activities, and a lack of family care and social support, form a vicious cycle that can exacerbate baseline anxiety and depression. As a result, the physiological effects of severe psychological distress may lower the pain threshold, causing even minor stimuli to feel intensely painful.

It is well recognized that a weakened psychosomatic system can influence both the pathology and the success of its treatment.[2-5] However, in the field of oncology, the extent to which these different factors interact remains unclear, requiring further analysis and new data to better understand these relationships. This gap in knowledge led to our research, which employed multidimensional questionnaires to assess 120 cancer patients.

Meta-analyses conducted over the last decade have concluded that 40% of cancer patients continue to experience significant pain even after curative treatment. This figure increases to 55.0% during specific surgical, chemotherapy, and radiotherapy treatments and approximately 66% in cases of metastatic, advanced, or terminal disease. In terms of moderate to severe pain, as measured on the Numerical Rating Scale (>5), global evaluations have shown a reduction in prevalence from 38%[2] to 30.6% over the past decade.[3] This data represents a significant decline of around 8% points in both the prevalence and severity of cancer pain.[3]

From a demographic perspective, a recent large-scale study in Portugal[4] reported that 38% of the population suffers from chronic pain. This study[4] further revealed that moderate to severe pain affects 50% of the sample, with 17% diagnosed with depression and more than 20% reporting a lack of pleasure in life.[4,5] Others studies have indicated a higher prevalence of chronic pain among women[6,7] and the elderly,[8] compared to the 10 – 30% range observed across Europe.[9-11]

Given that a relevant number of cancer patients continue to experience significant pain, improving cancer pain management remains a priority. In addition, other variables that might initially seem less relevant should also be studied, as they may play a crucial role in the overall improvement of patient care. This study identifies some of these variables that can significantly impact QoL.

The complexity of oncological pathology makes it particularly challenging to assess the relationship between the various symptoms associated with cancer pain.[10] Cancer, as an oncological entity, encompasses a range of related symptoms due to shared underlying factors.[12] Inflammation has been identified as the primary cause of many of these symptoms, including pain, fatigue, anorexia, and cachexia. These symptoms result from the aberrant production of cytokines by cancer cells and the immune system.[13] In the presence of cancer pain, the biopsychosocial dimensions are also significantly impacted, making it crucial to identify the variables that may interfere with QoL.[1]

It is already known that sleep disorders are directly associated with the psychological impact of cancer. They affect emotional well-being and have been linked to the development of anxiety and depression.[14] In addition to sleep disturbances, the present study included other variables, such as loss of self-sufficiency, changes in activities of daily living (ADL), marital status, and lack of family and social support, all of which may be directly or indirectly related to anxiety and depression. These psychological aspects can interfere with pain perception, cancer treatment outcomes, disease progression, and even mortality.[15]

Chronic pain and depressive symptoms often coexist as part of a sequence of events that are frequently not recognized as cause and effect.[16,17] Chronic pain can trigger depressive symptoms,[16] while psychological distress can also lead to pain.[16,17] As a result, individuals may become trapped in a cycle of emotional distress and physical pain, with each element exacerbating the other.[18] This reciprocal relationship has a physiological basis, as both symptoms share common neurological pathways involving dysfunction in the noradrenergic and serotonergic systems.[19]

As part of this vicious cycle, other comorbidities interfere with the onset, exacerbation, or persistence of these symptoms.[20] Together, these factors contribute to a worsening baseline state of anxiety and depression, which can, in turn, lower the pain threshold.[21] Some studies have identified factors that can aggravate the development of psychological distress. However, despite the wide variety of available therapies, many patients suffering from chronic pain still consider their pain undertreated due to the psychological nature of their problems.[9,20,22] Therefore, a holistic, multidisciplinary, and biopsychosocial treatment approach is important. Often, addressing any one component of the cycle can disrupt the negative chain and lead to overall improvements in other symptoms.[23] However, treatment must be highly individualized. Thus, it is crucial that, from the first consultation at a Chronic Pain Clinic, clinicians not only identify the patient's global symptoms but also initiate multimodal therapy aimed at improving sleep, anxiety, and depression. This approach often reduces the need for analgesics in the treatment of chronic pain.[24,25] In cancer patients, pain is a predominant symptom[2] that strongly interferes with ADL, making comprehensive patient evaluation essential. Multidimensional questionnaires are valuable tools for this assessment. A lack of self-sufficiency in daily activities, combined with inadequate home care, can lead to or worsen depression and anxiety in cancer patients.[25]

The results of our study highlight the importance of social assistance in promoting individual autonomy to reduce the development of psychological distress.[9,26] Another critical aspect is the need to assess the increased

risk of premature mortality in the cancer population as a consequence of severe biopsychosocial impairment.

The impact of psychological variables remains a key focus of clinical research, largely due to the complexity of oncological pathology. In this context, it is essential to conduct a comprehensive patient assessment using a biopsychosocial approach, alongside multimodal therapy. Given these considerations, studies aimed at identifying and quantifying the psychological factors that influence pain perception and affect the overall progression of the underlying disease can provide valuable insights for improving the holistic treatment of cancer patients.

The present study aims to (i) evaluate the role of self-sufficiency and marital status in the prevalence of psychological distress, such as anxiety and depression; (ii) examine the relationship between depression/anxiety and mortality; and (iii) assess statistical collinearity among three questionnaires regarding the dimensions of depression and anxiety, pain, and QoL.

2. Materials and methods

2.1. Procedures and participants

This article presents a multifactorial, prospective, observational, and cross-sectional study following strengthening the reporting of observational studies in epidemiology (STROBE) guidelines[27] and approved by the Ethics Committees of both Coimbra Hospital and the University of Coimbra, Portugal (Approval Number: Ref.n.CES-0222).

A total of 120 cancer patients were observed over the course of 1 year at the Portuguese Chronic Pain Unit. All participants provided written informed consent. The inclusion criteria of the recruited patients were (i) having an oncologic pathology; (ii) minimum age: 18 years old; (iii) capability to provide informed consent (written or oral); and (iv) capability to provide information to complete the questionnaires. Three questionnaires were completed by the patient or helped by a familiar or healthcare professional. The data used for all clinical study described in this article is related to the total of 120 patients. There was a posterior phase of the study that included more 13 patients, in exactly the same conditions and rules, and those complimentary numbers were used just to reinforce the collinearity of the questionnaires.

2.2. Instruments

Parameters such as pain, anxiety, depression, ADL, and QoL were assessed using three validated questionnaires for the Portuguese population: the Hospital Anxiety and Depression Scale (HADS),[28,29] the Brief Pain Inventory (BPI),[30-36] and the Short-Form Health Survey 36, version 2 (SF-36v2).[37,38]

The HADS evaluates depression and anxiety through a total of 14 items, with seven items assessing depression (HADS-D) and seven assessing anxiety (HADS-A). Each item is rated on a scale from 0 to 3, with a maximum score of 21 for both anxiety and depression. Scores between 0 and 8 indicate no anxiety or depression, while scores above 9 are considered positive for anxiety or depression. Scores between 14 and 21 indicate moderate-to-severe anxiety or depression.[28,29]

The BPI measures pain intensity across two dimensions: sensory and reactive. The tool assesses the interference of pain in the patient's QoL, as well as the quality of pain, the patient's perception of the pain's etiology, and pain relief. The sensory dimension assesses pain intensity or severity, while the reactive dimension evaluates how pain interferes with daily activities. To capture the variability of pain over time, four items were included to measure the "worst," "least," "average," and "current pain." In addition, seven items were selected to assess how pain interferes with ADL, including general activity, walking, work, mood, enjoyment of life, relationships, and sleep. The pain interference subdimensions were further categorized into affective and activity-related dimensions. The affective subdimensions are denoted as relationship, enjoyment of life, and mood, while the activity subdimensions are designated as Walking, Activity (general), and Work.[32,33,36,39]

The SF-36v2 evaluates QoL through 8 dimensions, which are grouped into two components: physical health (physical function, physical performance, pain, and general health) and mental health (vitality, social function, emotional performance, and mental health). Scores for each dimension are presented on a scale from 0 (*worst health status*) to 100 (*best health status*). The SF-36 also includes a health transition scale that measures changes in general health, scored from 1 (*very much better*) to 5 (*very much worse*).[37,38]

2.3. Statistical analyses

Data from the validated questionnaires (HADS, BPI, and SF-36v2) were transferred to the IBM® Statistical Package for the Social Sciences® Statistics version 26 and analyzed using version 20.0. The statistical analysis was conducted with a significance level of 0.05 ($P < 0.05$).

Spearman's correlation was used to assess the relationship between the results of the questionnaires. The correlation between the questionnaires and demographic parameters was calculated using Pearson's correlation coefficients (Pcc). A Wilcoxon rank-sum test (Mann-Whitney test) was performed to examine the relationship between the HADS

and SF-36 (global and mental health components) scores with the 1-year mortality rate, assessing the relationship between anxiety and depression with mortality in a chronic pain cancer population. A Kruskal–Wallis test was used to explore the relationship between HADS with marital status (single, married, divorced, or widowed). A Mann-Whitney test was performed to assess the relationship between HADS with self-sufficiency (autonomous or dependent).

Canonical correlation analysis (CCA) was used to evaluate the relationships among different constructs of anxiety, depression, QoL, and pain was carried out using. The dimensions of each questionnaire were treated as primary variables. For the BPI, the pain dimension and interference dimensions were considered, while for the HADS, the anxiety and depression dimensions were used. In the SF-36 questionnaire, the following dimensions were included: "physical function," "physical performance," "body pain," "general health," "vitality," "social function," "emotional performance," and "mental health."

The relationship between the BPI and HADS questionnaires was evaluated first. A CCA was then performed to examine the relationship between the dimensions of these two questionnaires and those of the SF-36. A composite construct was created by combining the dimensions of the BPI and the HADS, which were correlated with the dimensions of the SF36. The statistical significance of the canonical correlation was assessed using Wilks' Lambda. The strength of the correlation between the canonical variables was used to explore the relationships between the constructs. In addition, the correlations between the original variables (BPI/HADS and SF-36 dimensions) and the significant canonical variables were examined. In cases where multiple canonical variables were identified, the construct with the highest correlation was interpreted as the most likely construct, based on its relationship with the original variables.

3. Results and discussion

The results were obtained through statistical correlations of the variables analyzed from the three questionnaires selected for this study: HADS, BPI, and SF-36. These questionnaires evaluate the dimensions of depression and anxiety, the global dimensions related to pain, and the QoL, respectively. A 95% confidence level was applied, with results considered statistically significant at $P < 0.05$.

Regarding the demographic data, the study sample consisted of 120 cancer patients. Of these, 70% (84 patients) were classified as "married to partner," without distinguishing between the type of relationship (heterosexual or homosexual) or legal/religious status (civil marriage or "de facto" union). Only the gender of the participants (male or female) was recorded, with the proportion being 43% female and 57% male.

The remaining 30% of patients (36 individuals) were unmarried. Of these, 5% were single ($n = 6$), 5% were divorced, and 20% were widowed ($n = 24$). These data are presented in Figure 1.

Concerning individual autonomy or self-sufficiency, most patients – specifically 63.6% ($n = 77$) – considered themselves autonomous or self-sufficient, while 36.4% ($n = 43$) reported being dependent (Figure 2).

The statistical analysis of correlations revealed that depression is associated with marital status. Depression was more pronounced in widowed or divorced individuals ($P < 0.05$), less significant in unmarried individuals ($P = 0.042$), and not relevant in the married group ($P = 0.653$). The values presented in Table 1 represent the mean scores ± standard deviation for depression and anxiety in married and unmarried populations. These values reflect the average scores, based on the maximum possible score of 21 on the HADS for depression and anxiety. A 95% confidence level was used to determine statistical significance (Table 1).

The results related to marital status reveal a clear imbalance between the number of married and unmarried individuals. Although the statistical evaluation considered

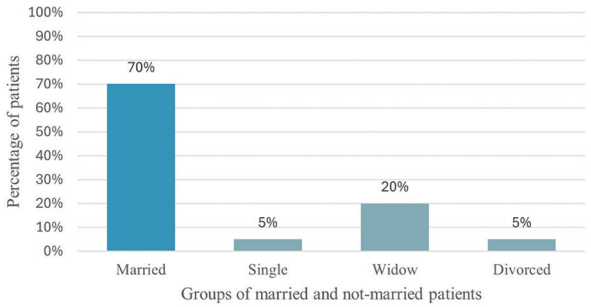

Figure 1. Marital status of 120 patients: 84 married (70%) and 36 non-married (30%). Among the non-married patients, 6 were single (5%), 24 were widowed (20%), and 6 were divorced (5%).

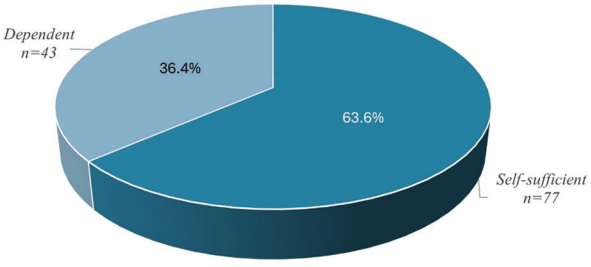

Figure 2. Individual autonomy status of 120 patients: 77 self-sufficient (63.6%) and 43 dependent patients (36.4%).

this difference, it may explain some of the less significant results. It was also confirmed that depression is associated with unmarried status, although the relationship is less pronounced. The results shown in Figure 3 did not reveal any statistically significant correlation between marital status and anxiety.

However, the correlation analysis indicated a statistically significant relationship between dependency and depression, while no significant relationship was found between dependency and anxiety (P = 0.001 and P = 0.125, respectively). The lack of autonomy was found to significantly increase the risk of depression in the studied population. The HADS results demonstrated lower levels of depression and anxiety in self-sufficient patients (Table 2 and Figure 4).

The dimensions assessed in the SF-36v2 and BPI showed worse outcomes in dependent patients (P < 0.01 and P < 0.05, respectively). A significant collinearity was observed between HADS and BPI (P < 0.01). Autocorrelation, demonstrated through Pcc (>0.3), was found among the subdimensions of BPI, all of which were collinear with HADS (P < 0.01).

Table 1. Depression and anxiety related in married and unmarried populations, as assessed by the Hospital Anxiety and Depression scale

Variable	Married	Unmarried	Significance
Depression	11.2±4.5	10.8±5.0	*P=0.042
Anxiety	10.9±4.0	10.7±4.5	P=0.653

Notes: Mean results±standard deviation. *denotes statistical significance (P<0.05).

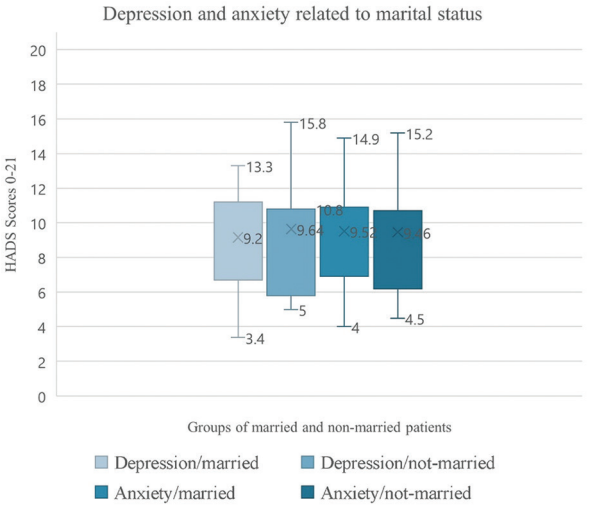

Figure 3. Relationship between depression and anxiety with marital status. Data are expressed as median and interquartile range. Abbreviation: HADS: Hospital anxiety and depression scale.

Dependence on ADLs was significantly associated with depression (P < 0.01) but not with anxiety (P = 0.21). A strong correlation (Pcc > 0.5) was observed between the partial and global results of the SF-36v2 and HADS (Table 3). In addition, a significant correlation (P < 0.01) was found between pain, as assessed by the BPI, and depression and anxiety scores from the HADS (r = 0.348 and r = 0.299, respectively) (Table 3).

When evaluating the impact of pain on changes in ADL, depression, and QoL using the validated Portuguese versions of the HADS and BPI, it was found that depression is associated with marital status, being more pronounced in widowed and divorced individuals. Changes in ADL were linked to depression, but not anxiety. A collinearity was observed between the HADS and BPI (Table 4). The affective and active subdimensions of BPI showed a strong correlation with both anxiety and depression. These correlations highlight the complexity of oncological conditions, underscoring the importance of early diagnosis using appropriate tools to enable effective pain management while addressing psychosomatic factors. The significant correlations found (Table 4) may help determine the impact of biopsychosocial conditioning, suggesting that early psychosomatic diagnosis and effective treatment of total pain can influence the progression of oncological pathology and the success of therapy.[40]

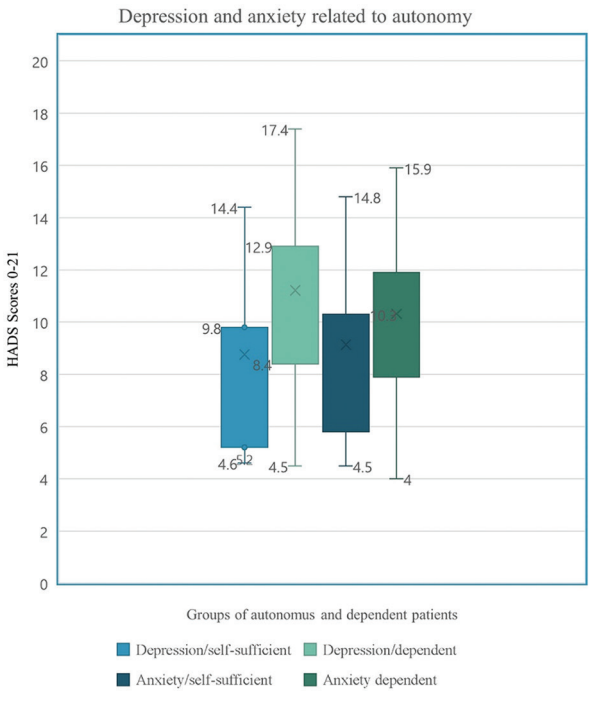

Figure 4. Depression and anxiety scores on the Hospital Anxiety and Depression Scale (HADS) in self-sufficient and dependent patients. Note: Data are presented as median and interquartile range.

Table 2. Depression and anxiety related to autonomy status, with a maximum score of 21 points on the hospital anxiety and depression scale

Variable	Self-sufficient	Dependent	Significance
Depression	9.8±4.6	12.9±4.5	*P=0.001
Anxiety	10.3±4.5	11.9±4.0	P=0.125

Notes: Confidence level was set at 95%. Results are presented as means±standard deviations. *denotes statistical significance (P<0.05).

Table 3. Pearson's correlation coefficients between the subdimensions of the Brief Pain Inventory and the Hospital Anxiety and Depression scale

Correlation	Anxiety	Depression
PAIN	0.348	0.299
REM	0.493	0.553
WAW	0.488	0.489
Interference	0.500	0.533

Notes: The statistical significance was set at a 95% confidence level. REM represents the affective subdimension and WAW represents the activity subdimension.
Abbreviations: REM: Relationship, Enjoyment of life, and mood; WAW: Walking, activity (general), and work.

Table 4. Pearson's correlation coefficients for the subdimensions of the brief pain inventory

Correlation	REM	WAW	Interference
PAIN	0.533	0.554	0.554
REM	/	0.923	0.982
WAW	/	/	0.980

Notes: The statistical significance was set at a 95% confidence level. REM represents the affective subdimension, and WAW represents the activity subdimension.
Abbreviations: REM: Relationship, Enjoyment of life, and mood; WAW: Walking, activity (general), and work.

The results revealed that a lack of self-sufficiency is a key factor in increasing the risk of depression. Social support for these patients must not be overlooked, and healthcare providers should adopt a proactive approach involving social services. Marital status is an important aspect of the patient's social assessment; however, the small number of unmarried individuals in the sample makes it difficult to interpret these findings. Therefore, further investigation into the impact of loneliness on depression risk[41] is crucial when conducting personal and social evaluations of patients. In addition, to avoid potential bias, it is essential not only to record marital status but also to assess the existence and quality of the caregiver within the family.

Some studies have emphasized the importance of strong social support and the preservation of individual autonomy

Table 5. Association between depression and mortality, and anxiety and mortality, with statistical significance

Group	Mean	SD	Mann–Whitney (significance level)
Depression (alive)	10.3	4.5	*P=0.02
Depression (dead)	12.7	5.3	
Anxiety (alive)	10.3	4.3	*P=0.037
Anxiety (dead)	12.2	4.3	

Note: *Denotes statistical significance (P<0.05).
Abbreviation: SD: Standard deviation.

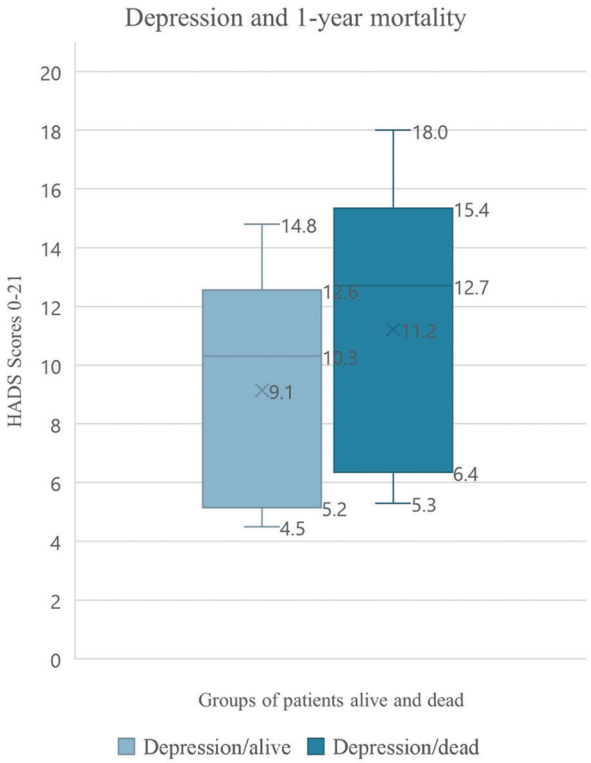

Figure 5. Evaluation of depression scores on the Hospital Anxiety and Depression Scale, comparing values between the living population and patients who died in the 1st year.
Note: Data are expressed as median and interquartile range.

in mitigating psychological distress. Consequently, it is essential to identify factors that may be directly or indirectly linked to anxiety and depression. In addition, research suggests that these psychological factors can influence pain perception, the progression of oncological disease, and, ultimately, mortality.

This study examined the mortality index within the 1st year following the initial visit to the Pain Clinic. The 1st-year mortality rate in the sample of 120 cancer patients was 24.8%. Among the deceased patients, a statistically significant association was found between both depression and mortality (P = 0.02; Table 5 and Figure 5)

as well as between anxiety and mortality (P = 0.037; Table 5 and Figure 6).

The collinearity observed among the questionnaires (P < 0.01) indicates that poorer results on one test correlate with poorer results on the others. This observation reinforces the validity of the patients' responses across different questionnaires. For example, lower functional status in the SF-36 correlated with greater interference in the BPI. The findings suggest that most parameters in the questionnaires are significantly worse in patients who died during the study period, with anxiety and depression — measured by the HDAS, BPI, and SF-36 questionnaires — being key predictors. Below, the correlations among the parameters of these three questionnaires are further demonstrated.

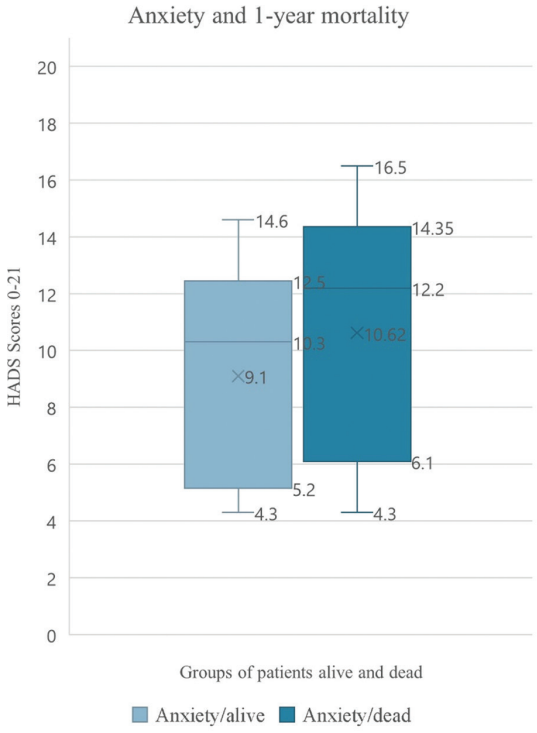

Figure 6. Evaluation of anxiety scores on the Hospital Anxiety and Depression Scale, comparing values between the surviving population and those deceased in the 1st year.
Note: Data are presented as median and interquartile range.

The canonical correlation between the dimensions of the BPI and HADS questionnaires was statistically significant (λ_{Wilks} = 0.730, F (4, 250) = 10.667, P < 0.001), with a moderate correlation between the canonical variables (r = 0.519, P < 0.001). The explained variance was approximately 27% (r^2 = 0.269). Figure 7 illustrates the correlations between the original variables and the canonical variables. In addition, the correlation between the dimensions of the SF-36 questionnaire was also statistically significant (λ_{Wilks} = 0.198, F (32, 418) = 7.184, P < 0.001).

The correlation between the first canonical variables was strong (r = 0.821, P < 0.001), explaining approximately 67% of the variance (r^2 = 0.674). The figure below shows the correlations between the original variables and the first canonical variables, aiding in their interpretation. The constructs associated with the canonical variables were interpreted as factors. The concept of "daily performance" was linked to the dimensions of the BPI and HADS questionnaires, while the concept of "well-being" was associated with the dimensions of the SF-36 questionnaire (Figure 8).

The correlation between the second canonical variables was moderate (r = 0.539, P < 0.001), with approximately 29% of the variance explained (r^2 = 0.291). The constructs related to these canonical variables were interpreted as factors: the concept of "perception of physical limitation" was associated with the dimensions of the BPI and HADS questionnaires, while the concept of "perception of

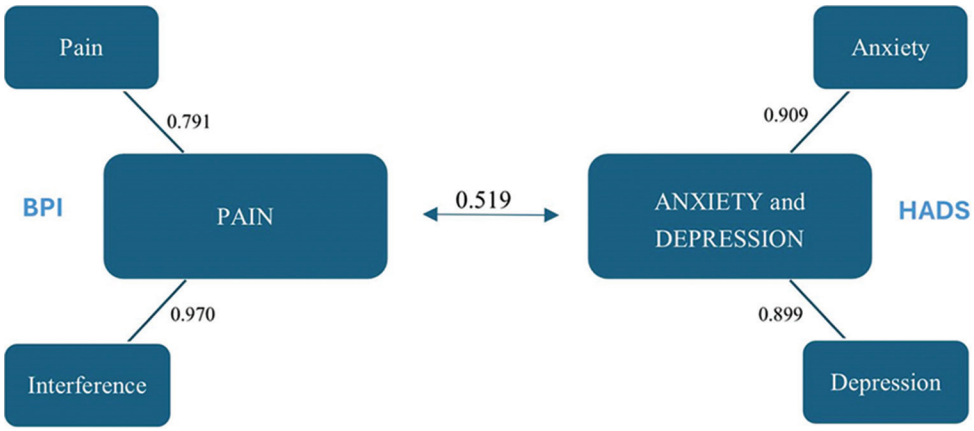

Figure 7. Correlation between the dimensions of the brief pain inventory and the hospital anxiety and depression scale questionnaires

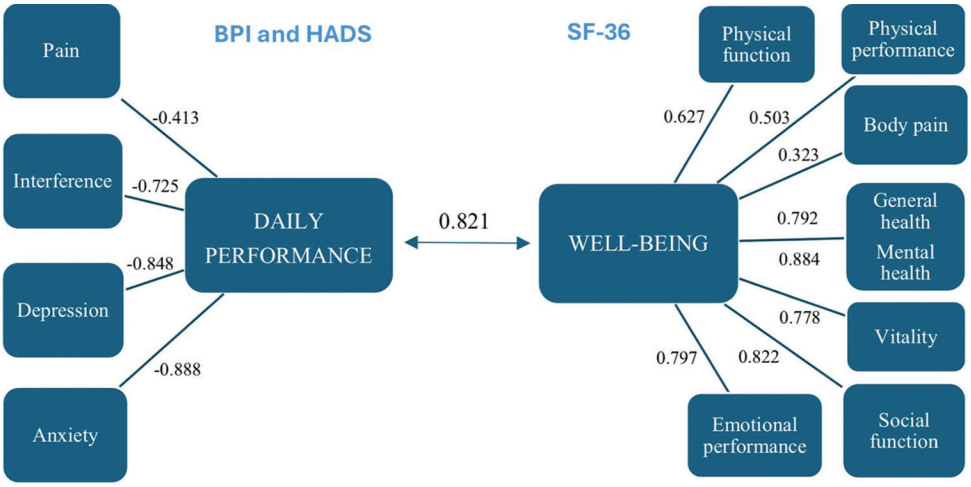

Figure 8. Correlation between the dimensions of the brief pain inventory, hospital anxiety and depression scale, and Short-Form Health Survey 36 questionnaires in terms of physical health (daily performance and well-being).

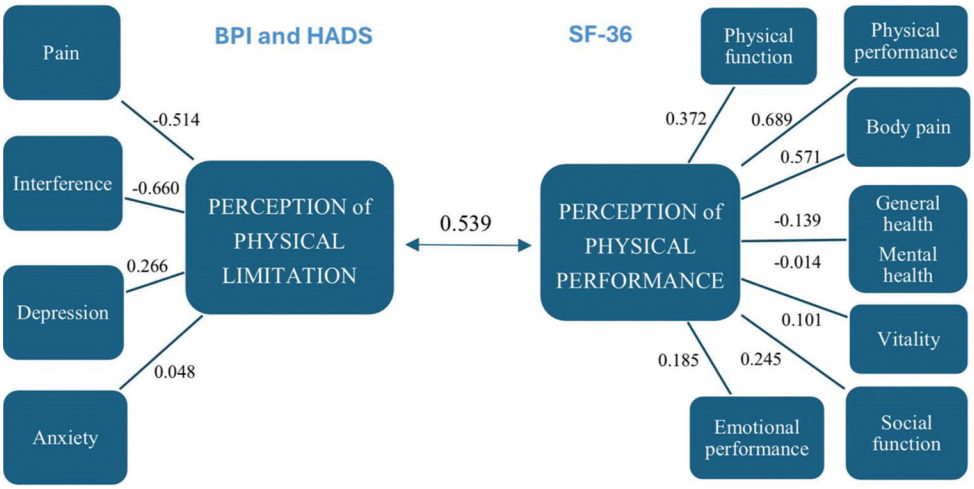

Figure 9. Correlation between the dimensions of the brief pain inventory, hospital anxiety and depression scale, and Short-Form Health Survey 36 questionnaires in terms of mental health (perception of physical limitation and perception of physical performance).

physical performance" was associated with the dimensions of the SF-36 questionnaire (Figure 9).

The results indicate that pain, as assessed by the BPI, was significantly correlated with anxiety ($P < 0.001$), depression ($P < 0.001$), and most of the SF-36 parameters. In addition, all BPI subdimensions of QoL showed significant correlations ($P < 0.001$), except for the physical function.

Regarding anxiety and depression, as measured by the HADS questionnaire, both anxiety and depression scores were significantly correlated with global QoL ($P < 0.003$ and $P < 0.001$, respectively), as well as with all its subdimensions.

Dependence was significantly correlated with depression ($P < 0.001$), but not with anxiety ($P = 0.060$). It was also significantly correlated with global QoL ($P < 0.001$), as well as with all subdimensions ($P < 0.01$ for all comparisons).

4. Conclusion

The observed correlations emphasize the complexity of oncological pathology, highlighting the importance of early and comprehensive diagnosis using appropriate tools, along with effective pain management and attention to psychosomatic symptoms to disrupt the established cycle. A significant correlation was found between the variables analyzed in the pain assessment through three multidimensional questionnaires (BPI, SF-36v2, and HADS) applied to a population of cancer outpatients. This finding demonstrates the importance of addressing poorly controlled pain, which significantly impacts QoL.

The evaluation of oncologic patients observed in the pain clinic and selected for this study revealed the significance of marital status and self-sufficiency in the prevalence of psychological distress, particularly anxiety and depression. Strong correlations were observed between some results obtained from SF-36 and HADS, with all dimensions of SF-36 and BPI showing worse outcomes in non-autonomous patients. In addition, significant collinearity between HADS and BPI was found, with the affective and active subdimensions of BPI strongly correlating with symptoms of anxiety and depression.

In cancer patients, pain is a predominant symptom that strongly interferes with ADL, making comprehensive patient evaluation essential. Multidimensional questionnaires are valuable tools for this assessment. Lack of self-sufficiency in daily activities and inadequate home care can exacerbate depression and anxiety. The statistical significance of depression and anxiety associations with mortality in cancer patients suggests that higher mortality rates correlate with more prevalent symptoms of these conditions.

Cancer treatment must be highly individualized. From the first pain clinic consultation, clinicians should not only identify global symptoms but also initiate multimodal therapy to improve sleep, anxiety, and depression, while reducing reliance on analgesics for chronic pain.

Homecare and social support should not be overlooked. Healthcare providers must adopt a proactive approach, integrating social services into care plans and emphasizing the importance of the family support.

Given the collinearity among questionnaires, the cost–benefit ratio of assessment tools must be carefully considered, accounting for patients' clinical conditions, limited consultation time, and the physical and emotional burdens on healthcare professionals. Further research is needed to explore additional aspects of marital status to minimize biases, and refine the selection of assessment tools, reducing redundancy in the information collected.

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Conflict of interest

The authors declare that they have no conflicts of interest.

Author contributions

Conceptualization: Carla Retroz-Marques
Formal analysis: Carla Retroz-Marques
Investigation: Carla Retroz-Marques
Methodology: Carla Retroz-Marques
Visualization: Carla Retroz-Marques
Writing – original draft: Carla Retroz-Marques, Inês Retroz-Marques
Writing – review & editing: Inês Retroz-Marques, Acílio Marques

Ethics approval and consent to participate

This article presents a multifactorial, prospective, observational, and cross-sectional study, following STROBE guidelines [27] and approved by the Ethics Committees of both Coimbra Hospital and the University of Coimbra, Portugal (Approval Number: Ref.n.CES-0222). All the patients voluntarily signed the written informed consent form, and patients with no physical capacities to sign the form, oral consent was taken from them.

Consent for publication

The study participants gave consent for the collection and publication of their data. All paticipants were fully informed about the purpose of the study.

Availability of data

Data used in this work are available from the corresponding author upon reasonable request.

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ACCSCIENCE PUBLISHING

Journal of Clinical and Basic Psychosomatics

ORIGINAL RESEARCH ARTICLE

Coping with a crisis: The intersection between spirituality and social media

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Abstract

This study examined the role of spiritual coping strategies and the impact of social media on stress, depression, anxiety, and resilience in a campus community during the COVID-19 pandemic. Spirituality, a sense of connection beyond oneself, often emerges during stress, illness, or confronting mortality, while resilience is the ability to adapt to challenges. Participants, including faculty, staff, and students, completed an online survey using various scales: the Spiritual Coping Strategies Scale; a revised Facebook Intensity Scale; the Depression, Anxiety, and Stress Scales-21; and the Brief Resilience Scale. Findings showed that spiritual coping correlated with lower depression ($r = -0.28$, $P < 0.01$), anxiety ($r = -0.12$, $P < 0.05$), and stress ($r = -0.18$, $P < 0.01$) scores and higher resilience ($r = 0.29$, $P < 0.01$). Social media use, however, was associated with increased anxiety ($r = 0.41$, $P < 0.01$), depression ($r = 0.26$, $P < 0.01$), and stress ($r = 0.31$, $P < 0.05$) and decreased resilience ($r = -0.28$, $P < 0.01$). Age was positively associated with resilience ($r = 0.20$, $P < 0.01$) and less social media use ($r = -0.46$, $P < 0.01$). Gender differences were noted: females reported higher spiritual coping, non-religious coping and anxiety, and a trend toward lower resilience than males. Fostering resilience depends largely on having a strong spiritual connection or social network consisting of supportive family and friends. Promoting alternative ways to build meaningful connections may enhance mental health for students, faculty, and staff in a university setting.

Keywords: Spiritual coping; Resilience; Social media; Anxiety; Depression; Stress

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1. Introduction

Spirituality represents a broad term and one that means different things to different people. For some, it is primarily about a belief in God and active participation in organized religion. For others, it is about non-religious experiences that help them get in touch with their spiritual selves through quiet reflection, time in nature, private prayer, yoga, or meditation.[1] According to the Fetzer Institute, "Spirituality is a complex, diverse, and nuanced phenomenon that people of all spiritual and religious self-identifications experience."[2,p.6] Despite the many definitions of spirituality, at its basic core, spirituality involves a sense of relationship or connectedness to something bigger than oneself (*e.g.*, the source of life, love, and energy that sustains us).

Mental health is defined as "the ability of an individual to fulfill his or her obligations to self and society while living in mutual harmony with the physical and social environment."[3,p.2] The connection between spirituality and mental health has captured the attention of researchers and practitioners alike in recent years.[4] For example, Manoi *et al.*[5] found a statistically significant relationship between religion/spirituality and positive mental health among Canadian adults ranging from ages 25 – ≥65. The relationship was most pronounced among adults over age 65. The researchers observed that older adults' capacity for resilience, which is defined as "the ability to overcome adversity," stems from being grounded in their religion/spirituality.[5,6] The researchers' findings also corroborated previous studies showing that older adults tend to seek meaning and purpose as a way to cope with challenging experiences such as depression and loneliness.[7] Research further indicates that the spiritual dimension becomes particularly significant when individuals face emotional stress, physical illness, or death, and that spirituality is a critical resource for coping with these challenges, playing an important role in enhancing quality of life.[8,9] Finally, studies have shown that higher levels of spirituality are associated with better outcomes when assessing depressive symptoms, anxiety, optimism, and happiness among adults.[10] The capacity for spirituality to improve life satisfaction and mental health outcomes lies within the realm of social support which can be gleaned through faith communities.[10]

As human beings, we long for connection and community with others. Lacking social connections can be detrimental to our overall mental health. Social media often replaces real-world human connections. The impact of time spent on social media on mental health is a topic of ongoing research. Furthermore, the research on the relationship between time spent on social media and feelings of belonging or community is complex and nuanced, with findings that vary depending on factors such as individual differences, the nature of social media use, and the platforms involved.[11-13] Some studies suggest that social media use can facilitate feelings of belonging and connection, particularly when individuals engage in meaningful interactions with others and use platforms to maintain relationships with friends, family, and communities. For example, frequent interactions with close friends and supportive online communities may enhance feelings of belonging and social support.[11,12] On the other hand, excessive use of social media can sometimes result in superficial or passive interactions that lack depth and authenticity. Research demonstrates that spending too much time engaging with social media can actually make a person feel more lonely and isolated, exacerbating mental health issues such as anxiety and depression.[13,14] In this realm, Lin *et al.*[15] surveyed 1787 adults aged 19 – 32 about their social media use and depression. They found that participants in the highest quartile of social media use – whether measured by total daily time spent, weekly site visits, or global frequency scores – had significantly higher odds of depression compared to those in the lowest quartiles for these measures.[15]

Spirituality and resilience are closely intertwined, often complementing and reinforcing each other.[16] Spiritual practices such as prayer, meditation, and mindfulness serve as powerful coping mechanisms during times of stress and hardship by promoting emotional regulation, reducing negative emotions, and fostering a sense of inner peace, all of which contribute to resilience.[16] In addition, spiritual communities provide a strong support network, offering a sense of belonging and connection with others who share similar beliefs. This support network offers encouragement, empathy, and practical assistance, further enhancing individuals' resilience in the face of challenges. Researchers have long identified the power of spirituality in confronting mental and physical health issues as well as mortality.[17] Perhaps the most challenging experience facing people worldwide in recent history was the coronavirus disease 2019 (COVID-19) pandemic. In light of evidence supporting the protective factors of spirituality and resilience, this study sought to examine spiritual coping and resilience in relation to social media use, anxiety, depression, and stress among a Midwestern campus community during the COVID-19 pandemic.

Research questions for this study were as follows:

(a) What practices (as measured by spiritual coping and/or social media use) did the campus community use to cope with the stressors of the pandemic?
(b) How did the coping mechanisms used intersect with overall feelings of mental health (as measured by depression, anxiety, stress, and overall resilience)?
(c) Did statistically significant differences exist between faculty/staff and students in relation to spiritual coping, resilience, social media use, anxiety, depression, and stress?
(d) Did spiritual coping, resilience, social media use, anxiety, depression, and stress differ by gender across the campus community?

2. Methods

2.1. Study design

The present study used a descriptive research design to investigate the potential relationships among the main study variables of spiritual coping, resilience, social media use, anxiety, depression, and stress.

2.2. Participants and setting

A convenience sampling technique was used to obtain participants for this study. The sample for this study consisted of 192 students (including 180 undergraduate and 12 graduate students) and 93 faculty/staff (including 48 staff and 45 faculty) at a mid-sized Midwestern public university in the U.S., thus totaling 285 total participants. The sample was recruited out of a total of 4578 students and 694 faculty and staff that were randomly selected.

Specifically, participants received an electronic message informing them of the nature of the study and assuring them that their participation was voluntary and anonymous. This message also informed participants that there would be no negative consequences if they chose not to participate in the study. Finally, the message presented a website that included a copy of the survey. A follow-up message was sent to participants a week later reminding them to complete the survey. Participants were asked not to identify themselves in any way on the survey to maintain anonymity. Furthermore, no attempts were made to access participants' IP addresses, and thus, the investigators had no way of linking individual participants to their responses. All study participants provided written informed consent before participating. Data were collected from March 1, 2022, to May 15, 2022, transferred to a Microsoft Excel spreadsheet (Version 16, Microsoft Corp.), and stored on the investigators' password-protected computers.[18] This study met the ethical guidelines, including adherence to the legal requirements, of the U.S. and received approval from the Institutional Review Board at the University Wisconsin-La Crosse (project number: 22-KS-266; approved on April 29, 2022).

2.3. Data sources and measurement

Participants completed an online survey consisting of items from the Spiritual Coping Strategies Scale;[19] the Facebook Intensity Scale;[20] the Depression, Anxiety, and Stress Scales (DASS-21);[21] the Brief Resilience Scale (BRS);[22] and selected demographic items (age, gender, and campus status). Two additional questions asked specifically for the average time spent on social media per day (h, min) as well as the total count of social media friends.

2.3.1. Demographic items

Participants answered items to indicate their gender (female, male, gender not listed please specify, or prefer not to say), age (in years), and their campus status (undergraduate student, graduate student, staff member, or faculty member).

2.3.2. Spiritual coping

The English version of the Spiritual Coping Strategies Scale consists of 20 items and is designed to assess the frequency and helpfulness of both religious and non-religious coping strategies.[19] Each item is measured on a 4-point Likert scale (0 = Never used; 1 = Seldom used [at least once in 6 months]; 2 = Sometimes used [at least once in a month]; and 3 = often used [at least once daily]). The scale culminates in a total score with a maximum score of 60 and has demonstrated an internal consistency reliability estimate of 0.82.[19] Consistent with previously reported reliability measurements for the spiritual coping strategies scale, the internal consistency reliability estimate for this study was $\alpha = 0.89$. Two subscales can be created out of the measure to identify specifically religious based coping methods ($n = 9$) and non-religious coping strategies ($n = 11$) with both subscales indicating strong reliability (religious coping, $\alpha = 0.82$; non-religious coping, $\alpha = 0.74$).

2.3.3. Social media intensity

The Facebook Intensity Scale consists of six items; each item is measured on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).[20] For the purposes of this study, the scale was adapted to reflect use of all social media platforms (*e.g.*, Facebook, Instagram, Snapchat, Twitter, *etc.*). Ellison *et al.*[20] reported high internal consistency reliability for the Facebook Intensity Scale with a Cronbach's alpha of 0.83. Similarly, the internal consistency reliability estimate for this study was $\alpha = 0.87$.

2.3.4. Mental health (anxiety, depression, and stress)

The DASS-21 is a condensed version of the original 42-item instrument, which includes three subscales to assess symptoms of anxiety, depression, and stress, respectively. Like the Spiritual Coping Strategies Scale, each item of the DASS-21 is measured through a 4-point Likert scale (0 = Did not apply to me at all; 1 = Applied to me to some degree, or some of the time; 2 = Applied to me to a considerable degree, or a good part of the time; and 3 = Applied to me very much, or most of the time).[21] Construct validity for the DASS-21 was confirmed through a factor analysis.[23] Moreover, the internal consistency reliability estimate for the DASS-21 subscales for this study were strong for the depression ($\alpha = 0.93$), anxiety ($\alpha = 0.84$), and stress ($\alpha = 0.86$) subscales, respectively. These reliability values are stronger than those found in the scale's initial development where the depression ($\alpha = 0.91$), anxiety ($\alpha = 0.80$), and stress ($\alpha = 0.84$) subscales also demonstrated acceptable reliability.[24]

2.3.5. Resilience

The BRS consists of six items including 3 that are "positively worded" and 3 that are "negatively worded."[22] Like the Facebook Intensity Scale, each item is measured through a Likert scale ranging from 1 (strongly disagree) to 5

(strongly agree). Smith *et al.*[22] reported favorable internal consistency reliability with estimates ranging from 0.80 to 91. The Cronbach's alpha for the BRS for this study was $\alpha = 0.89$.

2.3.6. Social media hours and social media friends

Additional questions asked participants to indicate how much time on average per day in the previous week they spent actively using social media (total social media hours) and how many total social media friends they had currently (total social media friends). These continuous variables were reported in whole numbers.

2.4. Statistical methods

Data for this study were analyzed using IBM SPSS Statistics (Version 28, IBM Corp.).[25] Two recent reviews of sample size estimates for the use of the Spearman correlation and use of the Mann–Whitney *U*-test were used as guides to estimate an adequate minimum sample size for the study.[26,27] Related to the Spearman correlation, Bujang[26] estimated a sample size of 75 when using 0.7 as a target correlation value and anticipating a 95% confidence level of a width of 0.3. The simulations of various methods of sample size estimation by Zhu[27] indicated that for a target effect size of 0.5 with power of 95% indicated a range of 109 up to 114 participants. With a sample of 285 in the present study, there is an adequate sample size based on these guidelines.

Demographic variables of gender and campus status (student or faculty/staff) as qualitative variables were reported using percentages based on frequency counts. The age variable was reported using mean and standard deviation. The main measures used in the study for spiritual coping, resilience, social media intensity, total social media hours, total social media friends, and mental health (depression, anxiety, and stress) as quantitative variables were summarized using means, standard deviation, and range. Cronbach's alpha was also calculated for each of these primary measures except for total social media hours and total social media friends as they were single items. The Kolmogorov–Smirnov test for normality was used and found violations of normality for the primary study variables. This led to the use of Spearman Rho to assess correlations among spiritual coping strategies, social media use, stress, depression, anxiety, and resilience for the overall sample and analyzed separately for faculty/staff alone and students alone. The Mann–Whitney *U*-test was used to assess differences on ranks on the primary study variables between students and faculty/staff and also to explore possible gender differences. In addition, the variable of total social media friends was transformed using a base 10 logarithmic transformation to create a variable that better approximated a normal distribution. The alpha levels (*P*-values) to limit type I errors were set at 0.05 for all analyses.

3. Results

3.1. Descriptive statistics

The demographic variables were analyzed and indicated a mostly female, young, and White sample. The gender breakdown in the sample was mostly self-identified female (74%); 21% identifying as male; 3.5% identifying as non-binary, gender fluid, transsexual; and <1% preferring no response. Over the full sample, the average age was 28.63 years (±12.83 years). The sample primarily identified as White, non-Hispanic (93%), followed by Hispanic (2%), Multiracial, non-Hispanic (1.8%), Asian (0.7%), and Black, non-Hispanic or African American (0.4%). About 1.8% preferred not to respond. Table 1 presents the means, standard deviations, ranges, and Cronbach's alpha reliability estimates.

3.2. Correlational analyses

Correlation patterns (Table 2) across all participants for spiritual coping indicated statistically significant weak to moderate negative correlations between spiritual coping and anxiety ($r = -0.12$, $P \leq 0.01$), depression ($r = -0.28$, $P \leq 0.05$), and stress scores ($r = -0.18$, $P \leq 0.01$), social media intensity ($r = -0.13$, $P \leq 0.05$), and social media hours ($r = -0.16$, $P \leq 0.05$), indicating more use of spiritual coping was associated with less symptomology of depression, anxiety, and stress and social media use. A weak but positive correlation was found between spiritual

Table 1. Means, standard deviations, ranges, minimum, maximum, and reliability values for measures

Variable	Items	*M*	*SD*	*Range*	Min.	Max.	α
Spiritual Coping Scale	20	30.69	11.20	53.00	7.00	60.00	0.89
Brief resilience scale	6	3.03	0.90	4.00	1.00	5.00	0.89
Social Media Intensity Scale	6	19.98	6.01	24.00	6.00	30.00	0.87
DASS-21 Anxiety	7	10.51	8.80	38.00	0.00	38.00	0.84
DASS-21 Depression	7	13.44	10.97	42.00	0.00	42.00	0.93
DASS-21 Stress	7	17.00	9.43	42.00	0.00	42.00	0.86
Total social media hours	1	2.97	2.33	19.07	0.00	19.07	-
Total social media friends[a]	1	2.47	0.73	3.70	0.00	3.70	-

Note: [a]Logarithmic transformed version of original variable.
Abbreviations: DASS-21: Depression, Anxiety, and Stress Scales; M: Mean; SD: Standard deviation.

coping and resilience scores ($r = 0.29$, $P \leq 0.01$), indicating the use of spiritual coping was associated with higher resilience. No significant correlations were found between spiritual coping and total social media friends. Regarding resilience, results showed a stronger pattern of moderate negative correlations with the anxiety ($r = -0.51$, $P \leq 0.01$), depression ($r = -0.49$, $P \leq 0.05$), stress ($r = -0.49$, $P \leq 0.01$) scores, weaker negative correlations with social media intensity scores ($r = -0.19$, $P \leq 0.01$), and social media hours ($r = -0.28$, $P \leq 0.01$). There was no correlation between resilience and total social media friends. The mental health variables presented a pattern of positive correlations with the social media intensity (anxiety, $r = 0.19$, $P \leq 0.01$; depression, $r = 0.13$, $P \leq 0.01$; and stress, $r = 0.16$, $P \leq 0.01$) and a stronger relationship with social media hours variables (anxiety, $r = 0.41$, $P \leq 0.01$; depression, $r = 0.26$, $P \leq 0.01$; and stress, $r = 0.31$, $P \leq 0.01$). Social media friends only demonstrated a relationship to anxiety ($r = 0.17$, $P \leq 0.05$). Age demonstrated a positive relationship with resilience ($r = 0.20$, $P \leq 0.01$), and negative relationships with measures of anxiety ($r = -0.39$, $P \leq 0.01$), depression ($r = -0.26$, $P \leq 0.01$), and stress ($r = -0.27$, $P \leq 0.01$). The relationships among age and the social media variables indicated lower use of social media as age increased for social media intensity ($r = -0.27$, $P \leq 0.01$), total social media hours ($r = -0.46$, $P \leq 0.01$), and total social media friends ($r = -0.21$, $P \leq 0.01$).

When examining only the scores of faculty and staff (Table 3), several overall correlations lost their significance. In this specific group, spiritual coping was negatively correlated with both depression ($r = -0.31$, $P < 0.05$) and stress scores ($r = -0.24$, $P < 0.05$). In addition, resilience scores showed a weak positive correlation with spiritual coping ($r = 0.24$, $P < 0.05$). The Brief Resilience scores displayed a similar pattern, maintaining negative correlations with all three DASS-21 scales: anxiety ($r = -0.51$, $P < 0.01$), depression ($r = -0.52$, $P < 0.01$), and stress ($r = -0.46$, $P < 0.01$). In this subset of the sample, none of the social media variables were correlated with

Table 2. Correlations among spiritual coping, brief resilience, social media intensity, and DASS-21 scales for all respondents (*n*=285)

Measure	1	2	3	4	5	6	7	8	9
1. Spiritual Coping	---								
2. Brief Resilience	0.29**	---							
3. Social Media Intensity	−0.13*	−0.19**	---						
4. DASS-21 Anxiety	−0.12*	−0.50**	0.19**	---					
5. DASS-21 Depression	−0.28**	−0.49**	0.13*	0.66**	---				
6. DASS-12 Stress	−0.18**	−0.49**	0.16**	0.71**	0.70**	---			
7. Social media hours	−0.16*	−0.28**	0.54**	0.41**	0.26**	0.31*	---		
8. Social media friends[a]	0.08	0.07	0.28**	0.17*	0.04	0.04	0.22**	---	
9. Age (years)	0.03	0.20**	−0.27**	−0.39**	−0.26**	−0.27**	−0.46**	−0.21**	---

Note: [a]Logarithmic transformed variable; *$P \leq 0.05$, **$P \leq 0.01$.
Abbreviation: DASS-21: Depression, Anxiety, and Stress Scales.

Table 3. Correlations among spiritual coping, brief resilience, social media intensity, and DASS-21 scales for faculty/staff respondents only (*n*=93)

Measure	1	2	3	4	5	6	7	8
1. Spiritual Coping	---							
2. Brief Resilience	0.24*	---						
3. Social Media Intensity	−0.11	−0.19	---					
4. DASS-21 Anxiety	−0.08	−0.51**	0.21*	---				
5. DASS-21 Depression	−0.31*	−0.52**	0.18	0.59**	---			
6. DASS-12 Stress	−0.24*	−0.46**	0.21*	0.61**	0.68**	---		
7. Social media hours	−0.16	−0.04	0.60**	0.04	0.06	0.00	---	
8. Social media friends[a]	0.18	0.06	0.33**	0.27*	0.10	0.16	0.23	---

Note: [a]Logarithmic transformed variable; *$P \leq 0.05$, **$P \leq 0.01$.
Abbreviation: DASS-21: Depression, anxiety, and stress scales.

resilience scores. However, there were indications of a relationship between social media use and mental health, as social media intensity was related to both anxiety (r = 0.21, P < 0.05) and stress (r = 0.21, P < 0.05). The number of social media friends was associated with anxiety (r = 0.27, P < 0.05), but not with depression or stress. Conversely, the number of hours spent on social media per day did not show any relationship with the mental health variables.

When examining the correlation results of the student-only sample (Table 4), a somewhat similar pattern to the overall sample emerged with the DASS scales, but fewer of the correlations with the social media measures were significantly related. Spiritual coping showed negative correlations with the three DASS scales (Anxiety [r = −0.16, $P \leq 0.05$], depression [r = −0.29, $P \leq 0.01$], and stress [r = −0.18, $P \leq 0.05$]) and a positive relationship with brief resilience scores (r = 0.33, $P \leq 0.01$). The social media variables of intensity and number of friends did not correlate with spiritual coping, except for hours spent on social media (r = −0.16, P < 0.05). This represents a shift from the overall sample, where social media intensity scores had a negative correlation with spiritual coping. In this student sample, resilience showed a strong negative correlation with DASS scores, similar to the pattern observed with spiritual coping (Anxiety [r = −0.45, $P \leq 0.01$], depression [r = −0.41, $P \leq 0.05$], and stress [r = −0.47, $P \leq 0.05$]). However, resilience correlated significantly with only one social media variable, hours spent on social media (r = −0.41, $P \leq 0.05$), and showed no associations with other social media measures. The mental health variables were related to hours spent per day on social media (Anxiety [r = 0.26, $P \leq 0.05$], depression [r = 0.20, $P \leq 0.05$], and stress [r = 0.24, $P \leq 0.05$]). Neither the intensity of social media use nor the number of social media friends showed a relationship with the mental health scales.

3.3. Mean score analyses

Further analysis showed significant differences between the faculty/staff group and the student group (Table 5). The results of the Mann–Whitney *U-test* revealed that faculty/staff (*Md* = 3.58, n = 91) had statistically higher levels of resilience compared to the student group (*Md* = 3.00, n = 192; U = 6527.50, z = −3.57, P = 0.001). Faculty/staff (*Md* = 19, n = 92) had lower levels of social media intensity than students (*Md* = 21, n = 191; U = 6160.00, z = −4.08, p = 0.001) and lower social media hours (faculty/staff: *Md* = 1.08, n = 58; students: *Md* = 3.33, n = 161; U = 1394.50, z = −7.92, P = 0.001) as well as lower social media friends (faculty/staff: *Md* = 2.47, n = 82; students: *Md* = 2.70, n = 164; U = 4984.00, z = −3.31, P = 0.001). Regarding mental health, faculty/staff reported lower levels of anxiety (faculty/staff: *Md* = 4, n = 92; students: *Md* = 14, n = 191; U = 3859.50, z = −7.67, P = 0.001), depression (faculty/staff: *Md* = 6, n = 93; students: *Md* = 14, n = 188; U = 5628.50, z = −4.87, P = 0.001), and stress (faculty/staff: *Md* = 12, n = 93; students: *Md* = 18, n = 192; U = 5539.00, z = −5.21, P = 0.001) compared to students.

Three gender differences emerged with females in the sample reporting higher levels of spiritual coping (female: *Md* = 30, n = 205; male: *Md* = 27.5, n = 60; U = 5079.00, z = −2.05, P = 0.040), non-religious spiritual coping (female: *Md* = 25, n = 206; male: *Md* = 272, n = 60; U = 4617.50, z = −2.99, P = 0.003), and anxiety (female: *Md* = 10, n = 210; male: *Md* = 6, n = 61; U = 5043.50, z = −2.54, P = 0.011) than their male counterparts and a trend toward a lower level of resilience that just missed significance (female: *Md* = 3, n = 211; male: *Md* = 3.17, n = 61; U = 5409.00, z = −1.90, P = 0.057).

4. Discussion

Evidence in the literature points to a relationship between spirituality and mental health. As noted, spirituality has

Table 4. Correlations among spiritual coping, brief resilience, social media intensity, and DASS-21 scales for students only (*n*=192)

Measure	1	2	3	4	5	6	7	8
1. Spiritual coping	---							
2. Brief Resilience	0.33**	---						
3. Social Media Intensity	−0.14	−0.08	---					
4. DASS-21 Anxiety	−0.16*	−0.45**	0.04	---				
5. DASS-21 Depression	−0.29**	−0.41**	0.01	0.64**	---			
6. DASS-12 Stress	−0.18*	−0.47**	0.04	0.69**	0.67**	---		
7. Social media hours	−0.16*	−0.26**	0.47**	0.26*	0.20*	0.24*	---	
8. Social media friends[a]	0.06	0.13	0.23**	0.02	−0.06	−0.08	0.13	---

Note: [a]Logarithmic transformed variable; *P≤0.05, **P≤0.01.
Abbreviation: DASS-21: Depression, anxiety, and stress scales.

Table 5. Comparison of faculty/staff respondents to students on social media, spiritual coping, and DASS-21 Scales using Mann–Whitney *U*-test

Scale	Mean rank		*U*	*z*	*P*	*r*
	Faculty/Staff	Students				
Spiritual Coping	143.79	136.69	7983.50	−0.69	0.490	N.S.
Religious Coping	142.14	142.67	8798.50	−0.05	0.960	N.S.
Non-Religious Coping	149.09	134.83	7636.00	−1.39	0.170	N.S.
Brief Resilience	167.55	130.50	6527.50	−3.57	0.001	−0.21
Social Media Intensity	113.46	155.75	6160.00	−4.08	0.001	−0.24
DASS-21 Anxiety	88.45	167.79	3859.50	−7.67	0.001	−0.46
DASS-21 Depression	107.52	157.56	5628.50	−4.87	0.001	−0.29
DASS-21 Stress	106.56	160.65	5539.00	−5.21	0.001	−0.31
Social media hours	53.54	130.34	1394.50	−7.92	0.001	−0.54
Social media friends[a]	102.28	134.11	4984.00	−3.31	0.001	−0.21

Note: [a]Logarithmic transformed variable.
Abbreviations: DASS-21: Depression, anxiety, and stress scales; N.S.: Not significant; r: Measure of effect size.

many definitions and interpretations and little consensus exist among the literature. Rev. Stephen Ryan defined spirituality as "the lens through which people interpret their universe. It is the basis for how they understand themselves; their multi-dimensional needs; the manner in which they relate to other people; and that which they perceive as transcending themselves. This spirituality may or may not be expressed in religious terminology."[28,p.16] Therefore, religion and spirituality are not necessarily the same thing and according to Smith[29] about three in ten U.S. adults are religiously unaffiliated. Our sample population seemed to align well with this broad view of spirituality, where some reported religious (*e.g.*, attending church) and others reported non-religious (*e.g.*, connecting with nature, art, *etc.*) coping skills.

Results from our study determined that relationships clearly exist between spiritual coping strategies and mental health as measured by depression, anxiety, stress, and resilience. We found that among the overall sample, higher spiritual coping strategies were associated with lower depression, anxiety, and stress scores and higher resilience. These findings appear to align with other studies.[10,30] Findings in the literature are mixed and much depends on whether one is assessing "spirituality (S)," "religiosity (R)," or both (S/R). But according to Kao *et al.*,[30] 61% of 444 studies on S/R show an inverse relationship between S/R and depression and 49% of studies show an inverse relationship between S/R and anxiety. Vitorino *et al.*[10] investigated how different levels of spirituality and religiousness were associated with quality of life, depressive symptoms, anxiety, optimism, and happiness among adults. While differences existed among levels of spirituality and religiousness, their results revealed that higher levels of both were more strongly correlated with better outcomes than having just one or neither. Further, Rosmarin *et al.*[31] noted that a plethora of research worldwide has connected spirituality with reduced depression, suicide, and substance use. Spirituality can also promote emotional wellness, as evidenced by its associations with greater life satisfaction and self-esteem.[32]

Results from our study indicate that the genders are more alike than different regarding many variables of mental health, resilience, spirituality, and social media use. However, a few key differences did emerge. Specifically, females reported higher levels of non-religious spiritual coping, higher levels of anxiety, and lower levels of resilience compared to males. These findings align with previous research by King *et al.*[33] and Leurent *et al.*[34] suggesting that individuals who are spiritual, but not affiliated with an established religion, may have a heightened risk of mental illness.

Like spirituality, resilience is another term with varying definitions in the scientific literature, but for the most part, there is agreement that resilience is connected to positive mental health.[35] Results from our overall sample showed that participants who demonstrated higher resilience had lower levels of depression, anxiety, and stress. Similar to our findings, studies show that resilience is negatively correlated to negative indicators of mental health and positively correlated to positive indicators of mental health.[36] Resilience appears to act as a protective factor in overall mental health and can prove to be very powerful in helping individuals bounce back from adverse experiences. In our study, resilience was twice as strongly correlated with reduced depression, anxiety, and stress

compared to spiritual coping. In addition, we found that higher spiritual coping scores were associated with greater resilience, highlighting its potential role in mitigating the impacts of challenges like the recent pandemic. According to Srivastava,[35] resilience is trainable. Therefore, fostering a climate that encourages spiritual practices could be beneficial, as it may naturally enhance resilience.

The positive correlation between age and resilience aligns with previous research showing that resilience tends to increase with age.[36] Interestingly, in our study sample, females reported lower resilience levels than males but had significantly higher levels of non-religious coping. This may suggest that men are more inclined to rely on themselves, while women may be more open to seeking support or external sources of comfort, even if non-religious. This finding is consistent with prior literature indicating higher resilience in males compared to females, which may also be related to higher levels of anxiety typically observed in females.[37]

Social media use was associated with increased levels of anxiety, depression, and stress and decreased resilience among our sample population. In a previous study on Facebook use and subjective feelings of well-being among young adults, Kross *et al.*[13] found that the more their participants used Facebook, the more their life satisfaction levels declined over time. Current societal norms often associate social media with supportive social relationships and social connection, but it was clear among our sample population that social media use provided no buffer or release from mental health disturbances as measured by levels of anxiety, depression, stress, and resilience. Similar to Kross *et al.*,[13] we found that social media use, particularly while experiencing adversity by way of the COVID-19 pandemic, may actually have undermined the mental health of our participants. Our findings highlighted notable differences in social media use between faculty/staff and students, with concerning impacts on students' mental health. Faculty and staff, while spending fewer hours on social media, had higher social media intensity scores, which were linked to increased anxiety and stress (but not depression). However, students showed much higher overall usage, and this extended time on social media correlated with elevated levels of depression, anxiety, and stress. It appears that the students struggling with the highest levels of anxiety, depression, and stress did not find relief by spending more time on social media; in fact, their mental health may have worsened with increased exposure. This trend aligns with research indicating that prolonged social media use is particularly detrimental to the mental well-being of younger individuals.[13,38] When comparing genders, while not statistically significant, we also found that women spent more hours per day and had higher social media intensity scores than men, which manifested in higher levels of anxiety. Twenge and Martin[38] observed similar findings in a large sample of adolescents. Their study revealed that moderate to heavy digital media use was more strongly associated with low psychological well-being and mental health issues in girls compared to boys. Among both genders, they found that heavy digital media users were often twice as likely as light users to experience low well-being or mental health issues, including risk for suicide.[38] Consistent with these studies, our findings revealed correlations between social media use and poorer mental health, though they do not allow for definitive conclusions about causation.

It is important to note that not all social media use is inherently harmful, and many individuals use these platforms in positive and meaningful ways to connect with others, seek support, and share experiences.[12] However, moderation and mindful usage are key to minimizing potential negative effects on mental health. The average person spends 145 min on social media every day.[39] Our student group reported an average of 3.56 h/day on social media and the faculty/staff group reported an average of 1.25 h. Given the correlation between time spent on social media and poorer mental health outcomes, we recommend focusing on raising awareness among students about the potential risks of excessive social media exposure.[15] This aligns with findings by Shakya and Christakis,[40] who observed that social media use reduced psychological well-being in adults, while in-person social interactions improved it. Similarly, Tromholt[41] found that those who took a break from social media experienced increases in life satisfaction and their emotions became more positive. Encouraging a healthy balance between online and offline activities, setting boundaries around social media use, and promoting engagement in activities that foster well-being may help mitigate the negative impact of excessive social media consumption.

This study has limitations common to survey research and self-reported data, including potential recall bias. Self-reported data can be inaccurate due to misunderstandings or reluctance to disclose personal information, especially given the stigma surrounding mental health or the influence of social desirability. In addition, the use of a convenience sample limits the ability to draw causal inferences, meaning the results may not be fully representative of the broader population. Longitudinal data could provide greater insight into the dynamics of mental distress and its relationship with both social media use and spirituality over time. Moreover, the use of a convenience sample led to a disproportionate number of male participants

and reduced ethnic and cultural diversity, which may limit the generalizability of the findings across different backgrounds. To that end, future research should involve a more culturally and gender-diverse sample.

5. Conclusion

Spirituality often implies a sense of community, with evidence suggesting that religious communities contribute significantly to human flourishing.[6,42] Studies, like those by Prieto-Ursúa and Jódar,[43] show that spirituality and religiousness can foster psychological growth and resilience, especially following stress, such as the COVID-19 pandemic. Similarly, positive social media use – especially in maintaining close relationships – can promote feelings of belonging and social support. Resilience, crucial for mental health, is often strengthened by spiritual connections and supportive social networks. Based on these insights and what we learned from our study, we recommend that students, faculty, and staff actively seek to build spiritual and in-person connections through activities such as spiritual book clubs, meditation groups, and faith-sharing sessions, as a means to enhancing overall mental health. Furthermore, fostering resilience should be a primary goal among campus community leaders.

To draw parallels or comparisons between spirituality and social media use in terms of their impact on mental health is challenging, as there is no clear comparison in the literature to date. Our study provides a unique glance into the intersection of spirituality and social media use on mental health in a campus community, recognizing diverse coping strategies among various ages and genders. Future researchers might need to consider broader frameworks or theoretical models that explore how different coping mechanisms, social support networks, or sources of meaning and purpose (including both spirituality and social connections via social media) interact to influence mental health outcomes. While there might not be direct comparative studies, synthesizing findings from research on spirituality, social media use, and mental health could provide valuable insights into how various factors contribute to overall well-being in today's digital age. In addition, interdisciplinary research that integrates perspectives from psychology, sociology, and religious studies could shed light on the complex interplay between spirituality, social media, and mental health.

In conclusion, our study underscores the intricate relationships among spirituality, social media use, and mental health, highlighting the need for tailored mental health interventions that consider the diverse coping mechanisms and social dynamics of different demographic groups.

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Conflict of interest

The authors declare that they have no competing interests.

Author contributions

Conceptualization: Karen M. Skemp, Michele L. Pettit
Formal analysis: Patrick J. Barlow
Investigation: All authors
Methodology: Patrick J. Barlow
Writing – original draft: Karen M. Skemp
Writing – review & editing: Michele L. Pettit, Patrick J. Barlow

Ethics approval and consent to participate

The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States and received approval from the Institutional Review Board of the University Wisconsin-La Crosse (approval ID: 22-KS-266). All study participants provided written consent before participating.

Consent for publication

All study participants provided written consent before participating and were informed that their responses would remain anonymous, and that all findings would be reported in aggregate form, ensuring that no individual responses could be identified.

Availability of data

Data are available from the corresponding author on reasonable request.

Further disclosure

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ACCSCIENCE PUBLISHING

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ORIGINAL RESEARCH ARTICLE

The mind-body connection: Sleep disruptions, dream processes and their effect on psychosomatic disorders

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Abstract

Sleep is recognized as a crucial link between mental and physical health, bridging the unconscious and conscious realms. However, the impact of both physiological and pathological sleep on the progression of diseases with significant psychological burdens, such as psychosomatic disorders, remains insufficiently understood. Gaining a deeper understanding of this relationship would offer a more comprehensive insight into both the physiology and pathophysiology of sleep, as well as the mechanisms underlying the development and progression of psychosomatic conditions. This knowledge could also guide the development of therapeutic strategies aimed at enhancing the quality of life for patients affected by these disorders. This review aimed to investigate the relationship between sleep, sleep deprivation, and dreaming in relation to psychosomatic diseases, the dependency relationships that can be established between these factors, and the medical and psychological implications that the links found have in the assessment and treatment of patients. Using a broad PubMed database search, primary and secondary studies were analyzed to understand how scientific research on this issue has evolved over time and what are the missing elements in this interconnected relationship. The study revealed that psychosomatic illnesses are complex, multifactorial conditions, strongly influenced by both normal and pathological sleep. It also highlighted that therapeutic interventions targeting sleep pathophysiology can alleviate patients' symptoms. In addition, the theoretical insights gained from this relationship serve as an initial step toward a comprehensive understanding of the connection between the mind and body.

Keywords: Sleep; Sleep deprivation; Dreams; Psychosomatic disorders

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1. Introduction

Sleep is a fundamental, periodic physiological process through which the balance between different neuronal centers is restored and without which higher organisms could not survive.[1] Although it does not have an unanimously accepted definition in the literature, the role of sleep in neuronal maturation, facilitation of learning and memory, elimination of neuronal metabolic products accumulated throughout the day, and its role in the maintenance and development of various cognitive processes is recognized.[2-4] In humans, sleep has a particular structure and order of processes

that profile its special roles in human physiology. Physiological sleep is divided into two broad phases: rapid eye movement (REM) sleep and non-REM (NREM) sleep. REM sleep is also called "paradoxical sleep" because it is characterized by desynchronized electroencephalographic activity, similar to wakefulness. During this phase of sleep, the heart and respiratory rates become irregular and there is an increase in intrinsic sympathetic activity. Muscle tone is significantly reduced, and rapid, jerky eye movements (known as saccades) are observed, which is how this stage gets its name—REM sleep. In addition, REM sleep plays a critical role in the formation of motor and cognitive learning patterns at the cortical level.[5-8] NREM sleep, subclassified into four other stages according to brain wave appearance (stage 1, stage 2, stage 3, and stage 4), is a form of sleep in which brain electrical activity is synchronous, with low frequency and high amplitude. It represents the period of sleep that involves the lowest neuronal energy consumption and plays a role in recovery and rebalancing the interrelationships with various elements of the central nervous system.[4,9]

A very important phenomenon associated with sleep is represented by dreams, which are a form of biological manifestation of fears, desires, and conflicts from the psychic universe.[7] They are classically associated with REM sleep but can occur in any sleep phase. However, dreams during REM sleep can be recalled upon awakening and are characterized by a significant psycho-emotional load.[10] The link between dreams during REM sleep, their character, and the ability to recall them in relation to psychosomatic pathology is a crucial one because dreams represent one of the main mechanisms through which the human body can discharge the psychic energy accumulated during the day. If dreams cannot manifest themselves, or manifest themselves in a pathological way, this psychic energy can cause the appearance of psychosomatic symptoms in different organs or even the decompensation of pre-existing pathologies.

Sleep deprivation refers to short duration or poor quality of sleep, which has a negative effect on alertness, cognitive abilities, and overall health. It may be acute or chronic depending on the time interval over which it is present and may not only occur in different clinical contexts, such as sleep pathologies, psychiatric disorders, or chronic diseases *(e.g.*, chronic kidney disease) but also appears as an adverse effect of some medications.[11-13] Sleep deprivation exerts a wide range of effects on the human body, both in the short term and over the long term. These effects not only impair the functioning of the nervous system but also have detrimental consequences for various other organ systems and physiological processes throughout the body. On the nervous system, acute sleep deprivation produces irritability, loss of concentration, mental fatigue, and dysthymia,[14] while chronic sleep deprivation has proapoptotic effects, predisposing the body to neurodegenerative and psychiatric disorders.[15] In other systems, chronic sleep deprivation is associated with cardiovascular disease, Type 2 diabetes mellitus, weight gain, and immunosuppression.[16-18]

Psychosomatic medicine, in a broad sense, is a medical approach that uses the biopsychosocial model to explain human pathologies and takes into account both organic and psychological factors to explain the etiology, course, and treatment of diseases.[19] This holistic approach, which takes into account different aspects of patients' lives, represents the school of thought of modern medicine, which emphasizes both the length and quality of patients' lives. This way of thinking has been criticized throughout its development, with arguments regarding the fact that psychological factors have a minor influence on the pathogenesis of different diseases or that psychological elements are difficult to quantify, making it impossible to measure the effects of specific therapeutic interventions. However, most diseases require a multidisciplinary approach to pathology, and psychosomatic medicine is now in a state of continuous development. In a narrow sense, it is concerned with the diagnosis and treatment of psychosomatic disorders, which are organic pathologies of all organ systems and on which the influence of the psyche plays a decisive role, with important diagnostic and prognostic implications.[20,21] Psychosomatic illnesses are organic diseases in which patients manifest somatic symptoms characteristic of different organ systems, symptoms that arise and are exacerbated by psychological factors (stress, anxiety, previous psychological trauma). Psychosomatic diseases have a pre-existing organic background – provable by laboratory, imaging, or histopathologic investigations – unlike psychiatric diseases, which are diseases that affect the various higher mental functions (thinking, memory, attention, perception, perception, language, or executive functions) and have no identifiable organic cause.

Based on all these preliminary data, the present paper aims to address and answer the following questions: whether there is any connection between sleep, either physiologic or pathologic (in terms of duration, as in sleep deprivation and hypersomnia, as well as in terms of quality and structure, as in neurologic or other organ system pathologies that alter sleep architecture and the percentage duration of REM sleep during the night), and the psychosomatic disorders; whether in the case of this

association, a temporal or even causal relationship can be established between changes in sleep architecture and the psychosomatic diseases; the particular dreams that occur in these types of sleep and their role in the appearance or exacerbation of the psychosomatic pathology; and whether there are therapeutic interventions on sleep that can lead to prevention or improvement of symptoms of psychosomatic illnesses.

2. Methods

The paper is structured in the form of a narrative review, concentrating on relevant information found in different types of scientific publications (original research articles, clinical trials, case studies, reviews, and books) on the link between sleep, dreams, and psychosomatic pathology. The articles were searched in the PubMed database, through repeated searches on consecutive days of the expression ("Psychosomatic Medicine"[Mesh] OR "Psychophysiologic Disorders"[Mesh]) AND ("Sleep Deprivation"[Mesh] OR "Sleep, REM"[Mesh] OR "Sleep, Slow Wave"[Mesh]), using the respective keywords. All English-language, full-text articles on human subjects were searched ("Full text," "Humans," and "English" filters). Relevant references of the papers were also included in the study. Articles related to psychiatric pathology, not psychosomatic illnesses, were excluded from the study. The type and number of items that were consulted, subsequently included, or excluded are shown in Table 1.

3. Results

3.1. REM sleep and psychosomatic disorders

As stated in the Introduction, REM sleep is a stage of sleep in which the activation of the autonomic nervous system and various mental processes is marked, and the stress generated on the body night after night can be a contributing factor to the onset or exacerbation of psychosomatic pathology. The scientific articles discuss the connection between sleep structure and this type of pathology, highlighting the role of both the quantity and quality of REM sleep in the development of these conditions. They also explore how REM sleep can affect various organ systems and suggest potential treatments for psychosomatic diseases, including the use of medication to suppress REM sleep.

Table 1. Article type of the included publications

Study design	Articles read	Articles included	Articles excluded
Original research article	15	13	2
Theoretical article	2	1	1
Case report	2	1	1
Review	8	7	1
Total	27	22	5

With regard to the quantitative aspect of REM sleep in individuals suffering from psychosomatic diseases, results in the literature have yielded contrasting results: some articles claimed that patients suffering from psychosomatic pathologies have high percentages of REM sleep in the total sleep period,[22-26] while others claimed the opposite,[27,28] which can be at least partly explained by the different methodologies of the studies and the small groups of patients involved. The studies that were consulted throughout the review, their type, and main key findings are listed in Table 2. The evidence for increased REM sleep time is stronger and more abundant, found in studies targeting psychosomatic pathologies of many different organ systems. Using the method of polysomnography, Bazil *et al.*[22] found statistically significant differences ($P < 0.05$) between a group of eight patients suffering from non-epileptic psychogenic seizures and a control group of 10 patients in sleep structure, stating that patients with seizures of psychogenic origin have a relatively increased amount of REM sleep. Based on similar assumptions found in other studies,[29-31] Jarrett *et al.*[23] demonstrated the presence of prolonged REM sleep durations in patients with irritable bowel syndrome. Schmidt and Nofzinger[24] showed a reduced REM sleep onset latency in patients with psychogenic erectile dysfunction, and Karacan *et al.*[25] identified long periods of superficial sleep, high sleep onset latency, and long periods of REM sleep in patients with nocturnal angina pectoris. Although there is more evidence that REM sleep is of longer duration in people with psychosomatic pathology, contrary results are also worth mentioning, like the study of Warnes[27] which states that the 10 patients with psychosomatic diseases in the study group, especially those with ulcerative colitis, had reduced REM sleep periods, or the one of Tantam *et al.*,[28] in which six patients with psychosomatic skin pathology had reduced REM sleep periods. Knowing all these data, only apparently contradictory to what is detailed in the Discussion section, we can affirm that the presence of an unstable REM sleep state is a possible precondition for the development of a psychosomatic pathology, an aspect also emphasized by Friedman.[32] Arguments in support of this hypothesis come from the fields of medicine and biology as well as psychology. From a biological point of view, REM sleep generates an activation of the sympathetic vegetative nervous system[33] with all the physiological or pathophysiological effects that can occur on a vulnerable organ system, and patients with psychosomatic pathology show a marked imbalance of the autonomic nervous system.[32] From a psychological point of view, the inability

Table 2. Key findings of the included publications

Article title	Study design	Key findings
Dream recall frequency and psychosomatics[61]	Review	Dream recall frequency is reduced in patients with psychosomatic pathology.
Social stressors at work, sleep quality, and psychosomatic health complaints[50]	Original research article	Sleep disorders mediate the relationship between work stressors and exacerbation of psychosomatic symptoms.
Recent sleep and dream research: Clinical implications[33]	Review	REM sleep has the potential to exacerbate the symptoms of pre-existing illnesses.
An integrative model for the treatment of psychosomatic disorders[27]	Review	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
The intern and sleep loss[49]	Original research article	Sleep deprivation reduces cognitive abilities.
ABC of sleep disorders. Dreams and medical illness[59]	Theoretical article	Dreams have the ability to exacerbate symptoms of psychosomatic diseases.
Sleep structure in patients with psychogenic non-epileptic seizures[22]	Original research article	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
Sleep, scratching, and dreams in eczema[28]	Original research article	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
Nightmare behavior[53]	Review	Dreams have the ability to exacerbate symptoms of psychosomatic diseases.
Sleep disturbance influences gastrointestinal symptoms in women with irritable bowel syndrome[23]	Original research article	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
Dream process in asthmatic subjects with nocturnal attacks[51]	Original research article	Dreams have the ability to exacerbate symptoms of psychosomatic diseases.
A review of psychogenic aspects and treatment of bruxism[39]	Review	REM sleep has the potential to exacerbate the symptoms of pre-existing illnesses.
Short REM latency in impotence without depression[24]	Original research article	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
Psychophysiological parallels in dreams[60]	Original research article	There is a direct link between dream characteristics and manifestations of psychosomatic diseases. Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
Do endocrines play an etiological role in diabetic and non-diabetic sexual dysfunctions?[42]	Original research article	REM sleep has a role in the differential diagnosis between organic and psychogenic disorders.
Basis for recurring ventricular fibrillation in the absence of coronary heart disease and its management[35]	Case report	REM sleep has the ability to generate symptoms on the cardiovascular system even in the absence of a pre-existing organic pathology.
Toward integrating psyche and soma: Psychoanalysis and neurobiology[70]	Review	The inability to manifest psychic energy in a psychic way, through dreams, predisposes individuals to the emergence of somatic manifestations.
The assessment of nocturnal REM erection in the differential diagnosis of sexual impotence[41]	Original research article	REM sleep has a role in the differential diagnosis between organic and psychogenic disorders.
On the treatment of neurodermatitis with a monoamine oxidase inhibitor[43]	Original research article	There are therapeutic interventions on REM sleep that can improve the symptoms associated with psychosomatic diseases.
Sleep characteristics of patients with angina pectoris[25]	Original research article	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
New approaches to the evaluation and treatment of insomnia[26]	Original research article	Psychosomatic diseases are associated with a quantitative and qualitative imbalance of REM sleep.
A psychophysiological model for the chemotherapy of psychosomatic illness[32]	Review	REM sleep impairment is a precondition for the development of a psychosomatic pathology.

Abbreviation: REM: Rapid eye movement.

of some patients to use mental coping mechanisms to respond to inner life stimuli predisposes them to respond in a somatic manner to release accumulated psychic energy,[34] which is also true for REM sleep.

Through the activation of different organ systems, REM sleep has the potential to exacerbate the symptoms of pre-existing illnesses,[33] which is also true regarding the psychosomatic pathology. It is recognized that acute cardiovascular episodes (angina pectoris, acute myocardial infarction, and stroke) are most frequent in the last part of the night when REM sleep density is the highest.[33] In a case study by Lown *et al.*,[35] a patient without organic cardiac pathology suffered two episodes of ventricular fibrillation due to high psychophysiological stress during REM sleep, hypothesizing that neurophysiologic factors may predispose to life-threatening arrhythmias in the absence of intrinsic cardiac pathology. Another system frequently concerned by variations during REM sleep is the respiratory system, particularly with regard to nocturnal attacks of bronchial asthma, which were influenced by the emotional content of dreams during REM sleep[33,36] and were more frequent in the latest part of the night,[37,38] similar to cardiovascular events. Other pathologies that were exacerbated during REM sleep were: Nocturnal episodes of bruxism[39] by stimulation of the masticatory centers in the medulla oblongata, acute peptic ulcer pain[33] by an exaggerated hydrochloric acid secretion associated with a decrease in the amount of mucus secreted due to psychic pressure, and nocturnal attacks of migraine and cluster headache.[40] Last but not least, the role of nocturnal penile tumescence measurement in the differential diagnosis of organic and psychogenic sexual dysfunctions[41,42] is found, with the organic ones being characterized by the absence of erections in REM sleep, and the psychogenic ones by their physiological presence. In addition, these studies noted that increased REM sleep quantity has a negative influence on daytime sexual performance in people with impotence, even in the absence of depression.[24]

Given all these observations, it can be hypothesized that reducing REM sleep duration in patients suffering from psychosomatic pathology could improve the symptoms of these diseases. In this respect, Friedman *et al.*[43] conducted a therapeutic trial on neurodermatitis (lichen simplex chronicus), a dermatological disease characterized by the presence of pruritic plaques on the skin,[44] which is strongly influenced by psychological factors and can be improved with psychotherapy.[45] The trial used phenelzine, a monoamine oxidase inhibitor which, at doses of at least 30 mg/day applied for at least 2 weeks, has the ability to block the onset of REM sleep.[46,47] The study methodology involved an experimental group of eight patients with neurodermatitis treated for 10 weeks with phenelzine (5 preliminary weeks for the onset of effects in which patients were treated with doses of 30 mg/day, divided into 5 doses of 6 mg/day and 5 experimental weeks with 75 mg of phenelzine per day, divided into 5 doses of 15 mg) and a control group of seven patients who were treated for 10 weeks with diazepam (5 preliminary weeks for the onset of effects and 5 experimental weeks in which patients were treated with a dose of 25 mg diazepam per day, divided into 5 doses of 5 mg), knowing that diazepam does not influence the total duration of REM sleep during the night.[48] The symptomatology associated with neurodermatitis (pruritus, erythema, presence of papules, lichenification, scaling) was evaluated at 5 weeks of treatment versus 10 weeks of treatment, with statistically significant results being observed in relation to improvement in pruritus ($P < 0.001$), erythema ($P < 0.001$) and presence of papules ($P < 0.03$).

3.2. Sleep deprivation and psychosomatic disorders

The studies linking acute or chronic sleep deprivation and psychosomatic pathology had two lines of approach: some demonstrate the existence of a significant association between sleep disturbances and the presence or severity of these diseases, while others show that sleep deprivation is the element that mediates the causal relationship between a stressor and the exacerbation of symptoms of illnesses with psychogenic influence.

Friedman *et al.*[49] studied the effects of sleep deprivation on interns' ability to recognize arrhythmias on electrocardiogram and on their cognitive, perceptual, and emotional abilities. The study included 14 interns who successively acted as their own control subjects. Starting 32 h before testing, the group of rested interns slept an average of 7 h of sleep per night, and the group of fatigued interns an average of about 2 h/night (statistically significant difference between the two groups, $P < 0.001$). The ability to recognize arrhythmias was tested on a Holter recording, perceptual and cognitive parameters on the Jarvik questionnaire, and mood on the Mood Adjective Checklist questionnaire. At the end of the study, sleep-deprived interns made significantly more diagnostic errors than rested interns (9.64 ± 1.41 vs. 5.21 ± 0.93, $P < 0.01$), with the Jarvik scale for psychophysiological abnormalities showing reduced perceptual and cognitive abilities in the group of fatigued interns compared to the rested ones (11.43 ± 1.56 vs. 2.64 ± 0.81, $P < 0.01$), and the emotions reported by the Mood Adjective Check List scale in the group of fatigued interns were sadness, fatigue, lack of attention and lack of vigor, all of which demonstrate that sleep deprivation can produce important psychophysiological abnormalities. Jarrett *et al.*,[23] studied the effects of the previous night sleep deprivation on the symptomatology of 82 women with irritable bowel syndrome, compared to 35 control women. In the experimental group, on the day following sleep deprivation, women reported significantly more gastrointestinal symptoms than patients in the

control group ($P < 0.05$). The relationship held even when psychological and stress parameters were controlled.

Pereira and Elfering[50] studied the mediating role that sleep quality may play on the relationship between job stress and psychosomatic complaints of employees. In this regard, two working hypotheses were addressed: on the one hand, whether there is a correlation between workplace stressors, sleep quality, and psychosomatic complaints, and on the other hand, whether sleep quality mediates the relationship between stressors and psychosomatic symptomatology. Sleep quality was measured both objectively (in terms of sleep onset duration, sleep efficiency, and sleep fragmentation using the actigraphy technique) and subjectively through a questionnaire and a patient sleep diary. Stress level was also measured by a scale at the beginning and end of the study (Frese and Zapf scale) and psychosomatic symptoms by the Mohr scale. The first resulting conclusion was that workplace stressors were significantly correlated with psychosomatic complaints and sleep fragmentation (defined in the study as the number of nocturnal awakenings lasting at least 5 min or more followed by at least 15 min of uninterrupted sleep), but not with the other objective measures of sleep quality ($P < 0.05$), partially proving the first working hypothesis. The second conclusion was that the negative effects of workplace stressors on the occurrence of psychosomatic illnesses are mediated by sleep fragmentation, as the bootstrap test of the indirect effect for the link between the two items yielded a regression coefficient B equal to 0.15, which was significantly different from zero (with a 90% confidence interval between 0.0036 and 0.3662). These aspects prove that objective sleep-related elements, such as sleep fragmentation in this study, have the capacity to induce exacerbation of psychosomatic symptomatology in individuals on whom stress or other aggression factor acts chronically.

3.3. Dreams and psychosomatic disorders

An interesting relationship was found between the psycho-physiologic phenomenon of dreams and psychosomatic pathology, both in terms of the content of the dreams reported by patients with these diseases and the possible effects that this content has on symptomatology and in terms of the broad effects that dreamlessness and lack of ability to express emotions, in general, have on the balance between psyche and body.

The unanimous direction of the studies consulted regarding the content of dreams reported by patients with psychosomatic pathologies was that of a negative experience in comparison to healthy individuals. Warnes[27] describes in his study of 10 patients with psychosomatic pathology, who spent three or four nights in the polysomnography laboratory, that the dreams they reported after awakening from REM sleep were accompanied by a multitude of negative feelings: Fear, terror, alienation, and helplessness. The dream content tended towards traumatic events and near-death experiences or death-related situations. Another observation is that some patients showed a lack of emotional involvement in their dreams. While they may not experience typical nightmares, they have dreams where they feel completely detached from the images they see. In these dreams, they do not appear as themselves and remain "uninvolved" in the events. This observation is also echoed in the work of Tantam *et al.*,[28] who stated that the six psychosomatic skin pathology patients analyzed tended to be less involved in their own dreams, having more of an observer than a participant role. In another study, Monday *et al.*[51] compared a group of 12 patients with psychogenic-induced bronchial asthma with 12 control subjects in terms of dreams spontaneously reported after awakening or immediately after intentional awakening from REM sleep and found a tendency of asthmatic patients to use much shorter sentences to describe dream narratives, much less emotional involvement or more frequent presence of nightmares than in healthy patients. An intuitive observation, but one that nevertheless needed to be demonstrated through study, is that the words spoken by patients during REM sleep and recorded by researchers correlate with the dream content that the patient narrates upon awakening from sleep.[52]

Building on these observations about dream content, numerous studies have documented the effects that dream content in REM sleep primarily, but also during NREM sleep, has on different organ systems. As a general direction, Hersen[53] states that nightmares, in relation to REM sleep, have the ability to induce autonomic nervous system activation, with all the consequences resulting from this activation.[54-56] Shapiro *et al.*[36] identified the effect of bronchoconstriction that strong emotions during dreams have on airway diameter in asthma patients, and Monday *et al.*[51] stated that conflictual material emerging from dreams during REM sleep (and also during other sleep stages) could contribute to nocturnal attacks of bronchial asthma. Nowlin *et al.*,[57] observed that nocturnal attacks of angina pectoris occur most often during REM sleep, and dreams reported by patients on awakening often contain anxious ideas or the sensation of sustained physical effort. In addition to clinical changes, biochemical changes related to the content of patient-reported dreams have also been observed: Plasma-free fatty acid levels as an indicator of catecholaminergic activity 15 min after awakening from REM sleep were significantly associated with patient-reported dream anxiety in the study by Gottschalk *et al.*[58]

Several authors have gone so far as to state that dreams may be the first indicator of psychosomatic illnesses, before objective clinical or laboratory changes,[59] because during REM sleep and especially during dreams, the variations of the autonomic nervous system are the most significant and may unbalance the vulnerable structures of the body. The most extensive study that dealt with the quantitative relationship between dream content and changes in autonomic nervous system parameters was that of Hauri and Van de Castle,[60] in which 15 adults were monitored to determine their polysomnographic and autonomic nervous system parameters during sleep. They were also questioned about the content of their dreams. The parameters measured were heart rate, respiratory rate, phasic vasoconstriction and rapid changes in skin electric potential, and the dreams were analyzed using a 7-question questionnaire designed to analyze the emotionality of the dream, an activity scale measuring the theoretical energy required for the person to perform the physical activity from the dream during wakefulness and a scale quantifying the level of involvement of the person as an "actor" in their dream. Participants spent one night of familiarization in the polysomnography laboratory and three experimental nights, being awakened twice a night from both REM and NREM sleep. Highly statistically significant results ($P < 0.005$) were observed between dream emotionality and heart rate variability in the last 6 min of REM sleep, between dream emotionality and skin potential variability in the last minute of REM sleep, and between the person's involvement in the dream as an "actor" and the average heart rate throughout REM sleep. All these relationships demonstrate that dream content can exert an influence on physiological variables during REM sleep.

Although dreams, especially those during REM sleep, may have a negative influence on physiological variables during sleep, it is worth noting the influence that patients' inability to dream or to remember and verbalize their dreams may negatively influence them throughout the entire circadian cycle. Another common observation in the literature related to people with psychosomatic pathology is that they tend to recall dreams less frequently than people in the general population.[61] It has been observed that people with these disorders report significantly fewer dreams during psychotherapy sessions.[62] Asthmatic patients did not recall any dream episodes if they had a nocturnal bronchial asthma attack and had much more often than healthy subjects the sensation of "white" dreaming (patients knew they had dreamt something, but were unable to recall any element of the dream) in the study by Monday *et al.*[51] Smith[63] stated that patients who do not dream or do not recall dreams have the worst cardiovascular prognosis. A quantitative study that addressed the issue of dream recall in relation to psychosomatic pathology is that of Ilias *et al.*,[64] in which 108 patients suffering from dermatitis proven to be psychosomatic, and six patients suffering from gastrointestinal disorders and hypertension proven to be psychosomatic were interviewed, the results showing that only 17.5% of the patients with dermatologic pathology and only 17% of the patients with gastrointestinal pathology were able to recall most of the dreams they had in the past week, compared to 80% reported in people without psychosomatic pathology who were questioned about their dreams upon awakening from REM sleep.[65]

4. Discussion

The data provided by the literature in the field allow us to answer, at least partially, the questions that we wished to address in this paper. The rational approach to a subject that involves medicine, biology, and psychology and in which scientific research through prospective studies and meta-analyses is limited is to be cautious in clearly stating conclusions, coupled with specifying proven working hypotheses to shed light on promising future directions.

Clearly, psychosomatic pathology is associated both with disturbances in sleep architecture, mainly in the form of a quantitative and qualitative imbalance of REM sleep, and with sleep deprivation, and also with dreams, in the particular manner in which they manifest in this group of patients. While only weak psychophysiological correlations between organ system function and pathological sleep have been observed in the general population, these connections become much more pronounced in patients with psychosomatic disorders[60]: REM sleep exerts pressure on vulnerable organ systems by activating the autonomic nervous system, sleep deprivation generates psychophysiological imbalances and dreams during REM sleep may exacerbate the symptomatology of many psychosomatic illnesses.

Due to the fact that most study approaches were either cross-sectional in design or lasted for short periods of time, the temporal or causal relationships between REM sleep disturbances, sleep deprivation, dream character, and psychosomatic pathology can only be intuited. REM sleep disturbance is considered one of many comorbid conditions that predispose to or exacerbate the symptomatology of multifactorial diseases, such as psychosomatic disorders. Dreams with high emotional charge or terrifying content for the patient were occurring around the same time as somatic complaints, which is why it is difficult to state which of the two is more likely to occur first and whether one of them generates the other. The general approach on this issue was that of a mutual relationship, in which the body and the psyche influence each other both during

REM sleep and especially during dreaming. A temporal relationship has, however, been demonstrated for sleep deprivation as a mediating factor between stress and exacerbation of digestive symptomatology,[23] necessitating future studies confirm whether this relationship is also valid in the long term and for other organ systems.

The practical usefulness of all these concepts is evidenced by attempts to prevent, treat, and ameliorate psychosomatic pathologies through sleep interventions. Although there is much evidence in the literature on the treatment of sleep-related pathologies by pharmacological[66] and psychotherapeutic[67] methods, few studies have investigated the value of these treatments in relation to psychosomatic pathology. The only study found in the search was that of Friedman *et al.*,[43] who successfully relieved the symptoms of neurodermatitis with a drug that inhibits REM sleep, adding yet another perspective to the holistic treatment that these diseases and these patients require.

The implications that all these data have in a psycho-medical context are very valuable from a theoretical point of view, for understanding the mechanisms that control the relationship between the psyche and the body. From a psychological point of view, the reason why patients suffering from psychosomatic disorders are so sensitive to changes in sleep and dreaming relative to the general population is that they often overlap with the psychological corollary of alexithymia, described by Sifneos.[68] He noted certain behavioral and reasoning characteristics of patients with psychosomatic pathology, namely, excessive preoccupation with somatic complaints, but with a marked inability to find the right words to describe their distress, with infrequent dreams, and inappropriate emotions regarding the situation in which they find themselves. Other papers also identify these patients as having an apparent intellectual inability to describe their emotions,[69] and their failure to respond to stimuli of the inner life in a psychic manner, including dreaming, predisposes them to respond to these stimuli in a somatic manner.[70] From a Freudian point of view, dreaming, a specific phenomenon of the REM sleep, is a way in which the psychic energy accumulated during the wakefulness can be released through recollection and analysis.[71] In patients with psychosomatic pathology, the low percentage of recalled dreams is equivalent to the accumulation of psychic energy

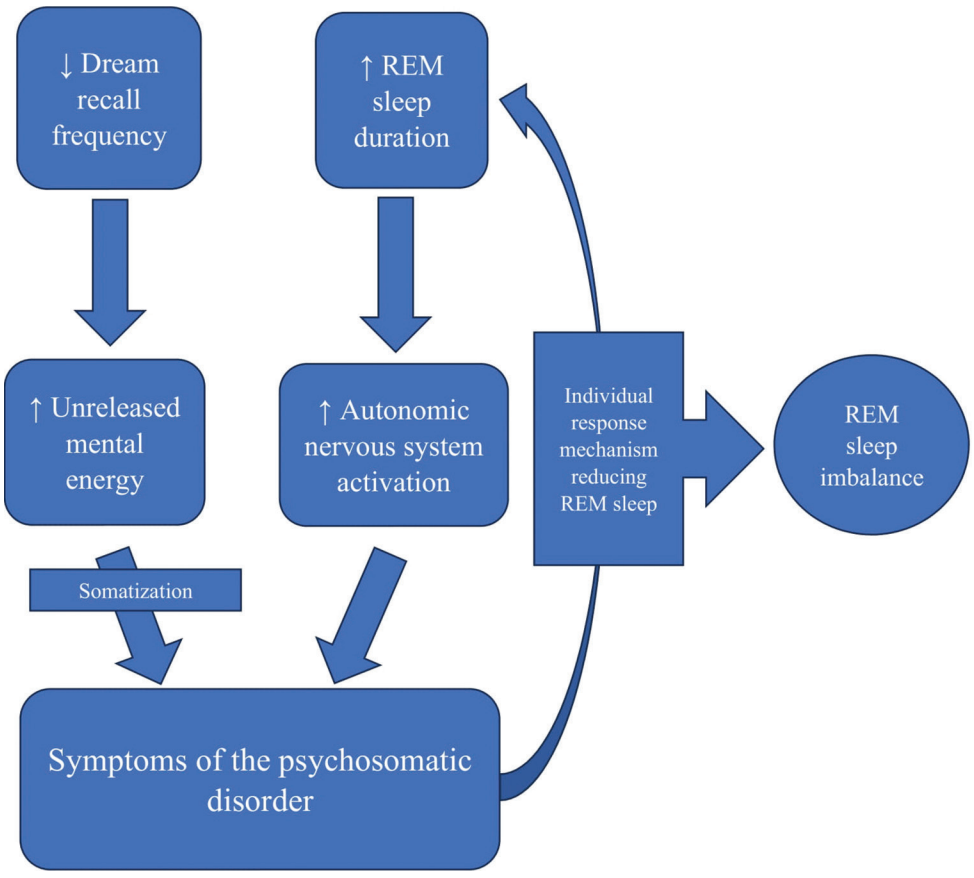

Figure 1. Model of interaction between psychological factors, REM sleep duration, and symptomatology in psychosomatic disorders
Abbreviation and symbols: REM: Rapid eye movement; ↑: Increased; ↓: Decreased.

that cannot be eliminated by expression, which is why it will be released to a vulnerable organs system. From a medical point of view, the findings that the percentage of REM sleep during the night is high in some pathologies and low in others may make it appear that there is no objective correlation between the duration of REM sleep and the propensity to develop this type of pathology, but some authors base these differences on the individual compensatory response of some patients, the body trying to reduce the nocturnal source of biological stress and dreams, which is the REM sleep.[59] A possible model of the interaction between psychological factors, REM sleep, and symptomatology in psychosomatic diseases is illustrated in Figure 1. Although it is clear that psychosomatic disorders belong as much to the domain of psychology as of medicine, the quantitative relationships between sleep architecture, psychological factors, and these particular diseases need to be studied more to be able to state to what extent each of these factors plays a role in the genesis and exacerbation of psychosomatic diseases.

Taking into account all sides of this neurophysiological and psychological puzzle, we can state with confidence certain aspects. On the one hand, health and quality of sleep are fundamental elements for the proper functioning of the nervous system and the psyche in general, as demonstrated by the alteration of sleep architecture or sleep duration in many brain pathologies and in most psychiatric disorders. Psychosomatic pathologies also follow this model, being influenced in their particular way by pathological REM sleep. On the other hand, dreams represent a mirror of the human psychological dimension, and their modification over time or their disappearance poses an alarming signal related to the status of psychological or somatic well-being of a patient. Last but not least, the interrelationship between all these elements reiterates the complexity of the human nervous system and shows that multifactorial pathologies, such as psychosomatic diseases, need to be addressed from all angles to improve the quality of life of patients to the greatest extent possible today.

5. Conclusion

The study of sleep and psychosomatic pathologies, both separately and intricately, using information from several scientific fields such as medicine, biology, and psychology, is a way in which the link between psychic life and somatic manifestations of human beings can be better understood, helping us to discern to what extent the psyche and to what extent the body are responsible for the onset and progression of certain diseases. Although this paper has summarized the views of researchers over the past 50 years on the link between sleep, dreams, and psychosomatic pathology, demonstrating that there is an interdependent relationship between the world of sleep and physical health and that therapeutic intervention can be made in this area, much more data are needed to provide a broad and comprehensive picture of the relationship between the psyche and the body. Research related to the influence of REM sleep and sleep deprivation on the development of psychosomatic diseases tends more towards methodologies and ways of researching from the medical and biological spectrum, but the observations related to dreams and their content in relation to psychosomatic diseases and the strong influence they can have on both day and nightlife prove that psychology and psychotherapy can contribute to improving some medical conditions. Although the broad subject of the relationship between the psyche and the body will never be fully understood and unanimously accepted by the scientific community, partly due to its strong cultural and philosophical charge, it is undeniable that the working hypotheses mentioned above should arouse the curiosity of researchers in the field. Achieving a better understanding of our unconscious life and of the psychic universe, both in terms of sleep and other fundamental processes of the central nervous system, will bring us closer to understanding human nature and the human mind, some of the most fascinating creations of the living world.

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ACCSCIENCE PUBLISHING

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CASE REPORT

Menstrual psychosis and treatment: A case report and brief review

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Abstract

Mental health disorders are a significant public health concern, and the dysregulation of menstrual cycles plays a role in the development of such disorders. Menstrual psychosis is a rare and generally self-limiting mental illness. The literature on menstrual psychosis is sparse and based mainly on case reports, retrospective studies, and reports from relatives, or prospective studies lacking adequate evidence regarding the menstruation timeline. Many case reports have emerged, providing additional information to clinicians about this disorder, since the phenomenon was first described and classified as menstrual psychosis by Krafft-Ebing in his monograph "Psychosis Menstrualis." This case report contributes to the current literature on menstrual psychosis and highlights the potential of contraceptive medication for treatment.

Keywords: Menstrual psychosis; Psychosis menstrualis; Mood; Premenstrual dysphoric disorder; Woman; Reproduction

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1. Introduction

The role of menstrual cycles in the development of such disorders has been a topic of interest since the 18th century.[1] Menstrual psychosis is characterized by the acute onset of psychotic symptoms during certain stages of the menstrual cycle. These symptoms exhibit a relapsing-and-remitting pattern, coinciding with the menstrual cycle. While menstrual psychosis is not considered a distinct disorder in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision, the close timing between the onset and remission of symptoms with specific menstrual phases has led some experts to view it as unique. Others, however, consider it related to bipolar disorder.[2]

The menstrual cycle is divided into two phases: the follicular phase, which spans from menstruation to ovulation, and the luteal phase, which lasts from ovulation to the next menstruation. During menstruation, estrogen and progesterone levels are low. As the cycle progresses, estrogen levels rise, triggering the release of hormones such as follicle-stimulating hormone and luteinizing hormone that facilitate egg maturation. If the egg is not fertilized, hormone levels, including progesterone, fall, leading to the onset of menstruation.[3,4] Research shows that psychiatric symptoms can fluctuate depending on the menstrual cycle, and these fluctuations may be influenced by behavioral, psychological, and neuroendocrine factors. A synthesis of the literature reveals that the premenstrual and menstrual phases are most consistently associated with an

exacerbation of various psychiatric symptoms. In addition, scientific data indicate that the risk of psychosis, mania, depression, suicide/suicide attempts, and alcohol use may increase during these phases in susceptible patients.[3]

Early observations noted a connection between menstruation and psychological disorders, with menstrual mood disorder even being used as a defense in a filicide case in 1827.[5] Various forms of psychosis related to the menstrual cycle, such as premenstrual and catamenial psychosis, were described in the 19th century. Researchers amassed cases related to all menstrual disorders, but the classification was based on presenting symptoms, as opposed to the timing of onset. Krafft-Ebing significantly contributed literature in 1878 by describing 19 cases and later introducing a temporal classification in his 1902 monograph "Psychosis Menstrualis." Krafft-Ebing's classification included menstrual developmental psychosis, ovulation psychosis, and epochal menstrual psychosis, based on the temporal differentiation of these conditions. In 1914, Jolly revised this classification, emphasizing the stage of reproductive life. Jolly's revision included differences among the conditions in terms of their relationship with the phases of the menstrual cycle; for example, psychoses that occur before menarche, at menarche, at menopause, recurrent menstrual psychosis, and epochal cases were included in this revision.[1]

Building on the work of Krafft-Ebing and Jolly, Brockington[1] proposed a modified classification system for menstrual psychosis. Brockington's new system categorizes cases in two steps: first by their timing within the menstrual cycle and then by the reproductive epoch. According to Brockington,[1] menstrual psychosis has the following characteristics: (a) acute onset, against a background of normality; (b) brief duration, with full recovery; (c) psychotic features: confusion, stupor, and mutism, delusions, hallucinations, or a manic syndrome; and (d) a circa-menstrual (approximately monthly) periodicity, in rhythm with the menstrual cycle.[1]

Research on menstrual-related psychosis remains limited, with most studies consisting of case reports and series. This case adds valuable data to the developing body of knowledge in this area. Specifically, it emphasizes the importance of antipsychotics for achieving initial stabilization and suggests the potential of hormone-based contraceptives as a preventive measure.

2. Case presentation

A 40-year-old female with a history of one previous involuntary inpatient hospitalization for psychotic symptoms was admitted to the inpatient psychiatric unit. The patient presented to the emergency department with labile affect, irritability, and subjective reports of loosening grip on reality. Collateral information ascertained by her husband noted worsening mood swings, irritability, and paranoia over the course of a few days. During the initial psychiatric consult interview, the patient was irritable and displayed paranoia, accusing the team of recording the conversation and taking pictures of her to be used for an undisclosed reason. Her husband reported that the patient thought people were following her and stealing her things at home. She had also dusted the home for fingerprints. In the emergency department, the patient denied everything her husband stated, but she did report knowing she needed help before symptoms worsened, as they had in the past. She reported very little sleep over the past few days before consulting us, being irritable and suspicious with her husband, typically acting "crazy" just before menstruation, then returning to baseline shortly after.

Notably, the patient had a recent involuntary admission to the inpatient psychiatric unit 2 weeks prior for similar psychotic symptoms of worsened severity, and that had progressed over the preceding 2 weeks. During that previous hospitalization, she presented with florid psychosis – disorganized thinking, delusions, paranoia, and agitation. Her delusions included believing her husband was cheating, someone was trying to kill her family, everyone was a pedophile, and her children had devices implanted in their eyes. She was treated with olanzapine 10 mg daily and responded rapidly, being discharged in <1 week. Her reason for seeking voluntary treatment during this second admission was to prevent symptoms from progressing as they had leading to the first admission. Both the patient and her husband reported good compliance with olanzapine at home. Before each admission, her irritability, agitation, paranoia, and delusional thoughts had worsened significantly in the week preceding it, coinciding with the premenstrual phase of her period. She believed all her symptoms were linked to her menstrual cycle and had worsened before her last admission, possibly due to cannabis and methylphenidate use, or due to psychosocial stressors including raising two small children and intermarital conflicts. She denied any safety concerns at home. Urine drug screen on first admission was positive for cannabis but negative for amphetamines.

The inpatient psychiatric evaluation on second admission was notable for a long history (starting from late adolescence/early adulthood) of experiencing worsening mood, agitation, irritability, affective lability, and mild paranoia in the two weeks before menstruation that were of stark contrast to her normal behavior. These times were often marked with interpersonal difficulties due to symptoms, and always alleviated after menses. She would often feel

embarrassed or shameful for how she had acted. She was not previously diagnosed with premenstrual dysphoric disorder (PMDD), nor had she sought psychiatric care for the symptoms. She had never used contraceptives but noted distinct symptom improvement during two previous pregnancies. During her first admission, the patient began feeling better after menses, which aligned with the use of olanzapine. She was compliant with olanzapine and did not miss doses between discharge and the second admission. Thyroid panel, Vitamin B12 level, complete blood count, and comprehensive metabolic panels were all generally within normal limits. The patient lived in a rural area of Pennsylvania where air pollution is not a concern. The patient did endorse a history of sexual abuse that she did not want to discuss, but she agreed to discuss in therapy after discharge.

Olanzapine 10 mg daily was initially continued and then titrated to 10 mg in the morning and 15 mg at night. The patient began showing symptom improvement quickly after admission. Notably, she started menses during the admission. The patient agreed to start hormonal contraception and received a 150 mg medroxyprogesterone injection. The patient received a primary diagnosis of unspecified psychosis not due to a substance or known physiological condition. She was discharged on the same medication regimen and scheduled for a follow-up appointment, and she was enrolled in an intensive outpatient program. Reviewing her medical record over the subsequent months revealed no relapse of psychotic symptoms and no subsequent inpatient hospitalizations.

3. Discussion

The menstrual cycle is characterized by predictable fluctuations in estrogen and progesterone that can influence women's mental health through various mechanisms. Many women experience physical discomfort around menstruation, which can be associated with increased psychological distress, irritability, and decreased self-esteem. Increased interpersonal conflicts and reduced social engagement during this period may contribute to low mood and isolation.[2,6,7]

During menstruation, estrogen and progesterone levels are low. As the cycle progresses, the levels of estrogen increase, triggering the release of hormones that facilitate egg maturation and ovulation. If fertilization does not occur, hormone levels fall, initiating menstruation.[2,3] These menstrual hormone changes appear to have direct biological effects on mental health. In patients suffering from PMDD, symptoms typically present 1 – 2 weeks before menstruation and intensify in the days leading up to menses. Depressed mood, anxiety, tension, affective lability, persistent anger, irritability, and increased interpersonal conflicts are common symptoms for those suffering from PMDD.[8] Our patient's reported past symptoms were consistent with PMDD which had intensified to also include psychotic symptoms. The pattern of symptoms was consistent with mental health changes directly related to her menstrual cycle.

Estrogen reduces dopamine transmission, similar to some antipsychotic medications. Some studies suggest higher estrogen levels may offer protection against psychiatric symptoms, such as psychosis, making individuals more vulnerable when estrogen is low.[9] Progesterone can have anti-anxiety effects by increasing allopregnanolone and gamma-aminobutyric acid activity. However, under stress, progesterone converts to cortisol, which can worsen stress responses and emotional processing. Recent case reports, case series, and reviews document menstrual exacerbations of various psychiatric symptoms.[9] Our patient's symptoms were consistent with this understanding, and she improved rapidly with onset of menses. Moreover, there has been no recrudescence of psychotic symptoms after initiation of contraceptive treatment, further supporting that she was experiencing menstruation-related changes to her mental health.

Various forms of psychosis related to the menstrual cycle, such as premenstrual and catamenial psychosis, were described in the 19th century. While researchers amassed cases related to all menstrual disorders, the classification focused on presenting symptoms rather than the timing of onset. In 1878, Krafft-Ebing made significant contributions by describing 19 cases and later introducing a temporal classification in his 1902 monograph "Psychosis Menstrualis." This classification included menstrual developmental psychosis, ovulation psychosis, and epochal menstrual psychosis. In 1914, Jolly revised this classification, emphasizing the stage of reproductive life, including psychosis starting before menarche, at menarche, at the menopause, recurrent menstrual psychosis, and epochal cases[1] (Table 1).

According to Brockington,[1] menstrual psychosis is characterized by: (a) acute onset against a normal background, (b) brief duration with full recovery, (c) psychotic features (confusion, stupor, mutism, delusions, hallucinations, or mania), and (d) a circa-menstrual periodicity, occurring around the menstrual cycle. Brockington argues that menstrual psychosis may be related to bipolar disorder due to similar features and the lack of specific diagnostic criteria for menstrual psychosis. Shah *et al.*,[10] however, propose classifying patients with brief menstrual-related psychosis as having "psychotic disorder not otherwise specified." Despite the scientific

Table 1. Classification by timing within menstrual cycle[1]

Classification	Description
Premenstrual psychosis	Starts during the second half of the cycle, and sometimes end with abrupt recovery at the onset of menstrual bleeding
Catamenial psychosis	Begins with the onset of menstrual flow
Para-menstrual psychosis	Psychoses with variable timing, always in harmony with the menstrual cycle
Mid-cycle psychosis	The onset is mid-way of menstrual bleeding
Epochal menstrual psychosis	Bipolar psychoses lasting for the complete cycle, with switches linked to menstruation

controversy, these researchers agree that antipsychotic treatment is usually ineffective and that steroid hormones and clomiphene are better treatment options. While case reports alone cannot guide treatment or policy, they offer valuable learning resources for science and suggest areas for future research.[11]

Treatment for psychosis related to menstruation typically involves antipsychotics, but some evidence suggests combining antipsychotics with contraceptives may be effective for treatment and prevention.[3] In a case series by Ray and Paul,[12] a 14-year-old girl with a diagnosis of possible menstrual psychosis was initially treated with olanzapine (continued at 10 mg/day) and then prescribed oral contraceptive pills containing norethindrone/ethinyl estradiol. She was eventually tapered off olanzapine and remained stable on only the oral contraceptive. Our case supports the use of contraceptives in patients experiencing menstrual psychosis.

This case highlights the importance of considering menstrual cycles in mental health disorders. The patient reported a worsening of symptoms in the week before her period, which aligns with a possible menstrual-related component. The patient's symptoms were consistent with unspecified psychosis and raised suspicion for substance-induced psychosis, mood disorder with psychotic features, and organic psychotic disorder. Her use of cannabinoids and methylphenidate may have contributed to worsening symptoms, possibly explaining why this was the first hospitalization. Olanzapine does not appear to have prevented relapse of psychotic symptoms during the next period, consistent with other case reports indicating that olanzapine does not completely resolve cases of menstrual psychosis.[13,14] However, her continued improvement with olanzapine and contraceptive use may suggest an effective treatment combination for patients suffering from menstruation-related psychosis.

A limitation of this study is that we did not have pre- and post-treatment hormone levels. While a definitive conclusion regarding hormone levels, symptoms, and treatment response cannot be made for this patient, inferences can be made given the time course of symptoms and response to contraceptive medication. Further research is needed to determine the role of menstrual cycles in mental health disorders and to identify effective treatment options for these conditions. Documenting pre- and post-treatment hormonal levels may provide valuable information into the etiology of menstrual psychosis as well as treatment response.

4. Conclusion

Menstrual psychosis is a rare and self-limiting illness characterized by the acute onset of psychotic symptoms during certain stages of the menstrual cycle. The relationship between psychosis and the menstrual cycle is not easy for clinicians to recognize, especially at the first presentation. This case report describes a 40-year-old female who presented to the inpatient psychiatric unit with psychotic symptoms including delusions, paranoia, disorganized thought process, and agitation coinciding with the premenstrual phase of her period. She was stabilized on a regimen of olanzapine and a medroxyprogesterone hormonal contraceptive injection. The patient also had a history of sexual abuse that may have impacted her symptoms. Medical records showed no recrudescence of psychotic symptoms and no subsequent psychiatric hospitalizations throughout the follow-up period. Research on menstrual-related psychosis remains limited, and this case adds valuable data to the developing body of knowledge in this area.

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Conflict of interest

The authors declare no competing of interest.

Author contributions

Conceptualization: John C. Garman
Investigation: All authors
Writing–original draft: John C. Garman
Writing–review & editing: All authors

Ethics approval and consent to participate

Patient gave written consent before her participation after her psychotic condition improved.

Consent for publication

Patient gave written consent to publish their data in this study.

Availability of data

Not applicable.

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ACCSCIENCE PUBLISHING

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CASE REPORT

Hypnosis as an effective psychosomatic intervention for globus pharyngeus: A case report

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Abstract

Globus pharyngeus is a common condition characterized by a persistent or intermittent sensation of a lump in the throat, affecting 21.5 – 46% of the population. Its multifactorial etiology includes both physical causes, such as pharyngoesophageal irritation, and psychological factors, such as anxiety, making it a challenging condition to treat. This case report examines the phenomenon of globus pharyngeus and explores the effectiveness of hypnosis as a treatment option. We present the case of an 18-year-old male who lost nearly 30 kg of body weight due to his reliance on liquid consumption, as he was unable to swallow solid food because of the globus sensation. The chosen therapeutic intervention was hypnosis. By the fourth session of a planned 10-session program, the patient was able to consume solid foods without experiencing the globus sensation and began to regain weight. This case highlights the potential of hypnosis as an effective treatment option in the treatment of psychosomatic conditions, such as globus pharyngeus.

Keywords: Hypnosis; Hypnotherapy; Globus pharyngeus; Phagophobia; Globus hystericus; Avoidant/restrictive food intake disorder; Weight loss

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1. Background

Globus pharyngeus, commonly referred to as "globus," is a persistent or intermittent, non-painful sensation of a lump or foreign object in the throat.[1] This condition often manifests through symptoms such as frequent throat clearing, coughing, and hoarseness,[2,3] and, in rare cases, phagophobia (fear of swallowing).[4] The lifetime prevalence of globus is surprisingly high, affecting between 21.5% and 46% of the general population,[1,2] with its persistent and recurrent nature making it a challenging condition to manage.[5]

Historically, globus was considered primarily psychosomatic, originally termed "globus hystericus" due to its perceived prevalence in anxious women. However, this terminology has since been revised, as it became evident that the condition affects both men and women equally. The etiology of globus remains elusive and is likely multifactorial, with potential causes including pharyngoesophageal inflammation and irritation.[6] When no underlying physical cause is identified, psychological factors such as anxiety and somatization should be considered.[5] The International Classification of Diseases, 10th revision (ICD-10) and the 11th edition (ICD-11) approach the globus

phenomenon differently. While ICD-10 categorized globus as a somatoform disorder, recognizing it as a psychiatric disorder,[7] ICD-11 classified globus under functional esophageal or gastroduodenal disorders, reflecting its multifactorial nature, which includes psychological factors.[8]

Current treatments for globus reflect its multifactorial etiology, with approaches ranging from pharmacological interventions to reassurance, psychoeducation, and cognitive-behavioral therapies.[5] Proton pump inhibitors (PPI) are often prescribed to address potential gastroesophageal reflux. In addition, speech and language therapy may be employed to address muscle tension dysphonia.[1]

In recent years, there has been growing interest in alternative therapies, including hypnosis. Hypnosis can be understood as a meditative state that individuals can consciously and intentionally access for therapeutic purposes. During this state, suggestions – either verbal or through visual imagery – are introduced to achieve specific therapeutic goals.[9]

Hypnotherapy has demonstrated potential in addressing both the physical and psychological components of the globus, helping patients relax throat muscles and reduce anxiety associated with the sensation.[10]

In this case report, we present an 18-year-old male patient who developed severe globus pharyngeus, leading to significant weight loss due to difficulty swallowing solid foods. This case highlights the potential effectiveness of alternative interventions, particularly in cases when conventional medical treatments have been unsuccessful.

2. Case presentation

An 18-year-old male was referred to the Eating Disorders Clinic at Hadassah Hebrew University Medical Center after losing nearly 30 kg over the past 6 months due to his inability to swallow solid food, leaving him able to consume only liquids.

He reported that 6 months prior, after eating a meal, he suddenly felt a lump in his throat and experienced a sensation of suffocation, which prevented him from swallowing. He attempted to vomit but was unsuccessful. He then drove but soon felt as if he was suffocating and on the verge of losing consciousness. He called an ambulance, which transported him to the emergency room (ER). Several tests were performed, including laryngoscopy (which was normal) and a gastroscopy (which revealed a small hiatus hernia and distal esophagitis). The patient was discharged with a prescription for a PPI (omeprazole 20 mg twice daily) to manage gastroesophageal reflux, along with a recommendation for follow-up with a gastroenterologist. Two days later, he visited the ER of a different hospital, complaining of "throat pain and dysphagia," which the ER doctor described. The patient reported intermittent pressure in his throat and chest that prevented him from eating, along with difficulty breathing. Physical examination was unremarkable, and he was again discharged with a prescription for PPI (omeprazole 20 mg twice daily) and an explanation that symptom improvement might require a least a week of medication use.

From that point onward, the patient developed a fear of eating. He returned to the ER (Figure 1) with the same difficulty swallowing and was admitted to the internal medicine ward for further evaluation. Since no underlying cause was identified, he was discharged with a prescription for PPI (esomeprazole 40 mg twice daily) that could be crushed and consumed with liquids, as the patient could not swallow pills. However, no improvement was observed, and he was consuming five to six bottles of liquid nutritional supplements per day to maintain functionality.

The patient was referred to the Eating Disorders Clinic after his weight dropped from 86 kg to 56 kg. During a psychiatric interview, it was concluded that the event 6 months earlier was likely an anxiety attack, and the symptoms now met the criteria for somatization disorder, which had led to avoidant/restrictive food intake disorder.[11]

Given the patient's significant weight loss (a third of his body weight) and the need for a rapid intervention to restore normal eating, hypnosis was chosen as the treatment method. Furthermore, his young age (at the end of puberty) was considered favorable, as individuals in this age group are typically more responsive to hypnotization[12] and more open to new ideas and suggestions than adults. During the initial evaluation, a positive rapport and trust were established. It seemed that reducing his anxiety and facilitating a positive experience of eating in a protected, hypnotic state could help the patient return to normal eating more quickly. In light of the urgency to address his severe weight loss, we initiated two hypnosis sessions per week for the first 2 weeks, followed by weekly sessions, for a total of 10 sessions. This initial intensive phase helped establish a strong therapeutic foundation and allowed for the assessment of early responses to treatment. The chosen induction technique involved muscle relaxation and gradual relaxation to reduce anxiety, preparing the patient for future encounters with eating. He was trained in self-hypnosis using the technique of a "conflict-free place" to prevent the recurrence of a "choking attack" in the future. Metaphors relevant to the patient's interests in cars and mechanics were incorporated to enhance the hypnotic suggestions.

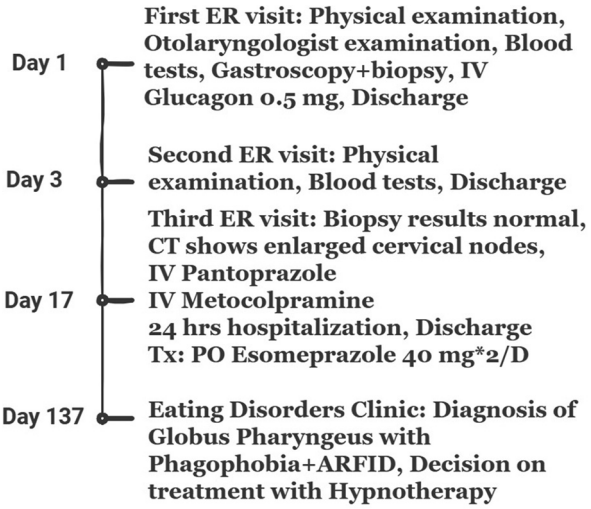

Figure 1. Timeline of the patient's symptoms leading up to diagnosis
Abbreviations: ARFID: Avoidant/restrictive food intake disorder; CT: Computed tomography; ER: Emergency room; IV: Intravenous; PO: Through mouth; Tx: Treatment; 2/D: Twice daily.

Gradual desensitization was employed, starting with imagining eating in a hypnotic state, followed by the actual consumption of pureed foods under hypnosis, and eventually progressing to solid foods both under hypnosis and after dehypnotization. At a 2-month follow-up, the patient regained 5 kg and was able to consume solid foods without experiencing the globus sensation or phagophobia. At a 3-year follow-up, he had regained all the weight he had lost and continued to eat regularly, with no signs or symptoms of the disorder.

3. Discussion

This case exemplifies the complex nature of the globus pharyngeus. While current research acknowledges potential organic causes, the psychosomatic component remains significant. In this patient's case, the onset of symptoms following a stressful eating experience and the absence of significant physical findings, despite multiple medical evaluations (Figure 1), strongly suggest a psychosomatic etiology. The mind-body connection in the globus pharyngeus is complex; psychological stress can lead to increased muscle tension in the throat, which may be perceived as a sensation of a lump.[13] Furthermore, anxiety about the symptom itself can create a feedback loop, exacerbating the perception of throat discomfort.[14] This psychophysiological interaction is evident in Tom's case, where initial anxiety about choking led to a persistent fear of eating and subsequent weight loss.

Hypnosis is a valuable tool in treating psychosomatic conditions, such as globus pharyngeus for several reasons. It bridges the gap between psychological and physical experiences, allowing patients to access and modify subconscious processes that may contribute to their symptoms.[15] Hypnotic induction typically involves deep relaxation, which can directly counteract the muscle tension often associated with globus pharyngeus.[16] By reducing overall anxiety levels, hypnosis can break the cycle of symptom-focused attention and anxiety that often perpetuates the globus sensation. In addition, through hypnotic suggestions, patients can reframe their perceptions and beliefs about their symptoms, enabling them to reinterpret physical sensations in a less threatening manner.[17] This approach may help patients perceive uncomfortable throat sensations as normal, rather than as signs of choking or suffocation.

Teaching self-hypnosis, as was done with this patient, provides individuals with a tool for managing symptoms and anxiety autonomously, empowering them to maintain progress independently and promoting long-term recovery.[16]

The success of hypnotherapy in this case report, with significant improvement by the fourth session and sustained recovery at a 3-year follow-up, aligns with emerging research on the efficacy of hypnosis for psychosomatic disorders. A study by Kiebles *et al.*[10] found that hypnotherapy effectively reduced globus symptoms and improved quality of life in patients with refractory globus pharyngeus. While hypnosis demonstrated notable effectiveness in this case, it is important to emphasize that treatment plans should be individualized. A combination of therapeutic approaches, including medical interventions when necessary, may offer the most benefit for certain individuals.

4. Conclusion

The psychosomatic nature of globus pharyngeus necessitates a treatment approach that addresses both the psychological and physical aspects of the condition. Hypnosis, with its ability to influence mind-body interactions, emerges as a promising tool in the therapeutic arsenal for globus pharyngeus, particularly in cases where conventional treatments have proven ineffective. Future research should focus on large-scale studies to further establish the efficacy of hypnosis in treating globus pharyngeus and identify patient characteristics that may predict a positive response to this treatment modality.

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Conflicts of interest

The authors declare that they have no competing interests.

Author contributions

Conceptualization: Shikma Keller
Investigation: All authors
Writing - original draft: All authors
Writing - review & editing: Shikma Keller

Ethics approval and consent to participate

Ethics approval and consent to participate are not required for this case report.

Consent for publication

Permission was obtained from the patient to publish his case.

Availability of data

Further details regarding this case report are available upon request, subject to ethical and privacy considerations.

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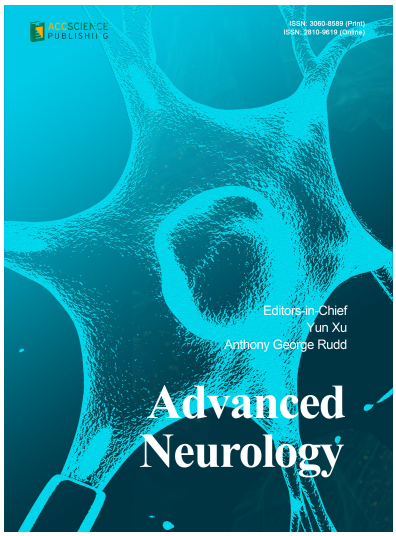

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