

Review

## The Research Status and Hotspots of Learning Burnout: A Visualization Analysis Based on CiteSpace

### Estado de la Investigación y los Puntos Calientes del Agotamiento en el Aprendizaje: Un Análisis de Visualización Basado en CiteSpace

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#### ABSTRACT

**Introduction:** recent years have seen a surge in research on learning burnout, encompassing all levels of education from compulsory to higher education.

**Objective:** the study aims to map the research status, hotspots, and emerging trends of learning burnout using CiteSpace, offering insights into key areas of focus and future research directions.

**Method:** the study employs CiteSpace, a visual analysis tool, to systematically analyze the literature on learning burnout.

**Results:** the analysis shows a steady increase in the volume of literature on learning burnout, with a significant surge in research after 2019. This uptick is attributed to shifts in educational policies and the rise of online learning. Although a core group of authors in this field is still developing, key contributors, especially from Europe and Asia, have significantly advanced the field. The most highly cited literature was published in the journal Annals of Internal Medicine. The keyword co-occurrence mapping reflects the broader field of research in the literature related to learning burnout, keyword clustering analysis indicated that current research hotspots are mainly focused on the conceptual definition and structural dimensions of learning burnout, influencing factors and mechanisms of action, intervention and prevention strategies, consequences of effects, and related research areas.

**Conclusions:** future research on learning burnout should focus on deepening the exploration of its influencing factors, intervention strategies, and long-term effects, while fostering interdisciplinary collaboration to refine theoretical frameworks and improve practical interventions.

**Keywords:** Learning Burnout; Bibliometrics; CiteSpace; Content Analysis Methodology.

#### RESUMEN

**Introducción:** en los últimos años, ha habido un aumento en la investigación sobre el agotamiento relacionado con el aprendizaje, que abarca todos los niveles educativos, desde la educación obligatoria hasta la educación superior.

**Objetivo:** el estudio tiene como objetivo mapear el estado de la investigación, los temas de interés y las tendencias emergentes del agotamiento en el aprendizaje utilizando CiteSpace, ofreciendo perspectivas sobre las áreas clave de enfoque y las direcciones futuras de investigación.

**Método:** el estudio emplea CiteSpace, una herramienta de análisis visual, para analizar de manera sistemática la literatura sobre el agotamiento en el aprendizaje.

**Resultados:** el análisis muestra un aumento constante en el volumen de literatura sobre el agotamiento relacionado con el aprendizaje, con un repunte significativo en la investigación después de 2019. Este aumento se atribuye a los cambios en las políticas educativas y al auge del aprendizaje en línea. Aunque aún se está desarrollando un grupo central de autores en este campo, los contribuyentes clave, especialmente de Europa y Asia, han avanzado significativamente en la disciplina. La literatura más citada fue publicada en la revista *Annals of Internal Medicine*. El mapeo de co-ocurrencia de palabras clave refleja el campo más amplio de investigación relacionado con el agotamiento en el aprendizaje, y el análisis de agrupamiento de palabras clave indicó que los temas de investigación actuales se centran principalmente en la definición conceptual y las dimensiones estructurales del agotamiento en el aprendizaje, los factores influyentes y los mecanismos de acción, las estrategias de intervención y prevención, las consecuencias de los efectos y las áreas de investigación relacionadas.

**Conclusiones:** la investigación futura sobre el agotamiento en el aprendizaje debería centrarse en profundizar en la exploración de sus factores influyentes, estrategias de intervención y efectos a largo plazo, mientras fomenta la colaboración interdisciplinaria para refinar los marcos teóricos y mejorar las intervenciones prácticas.

**Palabras clave:** Agotamiento en el Aprendizaje; Bibliometría; CiteSpace; Metodología de Análisis de Contenido.

## INTRODUCTION

The term “learning burnout” is used to denote a state of negativity in attitude and behavior exhibited by students. Prolonged exposure to pressure in the learning environment, or a waning interest in learning, can result in a marked decline in enthusiasm for learning tasks, a reduction in self-efficacy, and a sense of confusion regarding future prospects.<sup>(1)</sup> The concept of learning burnout first emerged in the context of the workplace, where practitioners may experience emotional exhaustion and apathy due to excessive work pressure. Subsequently, scholars observed that a similar phenomenon exists among the student population.<sup>(2)</sup> Lian Rong et al. posited that learning burnout is predominantly influenced by external environmental factors and individual characteristics, and that prolonged burnout not only diminishes learning commitment but also adversely impacts an individual’s psychological well-being and career progression.<sup>(3)</sup> Consequently, there is a pressing need for in-depth research to elucidate the mechanisms underlying learning burnout and to formulate effective intervention strategies for educational practice.

Recent years have seen a surge in research on learning burnout, encompassing all levels of education from compulsory to higher education. To comprehensively map the evolution of this research domain, this study employs the bibliometric software CiteSpace, integrating content analysis to systematically visualize and analyze relevant studies from 2004 to 2025. This approach aims to elucidate the contemporary status of research on learning burnout, discern its developmental trends, and identify research gaps. The findings of this study are expected to provide both theoretical underpinnings and practical guidance to future research endeavours.

## METHOD

### Data Sources

In the present paper, the Web of Science Core Collection was utilized as the source database. In order to ensure the precision and authority of the analyzed results, the paper further limited the search to the Science Citation Index Expanded (SCI-EXPANDED) 1996-present and Social Sciences Citation Index (SSCI)1982-present. The search terms were TS=(“learning burnout” OR “academic burnout” OR “student burnout” OR “school burnout”).<sup>(2)</sup> The selected time span was 2004-2025, and the search was conducted on 31 January 2025, obtaining a total of 858 eligible documents. In order to enhance the credibility and authority of the research results, non-academic papers such as non-English documents, retracted publications, early access, meeting abstracts, editorial materials, letters, and corrections were excluded. In addition, proceeding papers were excluded, resulting in the final dataset comprising 751 valid documents. This comprehensive dataset was then subjected to knowledge graph analysis, yielding a detailed investigation into the advancement of research and the identification of areas of concern pertaining to learning burnout (refer to the screening details outlined in Figure 2 for further insights).

### Research Tools

The CiteSpace information visualization software tool was first mentioned in the *Proceedings of the National Academy of Sciences (PNAS)* in 2004 by Professor Chaomei Chen, a Chinese scientist from Drexel University. The

software combines the Java language foundation and citation analysis theory, and is a powerful information visualization tool with the advantages of simplicity, science, effectiveness and aesthetics.<sup>(4)</sup> CiteSpace is able to visually depict the current status, hotspots and development trends of research in a specific field by clearly and intuitively displaying node sizes and network connectivity. Consequently, CiteSpace has rapidly garnered significant attention and utilization by researchers both domestically and internationally.

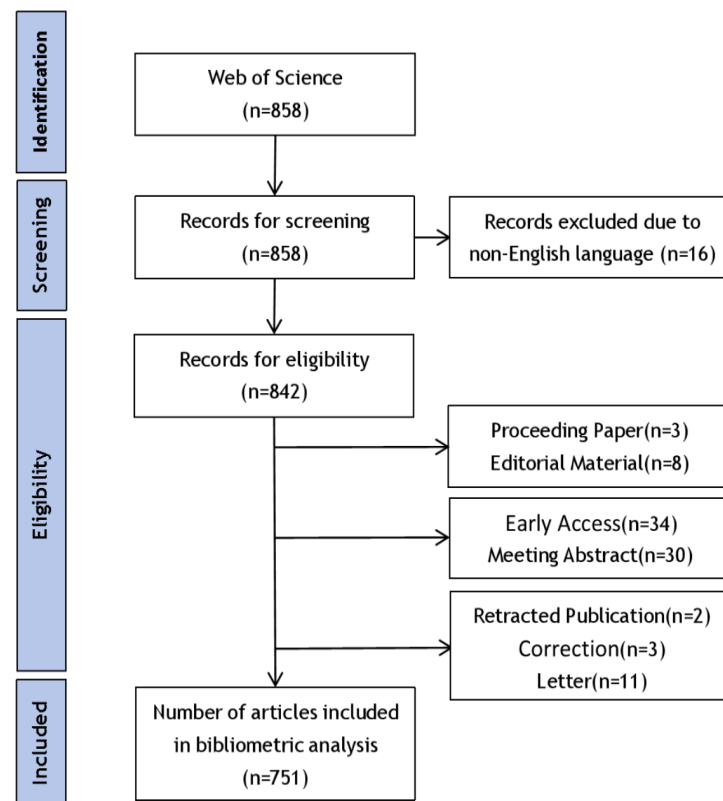


Figure 1. PRISMA flow diagram

The software has been continuously improved and promoted, and as a result, it is now used in many different disciplines, including library intelligence, economics, management and medicine. It has become one of the main tools for conducting citation analysis and knowledge graph construction.<sup>(5,6)</sup>

This study adopts the CiteSpace v.6.4.R1 version, which combines multi-dimensional data such as keyword analysis, publishing authors, publishing institutions, etc. to visualize the current status and hotspots of research in the field of learning burnout. The software assists researchers in identifying the intrinsic connections between disciplinary development and the potential direction of future research by constructing a knowledge map that reveals potential relationships such as evolution and crossover between knowledge communities in the research area.<sup>(7)</sup>

## RESULTS AND DISCUSSION

### *Analysis of Research Status of Learning Burnout*

#### *Annual Distribution of Literature*

Since the 21st century, research on learning burnout has steadily increased. From 2004 to 2010, publications were limited, with fewer than 10 per year, indicating the early stage of the field. Between 2011 and 2018, research grew slowly, reaching 23 articles in 2015 and 33 in 2018, likely due to growing attention to students' mental health. The most significant growth occurred from 2019 to 2024, with publications rising from 47 in 2019 to 129 in 2024. The accelerated growth during this phase may be attributable to the following factor: The shift towards a greater emphasis on students' mental health in educational policies has prompted researchers to direct their attention towards the issue of learning burnout. Changes in the social environment, such as the adoption of online learning during the epidemic, have the potential to exacerbate student burnout, thereby prompting a surge in related research.

#### *Analysis of Authors of Publications*

The status of core authorship can be viewed as an indicator of the development trend of the research field, and can also be used to assess the status of scientific research activities in the field.<sup>(8)</sup> Price's law is a significant

index for analysing core authors in bibliometrics, calculated by the formula  $M=0,749/N_{max}^{(9)}$  where  $N_{max}$  is the number of papers of the most prolific authors,  $M$  is the number of papers, and the authors with the number of papers above  $M$  are designated as core authors. It has been determined that the number of papers of the authors with the most publications is 59. Substituting  $N_{max} = 59$  into the formula, it is found that the value of  $M$  is 5,75, which means that the authors with 6 or more publications can be regarded as core authors. The 13 core authors are as follows: Salmela-Aro, Katariina; Lee, Sang Min; Fincham, Frank D; May, Ross W; Aunola, Kaisa; Seibert, Gregory S; Kiuru, Noona; Upadyaya, Katja; Hietajarvi, Lauri; Chang, Eunbi; Tuominen, Heta; Aypay, Ayse; Nurmi, Jari-Erik, with a total of 175 papers (23 %). Price's Law stipulates that the proportion of papers authored by core contributors should amount to no less than 50 % of the total number of papers in the field. Consequently, the study of learning burnout has not yet established a core group of authors, and there is a paucity of long-term and sustained attention to learning burnout.

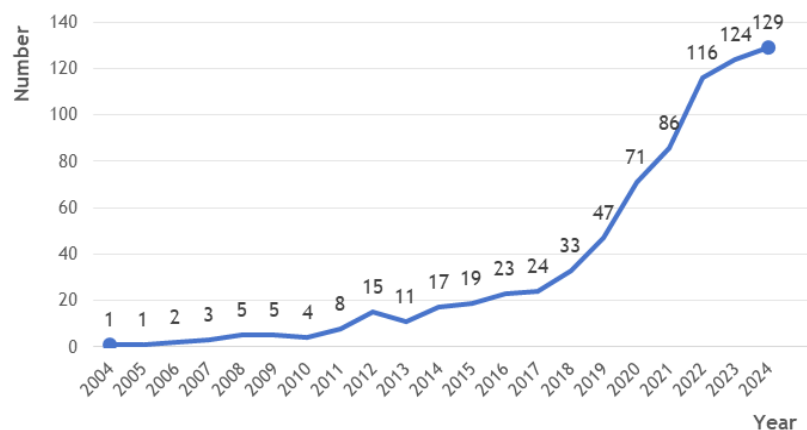


Figure 2. Annual Trends in Publications in the Learning Burnout Research Literature

The author collaboration graph is illustrated in figure 3. The size of the nodes in the graph is indicative of the number of documents published by the authors; the larger the nodes, the greater the number of documents published by the authors. The connecting lines represent the cooperation between the authors, and the thickness of the connecting lines indicates the intensity of the cooperation between the authors. The author cooperation map reveals a total of 489 nodes, 755 connecting lines, and a density of 0,0063. It is evident that only a limited number of authors exhibit multiple co-existing relationships, indicating an absence of discernible community within the field of learning burnout research. The majority of authors exhibit cooperation with only three other individuals, with a limited number engaging with four or more. The scope of cooperation remains restricted, predominantly within the same institution, suggesting that research on learning burnout remains predominantly solitary. This finding suggests that the study of learning burnout remains in the initial phase of development, characterised by a “single-player” approach.

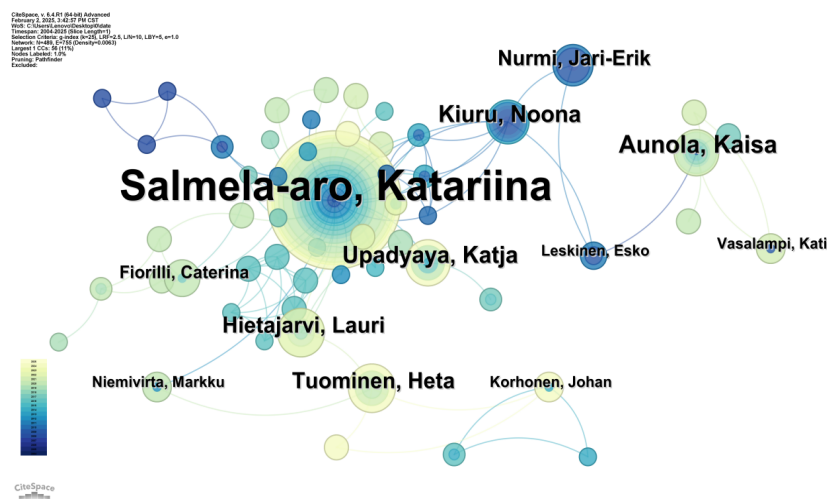


Figure 3. Distribution of research institutions

### Analysis of Research Institutions

Firstly, with regard to the number of publications from research institutions, the University of Helsinki, the University of Jyväskylä and Korea University are in the top three, indicating that these three universities are leaders in the field of learning burnout research. This finding is largely consistent with the majority of the core author units, suggesting that these institutions have assembled a group of experts and scholars who specialize in the study of learning burnout. The research institution with the largest number of articles is the University of Helsinki, with 70 articles, and the earliest articles appeared in 2010, indicating that this university has an important founding role in learning burnout research.

The years of first publication for the University of Jyväskylä and Korea University are 2008 and 2010 respectively, indicating that these two universities have also paid much attention to burnout research in recent years. The geographical distribution of research institutions indicates a notable concentration of high-yield institutions in Europe and Asia, including prominent institutions such as the University of Helsinki in Finland, Beijing Normal University in China, and Korea University in South Korea. These institutions have demonstrated significant research contributions in related fields. In contrast, there is a paucity of research institutions in the African and Latin American regions, resulting in an underdeveloped research capacity. The mapping reveals a dispersed research institution distribution, characterised by a lack of interconnectedness, suggesting the absence of a cohesive network of collaborative research activities. The core institutions, namely the University of California System, the University of Jyväskylä, and Korea University, exhibit a pattern of independent research. The data demonstrate that  $N=353$ ,  $E=411$ ,  $Density=0.0066$ , indicating that research is predominantly conducted in a manner of “self-initiated and self-initiated”, that the level of inter-institutional collaboration remains limited, and that the research institution cooperation network is relatively unstructured. In the future, cross-institutional cooperation can be further strengthened to enhance the overall impact of the research.

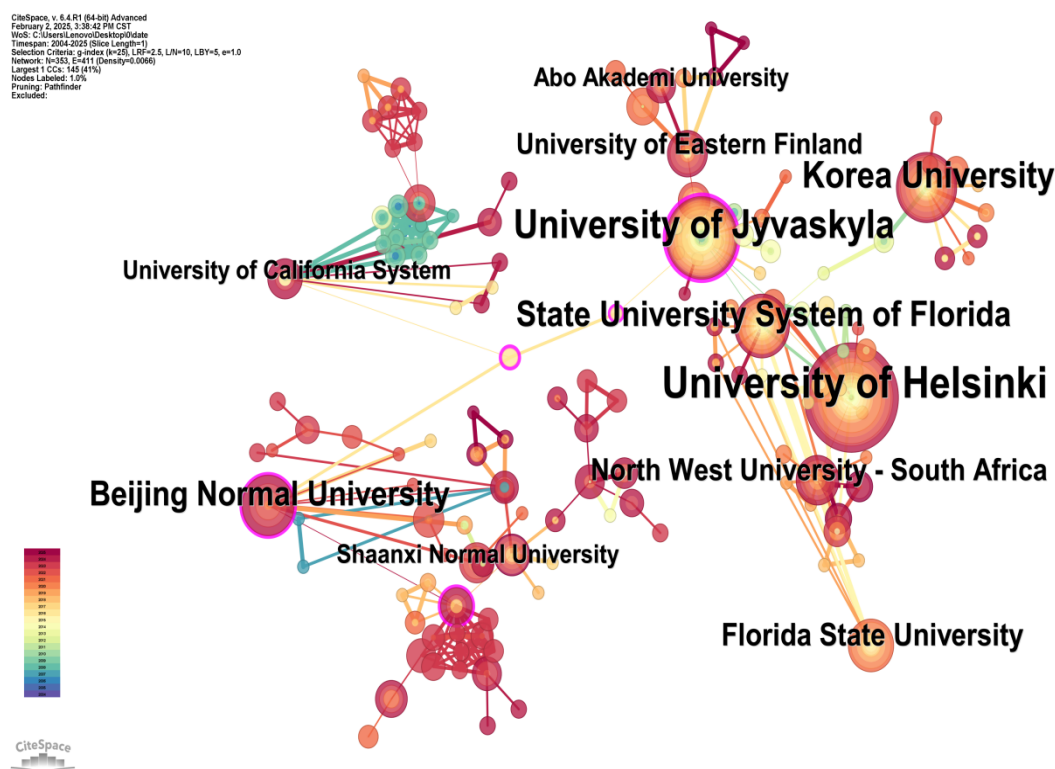


Figure 4. Mapping of collaborative network of learning burnout research organisations

### Analysis of Highly Cited Literature

Table 1 shows the top eight papers with citation frequency for research on learning burnout, along with specific information. With regard to the time of publication, the earliest paper was published in 2007, with the latest published in 2014. There are six papers published prior to 2010, indicating that the study of learning burnout has accumulated fruitful experience in the early research. With regard to the journal sources, the document that has been cited most frequently was published in *Annals of Internal Medicine*, with a high citation count of 961. This finding indicates that this journal exerts a high degree of academic influence and authority in the field of research related to burnout. As a leading international medical journal, *Annals of Internal Medicine* disseminates research findings encompassing not only the clinical domain of medicine, but also medical education, burnout, and associated subjects. Consequently, the highly cited papers in this journal



reflect the high level of attention paid to the issue of burnout in the medical education community, especially the impact on the medical student population. With regard to citation frequency, it is noteworthy that all of the articles have been cited in excess of 360 times, with the top five papers having been cited as many as 440 times and more. Notably, Salmela-Aro's contributions, specifically her three articles, have received an exceptional level of attention, with a total citation frequency of 927 times, highlighting her seminal work in the field of learning burnout.<sup>(10,11,12)</sup>

**Table 1.** Highly Cited Papers in Learning Burnout Research (Top 8)

No.	Author	Year	Title	Journal	Citations
1	Dyrbye, LN	2008	Burnout and suicidal ideation among US medical students	Annals of Internal Medicine	961
2	Salmela-Aro, K	2009	School Burnout Inventory (SBI) Reliability and Validity	European Journal of Psychological Assessment	446
3	Salmela-Aro, K	2014	School burnout and engagement in the context of demands-resources model	British Journal of Educational Psychology	267
4	Cole, MS	2012	Job Burnout and Employee Engagement: A Meta-Analytic Examination of Construct Proliferation	Journal of Management	267
5	Dyrbye, LN	2009	The learning environment and medical student burnout: a multicentre study	Medical Education	265
6	Brazeau, CMLR	2010	Relationships Between Medical Student Burnout, Empathy, and Professionalism Climate	Academic Medicine	248
7	Zhang, YW	2007	Perfectionism, academic burnout and engagement among Chinese college students: A structural equation modeling analysis	Personality and Individual Differences	221
8	Salmela-Aro, K	2009	Depressive Symptoms and School Burnout During Adolescence: Evidence from Two Cross-lagged Longitudinal Studies	Journal of Youth and Adolescence	214

### *Analysis of Hotspots of Learning Burnout*

#### *Keyword Co-occurrence Analysis*

The article undertook a frequency analysis of keywords and selects the eight most frequently occurring ones. The analysis revealed that engagement was the most frequently occurring keyword, appearing 229 times. This was followed by school burnout, which occurred 228 times, academic burnout (213 times), stress (190 times), achievement (106 times), students (102 times), performance (101 times), university students (95 times), and so on.

Among them, the top three in terms of centrality are “academic achievement” at 0,35, followed by “depression” and “motivation” at 0,21 and 0,2 respectively. Furthermore, keywords such as engagement, school burnout and academic burnout have higher frequency and lower centrality, which can be an important entry point for future research on academic burnout. The analysis of keyword co-occurrence mapping reveals the extensive scope of the research field concerning learning burnout, encompassing a range of issues including academic engagement, academic performance, job demands, and more. This comprehensive research not only investigates athlete burnout and mental health, but also explores subjects related to learning, such as adolescence, college students, and university students (figure 5).

#### *Keyword Cluster Analysis*

Cluster analysis of high-frequency keywords using log-likelihood ratio (LLR) yielded a cluster mapping (figure 6).

The module value  $Q=0,7548$  is significant for the clustering structure, and the average profile value  $S=0,907$  is efficient and credible for clustering. The following clusters were obtained: #0 academic burnout, #1 medical education, #2 achievement goals, #3 school engagement, #4 university students, #5 school burnout, #6 PTSD, #7 academic engagement, #8 physical fitness, #9 dispositional mindfulness, #10 academic performance, etc. The present study focuses on the following areas of research related to academic burnout by scholars:

#### *Conceptualization and structural dimensions of academic burnout*

The notion of academic burnout (AB) was initially introduced and extensively utilized in early research, with a predominant focus on students' experiences of burnout within academic settings. The concept of school burnout extends the focus from narrowly defined academic tasks to the broader school context, encompassing a more holistic experience of burnout in students' school lives. Salmela-Aro and other scholars noted in 2009 that school burnout reflects students' negative attitudes towards and experiences of the entire school environment, including academics, social interaction, and school organisation.<sup>(10)</sup> Researchers have continued to explore

the structural dimensions of academic burnout and have attempted to integrate the concepts of academic burnout and school burnout. In a meta-analysis of the relationship between social support and student burnout published by Kim *et al.* in 2018, the findings emphasised the significant impact of school environment factors (e.g. teacher support) on student burnout, although academic burnout remained the main focus in terms of the object of study and the choice of scales.<sup>(13)</sup> Iuga and David's meta-analysis on emotion regulation and academic burnout, published in 2024, further confirmed the validity of the multidimensional structural model of academic burnout and emphasised that future research should focus on the relationship between context-specific emotion regulation strategies and academic burnout.<sup>(14)</sup> These studies serve to consolidate the status of the classical three-dimensional model of academic burnout, whilst simultaneously underscoring the significance of research into school burnout and the necessity to integrate the two concepts.



Figure 5. Co-occurrence mapping of keywords in learning burnout research

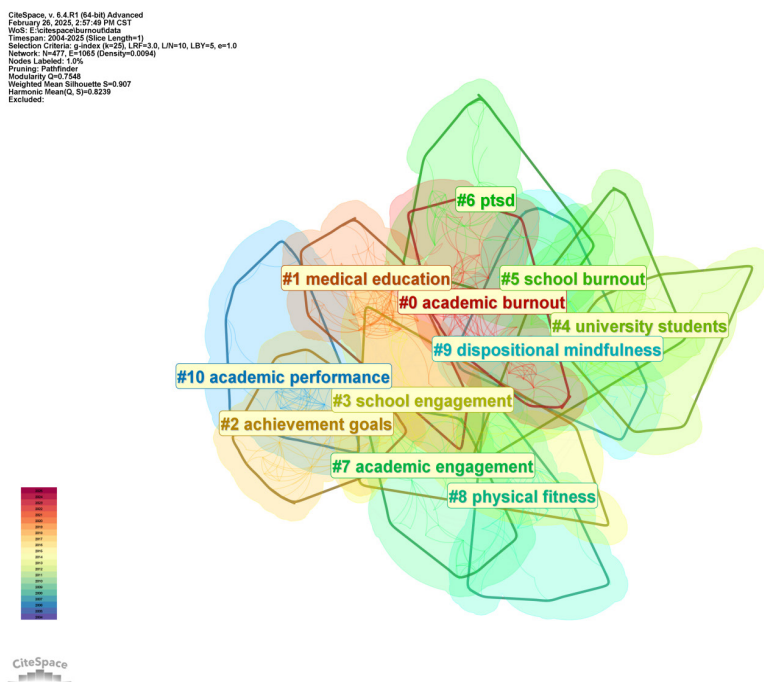


Figure 6. Clustering mapping of hotspots in learning burnout research

### *Influential factors and mechanisms of learning burnout*

The exploration of the influencing factors of learning burnout and its mechanism of action is pivotal to achieving a comprehensive understanding of the issue and implementing effective interventions. Over the past two decades, research in this domain has evolved from a focus on single factors to a more nuanced consideration of multidimensional interactions. Research has gradually delved into the mechanism of interaction between intrinsic factors within individuals and external environmental factors. Campillo et al.'s 2024 study explored the relationship between burnout and informal peer-assisted learning among medical students, revealing the unique stressors faced by the medical student population and emphasising the protective role of environmental factors in college students' burnout, providing a new perspective for understanding burnout in college students.<sup>(15)</sup> In addition to environmental factors, mental health issues have also received increasing attention from researchers. Liu et al.'s study, published in 2024, explored the relationship between parent-child stress and adolescent academic burnout and examined the chain-mediated role of mental health symptoms and positive psychological traits. The study revealed the mediating mechanism of mental health symptoms in the development of academic burnout, suggesting that mental health problems may be an important bridge between environmental stress and academic burnout.<sup>(16)</sup> The impact of post-traumatic stress disorder (PTSD) on academic burnout has gradually become an important topic as mental health research continues to deepen. Research findings have indicated that students who have experienced psychological trauma are more prone to manifesting symptoms of academic burnout in comparison to those who have not suffered from such trauma. Zhang et al. (2024) investigated the longitudinal relationship between adolescents' natural connection, depressive symptoms and academic burnout from the perspective of natural connection. The findings indicated that nature connection can function as a positive resource, mitigating depressive symptoms and consequently reducing the occurrence of academic burnout in adolescents.<sup>(17)</sup> For students who have experienced trauma, the trauma itself may have depleted a significant amount of psychological resources, making them more susceptible to stressors and thus exhibiting academic burnout.

### *Intervention and Prevention Strategies for Academic Burnout*

Academic engagement is regarded as one of the important factors in reducing academic burnout. With the evolution of educational concepts, scholars have come to recognize that students' active participation behavior plays a pivotal role in preventing burnout. By enhancing students' intrinsic motivation and independent learning, it has been found that students are able to maintain a high level of engagement and resilience in the face of academic challenges, thus alleviating academic burnout.<sup>(18)</sup> The relationship between school engagement and the impact of the school environment and culture on students' academic burnout had been highlighted by Liu et al. (2025), who also emphasized that school support and positive teacher-student relationships had a significant positive impact on students' academic engagement, especially at the secondary school level, where students' academic burnout was effectively alleviated.<sup>(19)</sup> Mindfulness Intervention (MI), an emerging psychological intervention, has garnered significant attention for its potential in reducing academic burnout. Zhang et al.'s study demonstrated that mindfulness training can enhance students' emotional regulation and stress resistance, thereby mitigating burnout.<sup>(17)</sup> The advent of the concept of Dispositional Mindfulness has prompted researchers to shift their focus towards the relationship between individual positive mindfulness traits and academic burnout. This has resulted in a paradigm shift towards comprehensive intervention strategies that incorporate individual-level and school-level interventions to prevent and reduce academic burnout in a more holistic manner.<sup>(20)</sup>

### *The consequences of learning burnout and associated research domains*

Preliminary research on the consequences of learning burnout centered on its direct negative effects on academic performance, including reduced learning efficiency, diminished motivation and declining academic achievement. Subsequently, with the increased focus on students' overall development and career planning, researchers have begun to explore the long-term consequences of learning burnout from a longitudinal perspective, such as the potential negative effects on psychological well-being (elevated risk of anxiety and depression) and on subsequent career development. Moreover, the phenomenon of burnout has been demonstrated to be associated with a multitude of factors, including physical health, social adjustment, and the development of interpersonal relationships. Consequently, an increasing number of studies are examining this issue from a multidisciplinary perspective, drawing upon disciplines such as education, medicine, psychology, and sociology. The problem of learning burnout is particularly prominent in the field of medical education, and studies have shown that medical students are prone to burnout in high-pressure learning environments, which not only affects their academic performance but also may have long-term effects on their career development.<sup>(21)</sup> Moderate physical activity has been demonstrated to enhance students' mental resilience and overall well-being, thereby mitigating the occurrence of burnout. This finding underscores the efficacy of physical activity as a means to alleviate learning burnout. Cheung (2019) study found that students who participated in physical activity had significantly lower levels of burnout than those who did not, which suggests that physical activity



can be used as a positive coping resource to help students reduce stress and increase mental toughness, thereby reducing the risk of burnout.<sup>(22)</sup> Academic burnout exerts a substantial negative influence on students' academic outcomes. Aker and Şahin conducted a study with 1st to 3rd year matriculated students in medical schools by using questionnaires and Structural Equation Modelling (SEM) analysis. The study demonstrated that academic burnout directly affects the students' learning efficiency and academic performance, and that school belonging indirectly affects academic performance by decreasing school burnout and by increasing students' school belonging. The reduction of academic burnout by increasing students' sense of belonging is an effective way to improve academic performance.<sup>(23)</sup>

## CONCLUSIONS

Despite the fact that research on learning burnout has been ongoing for the past two decades, the field remains in the exploratory stage. There is a paucity of interdisciplinary collaboration within the discipline, which hinders the development and refinement of the theoretical framework in this area. Future research should concentrate on the systematic study of the influencing factors, intervention strategies, and long-term consequences of learning burnout. At the same time, it should adopt a multidisciplinary perspective, construct a robust theoretical framework, and enhance practical intervention measures.

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## FINANCING

None.

## CONFLICT OF INTEREST

None.

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