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Review

An Assessment Aid Intended for Psychiatrists Regarding 2025 Peer-Reviewed Publications on Burnout and Associated Brain Changes Following PRISMA-ScR Guidelines

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Abstract

Research on burnout has been a consistent and increasingly popular topic since the 1970s when it was first defined. The focus of publications regarding burnout spans studies of various occupations, countries, age groups, social groups, and effects. A recent development is the documenting of brain changes associated with burnout. This review aims to investigate the peer-reviewed publications on this topic published in 2025. Although not a scoping review because it is limited to one year and peer-reviewed reports, this study follows the standardized PRISMA-ScR guidelines for scoping reviews as the methodology. The search was of five relevant databases: Google Scholar, OVID, PubMed, Scopus, and Web of Science. Brain changes AND burnout AND 2025 are the keywords searched. The keywords were limited to these to identify those articles where researchers themselves connected a relationship between brain changes and burnout during 2025. The results were several perspectives that investigated burnout, and the brain changes were various. The findings differ depending on the measurement tools used for burnout assessment, as discussed. The purpose of conducting the review is to aid psychiatrists in identifying the most recent research to enhance patient treatment options by considering current information on this developing topic.

Keywords: burnout; brain changes; psychiatrists; treatment options

1. Introduction

Burnout, a term originating in 1974 [1], arises in individuals who are strongly dedicated or committed to their job [2] and are overwhelmed by confronting work-related issues [3]. Emotional, mental, and physical fatigue is the result [4], causing a reduction in work engagement [5]. Burnout then represents a response to chronic workplace stress [6] such that job stress, lack of perceived social support when experiencing it, and lowered job satisfaction are predictors of burnout [7].

Since it was first defined, burnout has been a consistent and increasingly studied topic [8], focusing on various occupations [9–11], countries [12–14], age groups [15–17], genders [18–20], social groups [21–23], and effects [24–26]. Documenting brain changes associated with burnout represents a recent development [6,27,28], with results refined yearly, as recognized in this 2025 review [29]. In fact, 2025 was particularly relevant because of recently published insight that overwork (of which burnout can be the result) leads to significant brain changes [30].

This review aims to investigate peer-reviewed publications on burnout and brain changes published in 2025, following the Preferred Reporting Items for Systematic Review

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and Meta-Analysis (PRISMA-ScR) process [31–33] to identify the range of literature related to burnout-associated brain changes in those publications that recognize this relationship. Two perspectives examine the results of the included studies: (1) the advancement of burnout research in articles that consider brain changes, and (2) the effect on burnout of specific brain changes. In association with brain changes, a discussion of the assessment tools for measuring burnout results follows. Regarding 2025, these findings demonstrate several unique developments in both burnout and brain changes. The intention of identifying these is to assist psychiatrists in assessing the most current research to enhance their patient treatment options for burnout regarding brain changes.

2. Materials and Methods

Although not a scoping review per se, as it is limited to the most recent year and only peer-reviewed publications [34], this study follows the broadly supported [35] and internationally standardized [36] 2020 Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines for scoping reviews (PRISMA-ScR) [37,38]. This process is (1) considered a rigorous method for conducting a literature review; and (2) provides clear guidance regarding (i) research questions, (ii) the recognition of the inclusion and exclusion criteria, and (iii) precise and time-effective database examination [39,40]. The basis of the database selection (Google Scholar, OVID, PubMed, Scopus, and Web of Science) was by topic and their high regard [41].

One researcher conducted all aspects of the review. Revealing the steps reduces the possibility of cognitive bias. (1) All searches were on 1 January 2026, with the returns of every search copied immediately to a Word file in the order returned as displayed by the database results; (2) the Word file, Supplementary S1—five database searches on 1 January 2026 for the keywords brain change AND burnout AND 2025, was created to conduct the exclusions; (3) a listing of the keywords and order of exclusion process is at the top of each search in Supplementary S1; (4) the registration of the protocol was at https://osf.io/6v59z/overview on 31 January 2026 (accessed on 6 May 2026); and (5) the Supplementary S2—Preferred Reporting Items for Systematic Review and Meta-Analysis extension for scoping reviews (PRISMA-ScR) checklist was completed, indicating the page number of each aspect of the review process. Supplementary S1 and Supplementary S2 are available for download at https://osf.io/6v59z/overview (accessed on 6 May 2026). Following these steps and documenting the results permits any researcher to scrutinize the process and results.

2.1. Database Searches

Table 1 presents the search order for the five database searches regarding the searched databases, search parameters, and the number of returns.

Table 1. Databases, search parameters, and returns (#) of the searches of five databases on 1 January 2026 regarding burnout AND brain changes AND 2025 in their search order.

Database	Search Parameters	#
Google Scholar	Keywords: “brain changes”, “burnout”, “2025”, “English”	380
OVID	Keywords: brain changes AND burnout AND 2025 Limits: English, full text, human	4
PubMed	Keywords: brain changes AND burnout AND 2025	0
Scopus	Keywords: brain changes AND burnout AND 2025	1
Web of Science	Keywords: brain changes AND burnout AND 2025	24

2.2. Selection of Sources of Evidence

The search process of the five databases is in Supplementary S1. The results of that process are shown in the standardized PRISMA flow diagram in Figure 1.

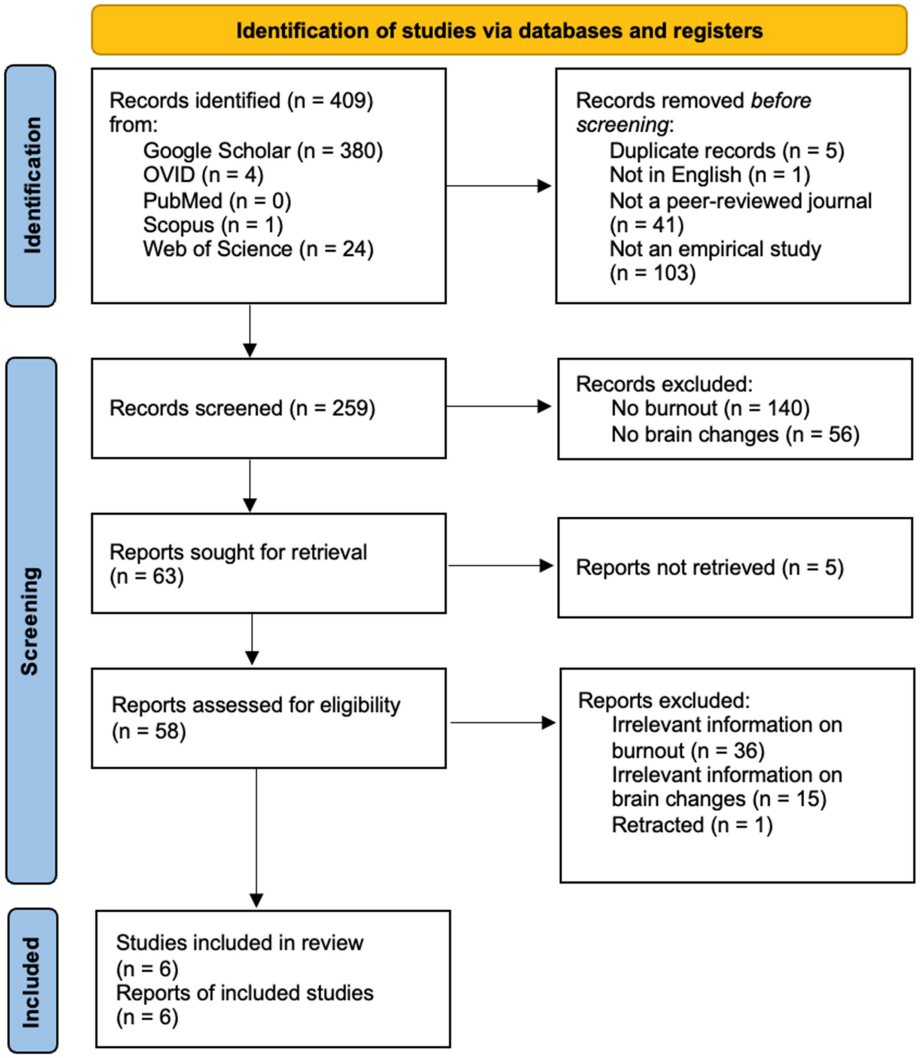


Figure 1. PRISMA 2020 flow diagram for new systematic review searches of databases. Source: Ref. [33]. The license of this work is under CC BY 4.0. To view a copy of this license, visit https://creativecommons.org/licenses/by/4.0/ (accessed on 6 May 2026).

2.3. Data Items and Summary

Table 2 summarizes the results of the exclusion process for the five database searches, providing additional details regarding the search process beyond those outlined in Figure 1. The details of these results are available in Supplementary S1.

Table 2. Detailed results of the searches of five databases on 1 January 2026.

	Google Scholar	OVID	PubMed	Scopus	Web of Science
Duplicate Records		3			2
Not in English	1				
Not a Peer-Reviewed Journal	41				
Not an Empirical Study	93	1		1	8

Table 2. *Cont.*

	Google Scholar	OVID	PubMed	Scopus	Web of Science
No Burnout	140				
No Brain Changes	50				6
Not Retrieved	5				
Irrelevant Information on Burnout	35				1
Irrelevant Information on Brain Changes	14				1
Retracted					1
Included	1	0	0	0	5
Total Results	380	4	0	1	24

3. Results

The PRISMA checklist (Supplementary S2) results section includes four required sections and one optional (not completed for this review). The results of the first of these four completed sections are presented in Figure 1. The other three sections are (1) the characteristics of the sources of evidence, (2) the results of individual sources of evidence, and (3) a synthesis of the results. The following subsections regard each of these three sections of the PRISMA-ScR checklist.

3.1. Characteristics of the Sources of Evidence

The bibliographic information of the included studies represents the characteristics of the evidence sources. This information is shown in Table 3.

Table 3. Citation numbers (#), article titles, authors, and journals of the six included studies from the 1 January 2026 search of burnout AND brain changes AND 2025 in five databases in their order of return.

#	Article Title	Authors	Journal
[42]	Burnout: At times a physical state	Parker & Russo	Australasian Psychiatry
[43]	Functional connectivity in burnout syndrome: A resting-state EEG study	Afek et al.	Frontiers in Human Neuroscience
[44]	Abnormal intrinsic functional hubs and connectivity in nurses with occupational burnout: A resting-state fMRI study	Liu et al.	Frontiers in Public Health
[45]	Plasma BDNF in burnout-related depressive disorders: The mediating role of perceived social isolation and the biopsychological effect of a multimodal inpatient treatment	La Marca et al.	Journal of Affective Disorders Reports
[46]	Neurobiological and emotional impact of occupational stress in frontline police officers: a neuroimaging and neurochemical study	Wang et al.	European Journal of Psychotraumatology
[47]	Neural correlates of well-being in young adults	Green et al.	Emotion

Fewer than three authored the only Google Scholar report [42]. None of the articles were by the same research team. Those authored by teams suggested that they were more likely to lack interpretation bias, primarily because of diverse perspectives, critical dialog, and reductions in individual blind spots [48].

The first report was the only one from a general journal specific to psychiatrists (Australasian Psychiatry) [42], the second report was from a dedicated neuroscience journal (Frontiers in Human Neuroscience) [43], the third was from a public health journal (Frontiers in Public Health) [44], and the last three [45–47] were from journals focusing on aspects of psychiatric practice (Journal of Affective Disorders Reports, European Journal of Psychotraumatology, and Emotion). When the intent is to aid psychiatrists in locating research on brain changes and burnout, publications in high-impact general psychiatric journals are those most likely to be read by the greatest number of psychiatrists. Although *Australasian Psychiatry* is a general psychiatric journal, it was ranked 164th of all psychiatric journals, with an impact factor of 1.2. None of the other journals representing the studies included were on the list of 190 journals regarding their impact factor [49]. As such, high-impact journals do not currently examine the relationship between burnout and brain changes.

3.2. Individual Sources of Evidence

Regarding the study aims represented in Table 4, the first two reports focused on burnout and brain changes [42,43]. The next four were focused on brain changes regarding stress disorders more generally, where burnout is included among these [44–47]. As such, although all included studies identify brain changes and burnout, this relationship was the focus of the manuscript for only the first two reports. For psychiatrists, the lack of extensive research investigating the link between burnout and specific brain changes is significant because it hinders the official classification of burnout as a medical disorder, complicates diagnosis, and prevents the development of targeted, biological treatments, as noted in this 2025 review of the psychiatric consequences of burnout [50].

When considering the value of the results of each study, it is relevant to note that, except for the first return (with 720 total participants) [42], each of the other studies [43–47] had fewer than 100 participants. Yet, in accordance with the Central Limit Theory, (n = 30) is the lower limit for such quantitative research [51]. As such, all of the studies were within this limit, meaning that the results of these studies can be considered valid. Without valid, evidence-based research, there can be a misdirection of resources, and psychiatric care can fail to implement effective and quality interventions [52].

Since the focus of this review is research from 2025, the study date matters. Only one of the publications reports the date of the study [44]. Because it is possible that the study results are not from 2025, a missing study completion date is a limitation [53]. Up-to-date burnout research permits psychiatrists to address the high prevalence of burnout and implement effective, evidence-based organizational interventions [54].

Four studies were conducted in Western countries (Australia [42], Poland [43], Switzerland [45], and the Netherlands [47]), while two were conducted in Asian countries (China [44], Taiwan [46]). The location of the studies is relevant because all of these countries represent those where the type of stress resulting in workplace burnout is likely [55–58]. Although China remains a developing nation [59], ref. [44] is a study on a developed area of the country. Therefore, similar to other studies, economically developed areas are the focus. However, it matters to psychiatrists that burnout research heavily focuses on developed countries because the result is a significant knowledge gap regarding developing regions, one that hinders the development of applicable intervention strategies in developing nations and limits the understanding of burnout in low-resource settings. The risk is importing ineffective and culturally mismatched solutions for burnout resolution [60].

Table 4. Citation numbers (#), exact quotations of study aims, types of participants and their numbers, study dates, and study locations of the six included studies from the 1 January 2026 search of burnout AND brain changes AND 2025 in five databases in their order of return.

#	Study Aim	Participants	Study Date	Location
[42]	To determine the prevalence of several physical symptoms informally reported as occurring or as being over-represented in those experiencing burnout.	317 burning out and 403 burned-out adults.	Not reported.	Black Dog Institute, Australia
[43]	To extend the existing knowledge on brain mechanisms in burnout syndrome by developing an analysis of functional connectivity in eyes-closed and eyes-open resting-state conditions for each EEG frequency band separately.	98 participants, aged 25–55 years, 1.5 years of work experience.	Not reported.	Jagiellonian University, Kraków, Poland
[44]	To investigate brain functional alterations in nurses with burnout using rs-fMRI.	40 female nurses with burnout and 40 healthy controls.	September 2024 to December 2024.	Yancheng Clinical Medical College, China
[45]	To examine the association of plasma BDNF with burnout-related depressive disorders and the impact of a multimodal inpatient treatment on BDNF levels.	35 inpatients at a specialized burnout clinic and 21 healthy controls.	Not reported for the three time periods, at least 6 months apart.	University of Zurich, Switzerland
[46]	To investigate the neurobiological signatures of chronic stress in police officers, with particular focus on brain regions central to emotional and cognitive regulation.	33 frontline police officers and 36 demographically matched controls.	Not reported.	Taipei, Taiwan
[47]	To identify the behavioral and neural correlates of subjective evaluation of well-being across multiple domains.	34 young adults.	Not reported.	Erasmus Medical Center, Rotterdam, The Netherlands

3.2.1. Outcomes Regarding the Aims

Table 5 presents the outcomes highlighted for the study aim from each investigation. They concern the aims relevant to burnout. The measured outcomes for the six reports focus on different aspects of brain changes regarding burnout, which may not be the primary aims of the studies.

The first article [42], on the differences between those who consider themselves "burning out" and others who self-identify as burned out, notes that a common precursor to burnout in those self-identifying as "burning out" is reported headaches. These headaches produce structural and functional brain changes and was reinforced recently in a review of magnetic resonance imaging (MRI) studies regarding burnout and the brain [29]. For those burned out, additional brain changes were regarding sustained hypothalamic–pituitary–

adrenal (HPA) axis suppression of the immune system, leading to these individuals falling ill. A 2025 systematic review of burnout, when characterized by endocrine dysregulation and circadian disruption, noted its association primarily with altered HPA-axis activity [61]. These results suggest that complaints of persistent headaches in burned-out employees should be recognized as potentially altering their brain function, both functionally and structurally, leading to consistently high cortisol levels and causing a reduction in its production. The outcome is hypocortisolism, similar to the effects of severe stress and trauma, producing a higher probability of other health issues [62].

In those who were burned out in the second study [43], the EEG recordings coincided with high scores of exhaustion and cynicism and low scores for self-efficacy. A 2025 systematic review of EEG and burnout identified EEG markers as valuable in complementing symptom scales for earlier diagnosis, treatment monitoring, and public health surveillance [63]. By exhibiting coherent neurophysiological signatures comparable in magnitude to established psychiatric disorders, burnout invalidates its classification as a non-disease [63].

In comparing differences in statistically calculated degree centrality (DC) and subsequent functional connectivity (FC) in [44], the findings support recent similar research on DC and FC regarding burnout [29]. With these results, scientists can map the transition of the brain from a state of normal functioning to one of disrupted, inefficient communication without presupposing which regions are affected. This two-step approach is particularly powerful for identifying specific neural substrates of burnout, such as decreased connectivity between the precuneus and the medial orbitofrontal cortex (mOFC), which correlates directly with clinical symptoms like emotional exhaustion and reduced professional self-efficacy [43].

Table 5. Citation numbers (#), outcomes of the aims, study types, and statistical significance of the results of the six included studies from the 1 January 2026 search of burnout AND brain changes AND 2025 in five databases in their order of return.

#	Outcomes Regarding Aim	Study Type	Significance
[42]	Headaches were reported by 89% of the sample, representing the symptom most often reported by those in the burning out group. Its high prevalence in early phase expression may suggest it as a marker of stress onset. In conjunction with falling ill, such changes reflect sustained hypothalamic–pituitary–adrenal (HPA) axis suppression of the immune system.	Quantitative questionnaire.	'Experiencing headaches' had a higher prevalence among the 'burning out' group, while the remaining variables regarding illness were significantly more prevalent in the 'burnt out' group.
[43]	For the EEG recordings, the burnout group had high scores on the exhaustion and cynicism subscales and low scores on the self-efficacy subscale. Depression symptoms were significantly higher but mild in the burnout group; in the control group, minimal depression symptoms were observed.	Quantitative questionnaire and continuous dense-array EEG data from 256 channels.	The significance of coherence value differences between the burnout group and control group was assessed separately for the eyes-open and eyes-closed conditions for each pair of channels within each frequency band.
[44]	Impaired integration between self-referential processing and reward/emotion regulation systems reduced DC in the precuneus. Coinciding with decreasing FC with the medial orbitofrontal cortex (mOFC), these represent key neural substrates of occupational burnout. There is considerable potential in neuroimaging biomarkers for the objective assessment of burnout.	Quantitative questionnaire and MRI scanning.	Comparing the occupational burnout group to the healthy control group demonstrates there were significant reductions in DC within the bilateral precuneus, and decreased FC between the left precuneus and the right mOFC. As observed with the diagnostic accuracy of the integrated DC-FC mode, there were significant robust correlations with clinical burnout scales.

Table 5. *Cont.*

#	Outcomes Regarding Aim	Study Type	Significance
[45]	Between plasma brain-derived neurotrophic factor (BDNF) levels and depression severity, there was an inverse association demonstrated, such that plasma BDNF is likely an indicator of an underlying pathophysiology present in various stress-related disorders, e.g., burnout, and not merely as a specific biomarker of depression.	Quantitative questionnaire and blood samples.	The effect of BDNF levels on the Self-Compassion Scale (SCS)–Isolation was significant. This adverse effect indicates lower social isolation in inpatients with higher BDNF levels. From the SCS–Isolation to the Hamilton Depression Rating Scale, 17-item version (HAMD-17), the path was also significantly positive, demonstrating a higher depression severity in inpatients experiencing higher social isolation. Although not for the direct path from BDNF levels on HAMD-17, as the result of BDNF levels on HAMD-17 was deemed significant.
[46]	Regarding changes in gray matter volume, neurotransmitter levels, and their correlations with emotional states, the significance of neurobiological impacts in high-stress professions, especially under conditions of high burnout, was highlighted.	Quantitative questionnaire and MRI scanning.	Compared to controls, police participants exhibited significantly lower mean levels of excitatory neurotransmitters in the dorsal anterior cingulate cortex (dACC). These reductions were associated with medium effect sizes and remained statistically significant after correction for the False Discovery Rate (FDR).
[47]	Increased activity was shown in neural results in the dorsolateral prefrontal cortex, for the domain of 'dealing with stress', and the precuneus, for the domain of 'positive family relations', compared to the other domains, which lacked specific neural patterns.	Quantitative questionnaire and MRI scanning.	A negative correlation existed between the mean score on well-being positivity ratings and the mean score on the desire for future changes in well-being, such that participants with lower well-being had a greater desire for future changes in their well-being across domains.

The idea that brain-derived neurotrophic factor (BDNF) levels are likely an indicator of an underlying pathophysiology present in burnout [45] is consistent with earlier research in this area from 2023 [27]. For psychiatrists, BDNF levels are a critical indicator in burnout because they bridge the gap between subjective experience (exhaustion, stress) and objective physiological damage, providing a potential biological marker for a condition often misunderstood or misdiagnosed. Reduced BDNF levels signify a disruption in neural plasticity and in the adaptability and repair of the brain, indicating that burnout is not merely "work stress" but an underlying pathophysiological process that is serious, supporting earlier research published in 2024 [64].

One report [46] recognized changes in gray matter volume and neurotransmitter levels as correlated with emotional states, specifically those leading to burnout. Support for this finding is part of a review of earlier research—a mechanistic review of magnetic resonance imaging (MRI) studies—also from 2025 [29]. This research transforms burnout from a vague, subjective complaint of "tiredness" into an objective and diagnosable neurobiological condition, allowing clinicians to tailor pharmacological or behavioral treatments, demonstrating that chronic stress causes reversible structural damage to the brain [29].

The role of the dorsolateral prefrontal cortex and precuneus in burnout, investigated in [47], is one that was first considered in combination in 2013 [65]. What is unexpected is that a search of "role of the dorsolateral prefrontal cortex and precuneus in burnout" in Google Scholar on 26 January 2026 produced a 2025 publication focused on this relationship and mentions both burnout and brain changes [66]. Yet, regarding the 1 January 2026 searches of brain changes AND burnout AND 2025, it was not a result of any of the searches performed. Because it provides a neurobiological basis

for cognitive and emotional symptoms as a quantifiable neurocognitive syndrome, the role of the dorsolateral prefrontal cortex (DLPFC) and precuneus in burnout is critical to psychiatrists. Understanding that burnout involves structural and functional impairments in these specific brain regions—particularly residents and trainees—helps psychiatrists diagnose, manage, and prevent severe burnout-related medical errors and cognitive decline [29].

3.2.2. Study Type

Also presented in Table 5 is the type of study for each publication. All the results were quantitative studies involving the analysis of a questionnaire. The analysis from one was based entirely on questionnaire responses [42]. Another used the questionnaire in combination with EEG data [43]. Three studies relied on MRI scanning [44,46,47] in addition to the questionnaire. One used blood samples along with the questionnaire [45]. The use of questionnaires in testing for burnout by mental health professionals in all cases is valuable because burnout is a complex and often difficult-to-diagnose condition, with symptoms that can mimic or overlap with other mental health disorders like depression or anxiety. In their ability to identify symptoms, track severity, and distinguish between general stress and burnout, validated questionnaires offer standardized, objective, and efficient methods. The British Medical Association has published an online burnout assessment questionnaire that may be helpful in this regard for clinicians [67].

The one study that did not use a supporting objective measure was ref. [42]. The focus of this study was on the headaches experienced by individuals who were burning out. This investigation was not seeking to establish the structural and functional brain changes resulting from burnout headache. The goal was to understand the extent of the problem, which was identified as substantial. Without an objective measure, the value of this result is limited for psychiatrists, especially since it was published in a general psychiatry journal, reaching a wider audience than the other included studies. Lacking an objective measure compromises the reliability, diagnosis, and treatment of the condition. Without objective data, subjective reports of headaches can lead to the pathologization of normal stress, which makes it difficult to differentiate burnout from established medical disorders. This need for more objective data in this regard was the conclusion of a 2024 review of burnout [68].

The relevance of EEG data [43] regarding burnout is well-known and has been recently summarized in a 2025 mechanistic review of the topic [29]. MRI scanning [44,46,47] is also an accepted method of testing in burnout research, covered additionally in ref. [29]. These technologies help distinguish burnout from depression, quantify severity, track recovery, and validate burnout as a distinct, actionable medical disorder rather than simply a psychological feeling [29].

Regarding ref. [45], Google Scholar was searched for 2025 publications on the “value of “blood samples” in burnout research regarding “brain changes” on 26 January 2026. It was not anticipated that there would be a peer-reviewed result of this search indicating the relevance of blood samples in this regard [69]. Given that each of “brain changes” AND “burnout” AND “2025” was found in this article, it is unclear why it was not returned by any of the database searches on 1 January 2026. Unlike most of the results included from those searches, this study was dated. It took place from February to August 2021, as well as 3 to 6 months later, with the last date in March 2022. By using blood samples, psychiatrists can identify specific physiological markers that can differentiate burnout from other conditions, track its impact on physical health, and tailor treatments to address underlying hormonal or nutritional imbalances [70].

3.2.3. Significance

Significance relates to the statistical tests performed [71] (see Table 5). Only two studies directly stated that the tests yielded significant results [45,47]. Another referred to "a high prevalence rate" [42]. A fourth mentions "a potential neurological basis" [43], while a fifth reports a "definite causal relationship" [44]. The final report merely states that the changes were "evident" [46]. The value of statistical significance is for establishing results that were not due to chance [72,73]. However, it is not the only determinant of research quality. The design of the study can be rigorous, validly measured, and reliably executed, and still produce statistically non-significant results [72]. Each of the studies included meets these design criteria, although most do not report significant results. For psychiatrists, having burnout research results rated as statistically significant legitimizes burnout as a serious, actionable occupational hazard rather than merely a personal failure or transient stress, allowing for targeted organizational and clinical interventions. Significant findings justify the allocation of resources for interventions, aid in distinguishing burnout from depression, and relate directly to the quality of patient care [74].

3.3. Synthesis

The synthesis regards the specific findings of each study about either burnout or brain changes. Each of the included reports provides increased information regarding burnout that was unavailable before 2025. These results are found in Table 6.

Table 6. Citation numbers (#), burnout, and brain changes in the six included studies from the 1 January 2026 search of burnout AND brain changes AND 2025 in five databases in their order of return.

#	Burnout	Brain Changes
[42]	In total, 10% of the sample requiring hospital admission demonstrates the severity of burnout states in some individuals; however, the study questionnaire did not seek specific details on the reason for hospitalization.	Most of the symptoms evaluated had a high prevalence rate. As such, there should be greater recognition of burnout having distinctive physical symptom risks, including structural and functional brain changes.
[43]	For individuals experiencing occupational burnout compared with controls, the provision was a comprehensive examination of resting-state functional brain connectivity. The recommendation for burnout syndrome is using the "eyes-open condition" (EO) in further resting-state protocols.	In the EO resting state, the observed patterns suggest a potential neurobiological basis for burnout syndrome—one characterized by decreased functional connectivity in the alpha3 sub-band (11–13 Hz) in frontal and midline brain sections, particularly in the right frontal area.
[44]	A key facet of burnout is a positive relationship between precuneus–mOFC connectivity and personal accomplishment.	As a cross-sectional study, establishing a definitive causal relationship between the observed brain functional changes and the development of burnout was prevented. Hormonal fluctuations can impact emotional regulation and rs-fMRI signals, affecting brain function in the context of burnout.
[45]	The findings indicate various intervention possibilities to improve biopsychological well-being in inpatients experiencing burnout-related depressive disorders.	Inpatients with burnout-related depressive disorders exhibited lower BDNF levels than controls; however, inpatient treatment led to a significant increase in BDNF levels, with an inverse relationship between the change in BDNF levels and depression severity.
[46]	Compared to control participants, frontline police officers reported significantly higher levels of burnout and depressive symptoms.	Reduced gray matter volume and lower levels of the excitatory neurotransmitter glutamate were observed in police officers, indicating structural and neurochemical brain alterations.
[47]	All well-being domains and burnout ratings demonstrated negative associations. The desire for change in the domains of confidence, impact, and whether loved had positive associations with burnout ratings.	When contrasting each domain, there was whole-brain domain-specific activation. Contrasting "family" with "other" and "stress" with "other" resulted in significant effects.

3.3.1. Burnout

Although it was known as early as 2009 that burnout could lead to hospitalization for mental and cardiovascular disorders [75], what ref. [42] offered as new information was that up to 10% of individuals could experience hospitalization. Although this study did not specify the reason for the hospitalization, another 2023 publication found that hospitalization resulted from problems in work relationships [76]. For psychiatrists, the fact that up to 10% of individuals experiencing burnout may require hospitalization is significant, because it highlights that burnout is not merely occupational stress but a severe, often debilitating health crisis. However, the assessment of this result must consider the lack of quantifiable data in coming to this conclusion.

When providing a comprehensive examination of resting-state functional brain connectivity of burnout [43], the recommendation is for the "eyes-open condition" (EO) in contrast to the "eyes-closed condition" (EC). This finding reinforces the results of similar research begun in 2013 [77]. Research from 2019 found that the task condition significantly affects the results regarding these two conditions [78]. A 2023 paper concluded that EC tends to correlate with greater integration of brain connectivity, and EO with greater specialization [79]. For psychiatrists, the recommendation is for EO over EC in resting-state functional connectivity (rs-FC) examinations of burnout because EO reveals distinct neural signatures of burnout—specifically, decreased functional connectivity in the right frontal/midline areas that are not detectable in the eyes-closed state [63].

Ref. [44] found that a central factor regarding burnout is a positive relationship between precuneus–mOFC connectivity and personal accomplishment. It is the first study to find this connection. Although there are other publications on the connection between burnout and the precuneus [29], they do not regard mOFC connectivity. The identification of a positive relationship between precuneus–medial orbitofrontal cortex (mOFC) connectivity and personal accomplishment provides a neurobiological basis for the emotional symptoms of burnout, distinguishing it from depression and offering a potential biomarker for diagnosis and treatment [29].

The finding of ref. [42] was that hospitalization may be necessary for those experiencing burnout. Therefore, the result of ref. [45]—that various interventions have demonstrated success with burnout inpatients—is encouraging. This research is unique. Other recent studies on burnout and inpatients concern burnout arising from being an inpatient rather than burnout being the reason for the hospital admission [80,81]. This result means that burnout is recognizable as a critical, systemic public health crisis within healthcare rather than just a personal failing. For psychiatrists, these successful interventions provide concrete tools for treating high levels of emotional exhaustion, helping to prevent employee turnover [82].

In addition to the publications on burnout in specific types of employment [9–11], ref. [46] identified that frontline police officers report significantly higher levels of burnout and depressive symptoms than controls. A 2025 systematic review and meta-analysis of this topic connected burnout in police officers to several post-traumatic stress disorders rather than depression [83]. These results matter to psychiatrists because they regard public safety and the health of a high-risk group. Police officers with high burnout can overreact, increasing their use of force, and display reduced empathy in critical community interactions [84].

The focus of the comparison between ratings of well-being and a desire for change in ref. [47] is a new study focus for burnout research. Other recent publications have prioritized promoting well-being and resilience to overcome burnout rather than the desire to change [85–87]. The shift in burnout research to focus on the comparison between ratings of well-being and a desire for change moves beyond simply measuring burnout as

a pathological state toward understanding the motivational and functional outcomes of burnout distress [88].

3.3.2. Brain Changes

The first article cautions that burnout has distinctive physical symptom risks, including structural and functional brain changes, and these risks deserve greater recognition [42]. Ref. [44]—another of the included studies—represents a study that agrees that burnout brain changes are both structural and functional. However, in other cases, structural changes alone are recognized concerning burnout [89,90]. Ref. [89] represents a review returned by (1) Google Scholar; (2) three databases associated with OVID (Embase, Healthstar, and Medline); and (3) Web of Science, and includes both burnout and brain changes. For brain changes in burnout to have both a structural and functional component demonstrates burnout as a legitimate neurobiological condition rather than a state of mind or a weakness. Recognizing physical risks—such as cortical thinning and neuroendocrine dysfunction—allows psychiatrists to treat burnout as a serious, long-term health risk [29].

Ref. [43] notes a potential neurobiological basis for burnout syndrome in the EO resting state, where the observed continuous dense-array EEG data patterns characterized by decreased functional connectivity in the alpha3 sub-band (11–13 Hz) in frontal and midline brain sections, particularly in the right frontal area, support this suggestion. This article represents the first to make this connection regarding brain changes. This information is highly significant to psychiatrists because it helps transform burnout from a nebulous, self-reported syndrome into a quantifiable neurophysiologically dependent disorder, providing evidence-based insight into the mechanics of burnout and aiding diagnosis and treatment [63].

In addition to identifying that burnout results in structural and functional brain changes, Ref. [44] also finds that the impact on brain function in the context of burnout can result in hormonal fluctuations. These differences result in rs-fMRI signal-identified changes to emotional regulation. This finding follows a 2024 publication on stress in general regarding subcortical networks. It concluded that the relationship between stress and connectivity changes was precise and functionally meaningful in balancing hormones [91]. This perspective allows for better diagnoses, differentiation from major depression, and the development of targeted, evidence-based treatments [29,63].

The finding that inpatient treatment was effective for burnout patients [45] is particularly encouraging, following a 2024 study published in 2025 that found that the BDNF gene rs6265 and the FKBP5 gene rs1360780 may jointly contribute to an increased risk of burnout resulting from exposure to high childhood abuse [92]. As there is no direct mention of brain changes, the study results for this review have not included this paper. Successful inpatient treatment for burnout is closely linked to reversing the structural and functional brain damage caused by chronic stress, specifically by reducing the size of an enlarged amygdala, repairing connectivity in the prefrontal cortex, and increasing key neurotrophic factors. Treatment includes Cognitive Behavioral Therapy (CBT) and mindfulness. The aim is to normalize brain activity and restore executive cognitive functions [93].

Regarding the reduced gray matter volume and lower levels of excitatory neurotransmitter for structural and neurochemical brain alterations in burned-out police officers [46], ref. [66] represents another publication on this topic returned in the 26 January 2026 Google Scholar search. This was the second search that returned ref. [66] as relevant. However, none of the 1 January 2026 searches regarding brain changes AND burnout AND 2025 included it. In contrast, another study from 2025—one that focused on perfectionism rather than burnout—recognized that, during situations of maladaptive perfectionism (that may result

in burnout), glutamatergic activity tends to be excessive rather than reduced. This brain change leads to intensifying emotional responses and increasing self-criticism with a fear of failure, contributing to a cycle of anxiety and chronic stress in perfectionist individuals [94]. These structural and neurochemical changes, often found in regions responsible for emotional regulation and cognitive control (like the orbitofrontal cortex and dACC), help explain the cognitive impairments, emotional exhaustion, and increased risk-taking behavior often observed in this population [46].

Ref. [47] was the only included result that specified burnout as a whole-brain related problem. However, it was not the first to do so, as a 2023 study investigated a whole-brain assessment for burnout [95]. The 2025 study added that significant whole-brain effects were those demonstrated by contrasting themes. This perspective changes the approach to burnout from simple stress management to clinical, targeted interventions that aim to reverse structural and functional brain damage [29].

4. Discussion

A common element in all the included results is the use of a questionnaire to assess burnout, along with any additional empirical tests. The measurement tools employed varied. They included the Burnout Assessment Tool (BAT), the Sydney Burnout Measure (SBM) [42], the Maslach Burnout Inventory—General Survey [43], the Maslach Burnout Inventory—Human Services Survey (MBI-HSS) [44], the Maslach Burnout Inventory [45], the Copenhagen Burnout Inventory (CBI) for measuring workplace fatigue/burnout [46], and the Dutch version of the Maslach Burnout Inventory—Utrechtse Burnout Schaal Algemene versie (UBOS-A) [47]. None of the studies employed the same questionnaire to assess burnout.

The Burnout Assessment Tool (BAT) [96] and Sydney Burnout Measure (SBM) [97] are newer, comprehensive instruments with 4–7 dimensions. Both focus on broader cognitive and physical impairment. This focus is in comparison to the traditional Maslach Burnout Inventory (MBI) and Copenhagen Burnout Inventory (CBI), which test for exhaustion and cynicism [98,99]. BAT/SBM evaluate current severity and offer clinical depth, unlike MBI's frequency-based approach [100,101].

Although several inventories employed in the included studies are part of the MBI, they are unique. The Maslach Burnout Inventory (MBI) is a comprehensive term. The Maslach Burnout Inventory—Human Services Survey (MBI-HSS) is a specific 22-item version. Its design is for the service professions, such as healthcare, social work, and law enforcement. The MBI-HSS is considered the original, standard version in this regard [102]. In contrast, the Maslach Burnout Inventory—General Survey (MBI-GS) (16 items) is adapted for general occupations, focusing on exhaustion, cynicism, and professional efficacy [103]. The Dutch Utrechtse Burnout Schaal (UBOS-A), a version of the Maslach Burnout Inventory—General Survey (MBI-GS), is a validated adaptation measuring the same three-factor structure (exhaustion, cynicism, and personal accomplishment) but consists of 20 items, compared to the standard 22-item MBI (nine items for exhaustion, five for depersonalization/cynicism, and eight for personal accomplishment) [104].

As such, when deciding on which questionnaire to employ as an inventory to assess burnout, it is necessary to determine the purpose of the assessment. For evaluating the current severity of burnout for clinical depth, BAT [96] and SBM [97] can be used individually or in combination. In contrast, if the goal is to match the measurement tool with the occupation, the choice should be to employ a more precise measurement than MBI—general occupations should use the MBI-GS and the service professions should employ the MBI-HSS. Although not employed by any of the included studies,

the Educators Survey (MBI-ES) is an MBI designed for educators [105]. If there is a concern that understanding the country of origin would affect interpreting burnout, a tool such as the UBOS-A would be advised [104]. MBI has been validated in many languages [103].

Whatever the treatment selection for burnout regarding brain changes, the choice of an appropriate questionnaire to initially assess the aspects demonstrated of burnout using either CBI or MBI (using the relevant version for employment and nationality) will determine how the brain changes are measured [106]; for example, knowing the severity of the burnout with the BAT/SBM will contribute to understanding if treatment is best undertaken inpatient, outpatient in person, or via telehealth [107,108].

Differences in burnout assessment tools significantly impact research on brain changes by creating distinct symptom profiles (e.g., emotional vs. cognitive focus), connecting with dissimilar neural markers. CBI and MBI correlate with amygdala enlargement, dysfunction in the amygdala–anterior cingulate cortex, and prefrontal cortex thinning in their focus on exhaustion, depersonalization, and personal accomplishment [29]. In contrast, the type of cognitive impairment or psychophysiological fatigue that aligns with functional changes in the precuneus and cognitive processing centers tests with BAT and SBM [109].

4.1. Overarching Concepts

New findings that brain changes are both structural and functional [42,44,46], affect the entire brain [47], and may lead to hospitalization [42] have been identified by the included studies. These results represent an advancement for this topic in contrast to the 2025 review, which recognized previous research on this topic and determined that it is structural alone [89]. As such, brain changes associated with burnout are both structural and functional, and 2025 was the turning point year for this recognition [110,111]. This new understanding, that burnout affects both the structure and function of the entire brain, explains why multi-modal assessment tools which combine questionnaires are both relevant and advised. Additionally, EEG, MRI, and biomarker tests demonstrated their value in 2025 for further understanding of the functional changes associated with burnout. However, psychiatrists must remain cautious about the findings from 2025. There were few included studies assessed in this review, and they lacked (1) a large population, (2) various types of employment, (3) employees of different socioeconomic backgrounds, and (4) longitudinal considerations. Consequently, although 2025 was a watershed year for studies regarding functional changes associated with burnout in the whole brain, these results represent the beginning of this area of study, though not a complete, comprehensive understanding.

4.2. Limitations

As a review concerned with the currency of publications, the date of the study would be a significant factor. Only one of the included reports [44] states the study date. The primary reason why the study date is important, as noted in the previous subsection, is that it was not until the publication of research in 2025 that the extent to which burnout alters the brain was recognized. Lacking the date of study completion in the remaining reports is a limitation for this 2025 review [53].

Keyword bias [112] can be a reason for a lack of returns from database searches. In cases where there might be a gap in the keywords, the advice is to search Google Scholar as a supplementary database [113]. Although one of the databases searched was Google Scholar, the returns were still limited, with the included returns from Web of Science significantly greater than those from Google Scholar. In confining this review to only those publications regarding a keyword search of brain changes AND burnout AND 2025, additional comparisons were made,

some of which were published in 2025 ([29,61,63,66,89,94,95,110,111]). These supplementary publications were relevant to the topics; however, they were reviews and were therefore excluded from the included studies.

On the other hand, one later-identified relevant study [66] was not among the search results. It contained "burnout" and "2025", but it referred to "brain activity" rather than brain changes. To identify this study, the search was for "role of the dorsolateral prefrontal cortex and precuneus in burnout". To this extent, several other keywords might have produced additional relevant studies—some are "neural correlates", "neuroimaging", "functional connectivity", "brain structure", or "neurobiological mechanisms". A search on 22 March 2026 of the same five databases for these keywords produced results that represent the contents of Supplementary S3 (uploaded to OSF on 24 March 2026). The result of this search was that ref. [66] was then returned in Google Scholar, OVID (Medline), and Web of Science each. However, it was the only included study that was in addition to the original search of burnout AND brain changes AND 2025. Although not part of the included studies, ref. [66] was examined in relation to both ref. [46] and ref. [47]. This additional search demonstrated that, to return ref. [66], the original keywords were insufficient, representing a limitation.

More problematically was the identification of one article with a search of "value of "blood samples" for burnout research regarding "brain changes" [69] that included all the keywords brain changes AND burnout AND 2025 in the text, yet it was not among the included studies. There is no explanation for why there was no return of this article in any of the searches—the initial search or the additional one on 22 March 2026. Moreover, the 22 March 2026 search that included "brain structure" was unable to identify [114]—a 2025 paper that concerns both burnout and brain changes—that had been the result of the 26 March 2026 search of Google (not Google Scholar) regarding the question: "Why was 2025 particularly significant for research regarding brain changes and burnout?" Ref. [114] was not reviewed in the body of this paper as it did not return with the five selected databases; however, the title of the article summarizes its findings: "Whole-brain gray matter volume mediates the relationship between psychological distress and job satisfaction." The results of this study further reinforce the findings of ref. [47], where the brain changes associated with burnout affect the whole brain. The lack of any of these searches to identify these relevant studies indicates a limitation associated with the search engines themselves.

Some pre-2025 publications assessed the included studies ([65,75,77–80,85–87,107]). The use of earlier studies appears to be contrary to the intention to review only those publications from 2025. Their citation was to demonstrate a continuing trend in the respective research areas, and there is an acknowledgement of their earlier publication dates in the text where they appear.

An additional limitation is that, in comparison to a systematic review and meta-analysis [115,116], this review does not evaluate sample sizes [117] or the validity of the measurement tools [118]. The advice was to avoid conducting a systematic review and meta-analysis for this type of analysis [34,119,120]. However, this choice then required following the PRISMA-ScR guidelines [36,119,121–123] for scoping reviews. The decision to follow the methodology of a scoping review was because the aim was to locate the extent of research on the topic published in 2025. Nevertheless, although this work follows the guidelines of PRSIMA-ScR, research older than 2025 and any reports that were not peer-reviewed were excluded, making it not a scoping review per se. If the aim had been to find the range of all research on burnout and brain changes, this would be a limitation. However, as the aim was to clarify the most recent studies on the topic from 2025, not conducting a full scoping review made the research from that year evident—previous studies were referenced when they were relevant to the 2025 research. There was an

exclusion of non-peer-reviewed research because mitigating bias was not a requirement, as it is with peer-reviewed research [124]. The focus on studies from 2025 results from psychiatry witnessing a shift towards precision psychiatry and novel biological treatments during the past year [125,126], as captured in this review.

Nevertheless, the manuscript remains ambiguous in its methodology, as it is between a scoping review and a narrative review. Although there are references to PRISMA-ScR and a following of the PRISMA-ScR guidelines, the methodological choices (e.g., temporal restriction, keyword selection, and lack of dual screening) are those of a focused narrative synthesis. This result—being neither a scoping review nor a narrative review—is a limitation.

By examining only peer-reviewed studies from 2025, the result was a small number of included studies, equaling a sample size of n = 6. As such, with so few results, it is difficult to generalize the outcomes in broader terms, especially since the results were heterogeneous. Nevertheless, this identified problem of a small number of returns in recent research regarding burnout is not unique to this review. A 2026 systematic review of burnout and biological biomarkers in emergency and acute-care healthcare workers noted a similar problem [127].

One researcher conducted the data charting process—a method that may create cognitive bias [128]. A way to reduce such bias is to have at least two independent reviewers for screening and data extraction [129]. As this was not the method employed, one reason for following PRISMA-ScR procedures for scoping reviews [38] was that, in ensuring rigor, transparency, and reproducibility [130], this process mitigates possible cognitive bias. Supplementary S1 lists the returns from all five database searches, with the details of the reasons for those excluded and included. This file is available to any researcher for examination. As such, it acts as the full set of data necessary for multiple researchers to confirm screening and data extraction. Another means of controlling cognitive bias for transparency was the Preferred Reporting Items for Systematic Review and Meta-Analysis extension for scoping reviews (PRISMA-ScR) checklist [37] of Supplementary S2, which was completed.

4.3. Suggested Research Directions

The variety of topics investigating brain changes and burnout has progressed consistently. The 2025 publications make these results evident. Some results have strengthened a line of research that began more than a decade ago [65,75,77,107]. These include investigations of inpatient burnout [45], functional neuroimaging [47], and fMRI regarding eyes-open and eyes-closed conditions [43], in which the expectation is that continued research will be fruitful.

What is lacking is a comprehensive examination of brain changes in burnout available from a single study. Researchers in 2025 used either BAT/SBM or CBI/MBI. The recommendation is to use both types of questionnaire to assess burnout. Combining the use of more than one burnout assessment tool can merge the symptom profiles to include both emotional and cognitive focuses. As such, information on brain changes can potentially include amygdala enlargement, amygdala–anterior cingulate cortex dysfunction, and prefrontal cortex thinning [29] along with functional changes in the precuneus and cognitive processing hubs [91].

Additionally, considering differences in occupation and economic development would further enhance the research on this topic. The concentration on burnout research regarding brain changes in 2025 was on professionals in service industries [44,46] and in developed nations [42,43,45–47]. There was no focus in 2025 regarding brain changes and burnout, for

example, in factory workers in developing nations. The role of burnout associated with factory work in developing countries was only beginning to be investigated in 2025 [131,132].

With more precise data from a broader and more appropriate range of questionnaires, tailoring brain changes studies can anticipate the measures that are most likely to provide relevant and insightful findings. This review of 2025 publications identified that EEG data [43], MRI scanning [44,46,47], and blood samples [45] each provide valuable information on the brain changes associated with burnout. In 2025, the assessment of burnout was with only one measurement type per study. The advice is for future research to test for burnout comprehensively when considering the brain changes that may be affected by it.

Learning that, as a result of burnout symptoms, 10% of participants in one study were hospitalized [42] may be a reason to reinterpret the seriousness of burnout symptoms. Inpatient treatment programs were successful in reducing burnout. In part, this interpretation was a result of brain changes in hospital-based tests, suggesting that continuing research on inpatient treatment programs for burnout is advisable.

None of the included studies were in a high-impact journal. To gain higher visibility and greater impact on the field, the advice for future research on burnout and brain changes is to publish in the highest-ranking psychiatry journals. As of 2024, the following journals had the highest impact factors: *World Psychiatry*—65.8, *Psychotherapy and Psychosomatics*—17.4, and *JAMA Psychiatry*—17.1 [49].

Overall, these recommendations for suggested research directions regarding the relationship between burnout and brain changes distinguish the need for researchers to anticipate that burnout produces brain changes in various ways. Research in 2025 revealed that burnout is associated with both structural and functional brain changes [42,44,46]. Further research on functional brain changes with burnout is warranted. Building on the findings from 2025, researchers can now begin their studies with the foundational assumption that burnout produces both structural and functional brain changes. In this way, studies can search for additional brain changes using a full range of assessment tools and tests, further expanding the range of these anticipated changes. Doing so will not only increase research in this area but also identify burnout-reduction interventions and their effects on the brain. As such, long-term negative outcomes from burnout will potentially be lessened.

5. Conclusions

In investigating peer-reviewed publications on burnout and brain changes published in 2025, this review followed the PRISMA-ScR guidelines when searching five databases. There were various recorded brain changes in the six peer-reviewed publications included regarding burnout. All studies employed questionnaires to assess the type or level of burnout in gauging the structural and functional brain changes. Additionally, five of the six reports employed another objective empirical method to determine the kind of brain change, such as EEG data, MRI scanning, or blood samples.

The research on this topic demonstrates that investigations on this new area of burnout research are ongoing and expanding in their reach and application. Regarding research on brain changes and burnout in 2025, various occupations and countries were investigated. A turning point in 2025 was reached in burnout research and brain changes. Research from 2025 (1) identified burnout with structural and functional changes in the whole brain, in addition (2) to being properly testable by more than one type of questionnaire and several quantitative methods, though the research is still in its infancy. Therefore, psychiatrists should be cautious in the conclusions they draw from the results and their selected methods of treatment in response to this research. In the future, expansions of this

area of investigation to compare age groups, genders, social groups, and longitudinal effects of burnout on brain changes are necessary to supplement the current range of evolving research on the topic of brain changes and burnout.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/psychiatryint7030116/s1, Supplementary S1—five database searches on 1 January 2026 for the keywords brain change AND burnout AND 2025; Supplementary S2—Preferred Reporting Items for Systematic Review and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) checklist; and Supplementary S3—five database searches on 22 March 2026 for the keywords burnout AND (neural correlates OR neuroimaging OR functional connectivity OR brain structure OR neurobiological mechanisms), with the limit of results from 2025.

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Abbreviations

The following abbreviations are used in this manuscript:

PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
ScR	Scoping Review
EEG	Electroencephalogram
fMRI	Functional Magnetic Resonance Imaging
BDNF	Brain-Derived Neurotrophic Factor
DC	Degree Centrality
FC	Functional Connectivity
HPA	Hypothalamic–Pituitary–Adrenal
mOFC	Medial Orbitofrontal Cortex
SCS	Self-Compassion Scale
HAMD-17	Hamilton Depression Rating Scale, 17-Item Version
dACC	Dorsal Anterior Cingulate Cortex
FDR	False Discovery Rate
EO	Eyes-Open Condition
EC	Eyes-Closed Condition
BAT	Burnout Assessment Tool
SBM	Sydney Burnout Measure
MBI-HSS	Maslach Burnout Inventory—Human Services Survey
CBI	Copenhagen Burnout Inventory
UBOS-A	Utrechtse Burnout Schaal Algemene Versie/Dutch Utrechtse Burnout Schaal
MBI-GS	Maslach Burnout Inventory—General Survey
MBI-ES	Maslach Burnout Inventory—Educators Survey

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