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# Chronic Psychological Stress and Executive Function in Healthcare Professionals: A Neuropsychological Review

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## Abstract

**Background:** Healthcare professionals are routinely exposed to high cognitive workload, long or irregular shifts, and emotionally demanding clinical encounters, conditions that constitute a well-established model of chronic occupational stress. Executive functions, attention, working memory, inhibition, and cognitive flexibility, depend on the structural and functional integrity of the prefrontal cortex, a region known to be particularly sensitive to stress-related neuromodulation.

**Objective:** This narrative review synthesizes the available neuropsychological evidence on the relationship between chronic psychological stress, occupational burnout, and executive function in physicians, nurses, and trainee clinicians.

**Methods:** A structured search of academic databases and search engines was conducted for primary empirical studies and systematic reviews/meta-analyses examining objective or validated measures of executive function in healthcare professionals exposed to occupational stress, burnout, or shift work. Five primary studies and two systematic reviews/meta-analyses met inclusion criteria.

**Results:** Across nearly all included studies, exposure to acute or chronic occupational stress was associated with measurable decrements in executive performance. Healthcare workers on COVID-19 isolation wards showed significantly more errors on the Wisconsin Card Sorting Test during shifts than two weeks later, correlated with burnout severity. Trainee and resident physicians exposed to frequent on-call shifts or high-stress call periods showed impaired working memory, reduced mental flexibility, and slower information processing, with high-stress surgical call shifts also degrading psychomotor surgical performance. Nurses showed significant post-shift declines in attention, working memory, and reaction time, worsened by double shifts. At the meta-analytic level, clinical burnout was associated with small-to-moderate impairments in executive function, attention, and memory relative to healthy controls.

**Discussion:** These findings are consistent with neurobiological models describing stress-induced catecholamine and glucocorticoid dysregulation of prefrontal circuitry, and raise direct patient-safety concerns given that executive function underlies clinical judgment, error monitoring, and procedural performance. However, most evidence remains cross-sectional or single-occasion, relies heavily on self-report alongside objective testing, and cannot fully disentangle acute fatigue from chronic stress-related decline.

**Conclusion:** Chronic occupational stress and burnout in healthcare professionals are consistently associated with executive dysfunction, particularly in attention, working memory, and cognitive flexibility, but longitudinal and intervention studies are needed to establish causality and to test whether reducing workload or burnout restores executive performance.

**Keywords:** chronic stress; burnout; executive function; healthcare professionals; attention; working memory; cognitive flexibility; prefrontal cortex

## Introduction

Healthcare professionals work under conditions widely recognized as a model of chronic occupational stress: long and irregular shifts, high cognitive and emotional load, time pressure, and repeated exposure to critical or life-threatening situations. The prevalence of occupational stress among healthcare workers has been estimated at 27-87% depending on setting and measurement, and its chronic form, burnout, is now formally recognized as an occupational phenomenon. While the mental health consequences of this exposure, anxiety, depression, sleep disturbance, are well documented, its consequences for the specific cognitive processes that underlie safe clinical practice have received comparatively less systematic attention.

Executive functions comprise the higher-order cognitive processes that allow goal-directed behavior under changing or demanding conditions: sustained

and selective attention, working memory, inhibitory control, and cognitive flexibility. These functions depend heavily on the structural and functional integrity of the prefrontal cortex (PFC), which guides thought, attention, and behavior through recurrent excitatory networks that support the online maintenance of task-relevant information. Critically, the PFC is also the brain region most sensitive to the detrimental effects of stress: even mild, acute uncontrollable stress can produce a rapid loss of prefrontal cognitive capacity, and more prolonged stress exposure is associated with structural changes in prefrontal dendritic architecture. Mechanistically, stress-induced increases in catecholamines (noradrenaline, dopamine) and glucocorticoids act on prefrontal circuitry through intracellular signalling pathways that impair the persistent neuronal firing patterns required for working memory and top-down cognitive control.

For healthcare professionals, this is not a purely theoretical concern. Clinical decision-making, medication calculation, procedural execution, and error detection all depend on intact executive function, and impairment in these domains has direct implications for patient safety, not only clinician wellbeing. Burnout, defined by emotional exhaustion, depersonalization, and reduced personal accomplishment, has already been linked to impaired attention, memory, and executive function that decrease clinicians' recall and attention to detail, with corresponding increases in reported safety lapses. This review aims to synthesize the available neuropsychological evidence, both objective cognitive testing and validated self-report executive measures, on the relationship between chronic occupational stress, burnout, and executive function specifically within healthcare professional populations, and to evaluate the methodological maturity of this evidence base.

## Methods

This is a narrative review rather than a formally registered PRISMA systematic review. A structured search was conducted across academic search engines combining terms related to chronic stress and burnout ("occupational stress," "chronic stress," "burnout," "work-related stress") with terms related to healthcare populations ("healthcare workers," "physicians," "nurses," "trainee," "resident") and terms related to the cognitive domains under study ("executive function," "attention," "working memory," "cognitive flexibility," "Stroop," "Wisconsin Card Sorting Test," "prefrontal cortex"). Reference lists of retrieved systematic reviews were also hand-searched.

Inclusion criteria comprised studies that (a) reported primary empirical data using objective cognitive testing or validated executive-function measures, or were themselves systematic reviews/meta-analyses; (b) examined a healthcare professional population (physicians, nurses, trainees/residents, or mixed healthcare worker samples); (c) examined chronic occupational stress, burnout, or closely related shift-work exposure as the primary predictor; and (d) were available in English. Studies examining occupational stress in healthcare workers without any cognitive or executive-function outcome, and studies of burnout in non-healthcare populations, were excluded, with the exception of foundational neurobiological literature retained for theoretical framing.

Five primary studies and two systematic reviews/meta-analyses met inclusion criteria and form the basis of the synthesis below (Table 1). For each study, the following were extracted: authorship and year, setting/population, design, sample, outcome measure(s), and the direction of the key finding. Given heterogeneity in design, population, and outcome measurement, a narrative rather than a meta-analytic synthesis was undertaken, organized around three evidence strands: (a) objective cognitive testing under acute occupational stress exposure (shifts, on-call periods), (b) validated self-report executive measures in relation to chronic stress, and (c) meta-analytic evidence on burnout and cognitive function more broadly.

## Results

### Objective Cognitive Testing Under Acute Occupational Stress

The clearest evidence of stress-related executive impairment comes from studies that tested healthcare workers before and after periods of high occupational demand. In a study of 81 healthcare workers in a Cairo COVID-19 isolation hospital, participants completed the Wisconsin Card Sorting Test (WCST) during their hospital shifts and again two weeks later; total errors were significantly higher during the stressful shift period, and error counts correlated positively with both self-reported work-related stress and Maslach Burnout Inventory scores at both time points (Farahat, Amin, Hamdy & Fouad, 2021).

Similar findings emerge from surgical and procedural specialties, where executive impairment carries direct

 

technical consequences. In a prospective study of orthopaedic surgery residents assessed before and after 12- and 24-hour call shifts, high-stress call shift exposure was associated with significant declines in mental flexibility and information-processing speed on a validated cognitive testing platform, and, critically, with significantly worse performance on a simulated drilling task used as a proxy for surgical psychomotor performance; higher baseline attention was protective against this decline (Walley et al., 2024). A related, cross-sectional study of 83 trainee physicians found that a greater number of on-call shifts per month was associated with significantly worse working memory performance, and that depressive symptoms and burnout scores independently predicted further working memory impairment beyond on-call frequency alone (Almarzouki, 2024).

Nurses show a comparable pattern under conditions of shift-based fatigue. In a study of 45 hospital nurses assessed with the Stroop test, a digit span working memory task, and a manual dexterity test before and after shifts, working memory, attention, and response time all declined significantly following a single shift, with double shifts producing significantly greater deterioration across every measured domain than single shifts (Ulupınar & Meler, 2025).

## Chronic Stress, Self-Regulation, and Quality of Life

Beyond acute, shift-linked testing, chronic occupational stress has also been linked to broader executive self-regulation difficulties using validated self-report instruments. In a cross-sectional study of 82 shift-working healthcare professionals, perceived stress (measured with the Perceived Stress Scale) significantly predicted difficulties on the Executive Skills Questionnaire-Revised, a self-report measure of everyday executive functions such as organization, task initiation, and emotional control; these self-regulation difficulties, in turn, significantly predicted diminished quality of life, consistent with an indirect-only mediation pathway from stress to wellbeing through executive dysfunction (Salahuddin et al., 2025).

## Meta-Analytic Evidence on Burnout and Cognitive Function

At the review level, two syntheses trace the evolution of this evidence base. An early systematic review concluded that job burnout is associated with impaired performance on neuropsychological tests, primarily within the domains of executive function, attention, and memory, though the authors noted substantial heterogeneity across the included studies (Deligkaris, Panagopoulou, Montgomery & Masoura, 2014). This was substantially extended by a more recent systematic review with multivariate meta-analysis of 17 studies comprising 730 patients with clinical burnout and 649 healthy controls, which found small-to-moderate impairments in clinical burnout relative to controls across episodic memory, short-term and working memory, executive function (Hedges' g = -0.39), attention and processing speed (g = -0.43), and verbal fluency (g = -0.53) (Gavelin et al., 2022). The authors characterized this overall pattern as indicative of a broad cognitive control deficit consistent with a prefrontal locus of impairment, aligning with neuroimaging evidence of structural and functional deviations in the prefrontal cortex, striatum, and amygdala in stress-related exhaustion.

Table 1 summarizes the setting, design, sample, outcome measures, and key findings of the seven studies included in this review.

**Table 1:** Characteristics of Included Studies on Chronic Stress and Executive Function in Healthcare Professionals.

| Study (Authors, Year) | Setting/Population | Design | Sample | Outcome Measure(s) | Key Finding |
|---|---|---|---|---|---|
| Farahat, Amin, Hamdy & Fouad (2021) | Cairo, Egypt; physicians and nurses in a COVID-19 isolation hospital | Within-subject, repeated measures | n = 81 healthcare workers | Wisconsin Card Sorting Test (WCST) total errors, Maslach Burnout Inventory, work-related stress questionnaire | WCST errors were significantly higher during hospital shifts than 2 weeks later, and correlated positively with both stress and burnout scores. Negative |
| Almarzouki (2024) | Saudi Arabia; trainee physicians | Cross-sectional | n = 83 trainee physicians | Working memory task; PHQ-9, STAI, OLBI, PANAS, PSQI | More on-call shifts per month were associated with worse working memory; depressive symptoms and burnout scores independently predicted greater WM impairment. Negative |

| | | | | | |
|---|---|---|---|---|---|
| Walley et al. (2024) | USA; orthopaedic surgery residents (PGY II–V) | Prospective, within-subject, pre/post call shift | Orthopaedic residents assessed across 12- and 24-hour call shifts | Validated cognitive testing platform (mental flexibility, information processing); simulated drilling/psychomotor task | High-stress call shifts were associated with significant declines in mental flexibility and information-processing speed, plus worse psychomotor/surgical performance; higher baseline attention was protective. Negative |
| Ulupınar & Meler (2025) | Turkey; hospital nurses | Within-subject, pre/post shift | n = 45 nurses | Stroop test (attention), digit span task (working memory), reaction time, Nine-Hole Peg Test (hand function) | Working memory, attention, and response time all declined significantly after shifts, with double shifts producing significantly greater deterioration than single shifts. Negative |
| Salahuddin et al. (2025) | USA; shift-working healthcare professionals | Cross-sectional, mediation analysis | n = 82 shift-working healthcare professionals | Perceived Stress Scale (PSS-4), Executive Skills Questionnaire-Revised (ESQ-R), Quality of Life Scale (QOLS) | Perceived stress significantly predicted executive self-regulation difficulties, which in turn predicted diminished quality of life (indirect-only mediation). Negative (indirect) |
| Deligkaris, Panagopoulou, Montgomery & Masoura (2014) | Global (review) | Systematic review | Multiple studies of job burnout and cognitive functioning | Narrative synthesis of neuropsychological test performance across domains | Burnout was associated with impaired performance primarily in executive function, attention, and memory, though findings across studies were heterogeneous. Negative/heterogeneous |
| Gavelin et al. (2022) | Global (review) | Systematic review with multivariate meta-analysis | 17 studies; n = 730 clinical burnout patients, n = 649 healthy controls | Neuropsychological test batteries across cognitive domains | Clinical burnout was associated with small-to-moderate impairments in executive function (g = -0.39), attention/processing speed (g = -0.43), and episodic and working memory. Negative |

*Note: WCST = Wisconsin Card Sorting Test; WM = working memory; PHQ-9 = Patient Health Questionnaire-9; STAI = State-Trait Anxiety Inventory; OLBI = Oldenburg Burnout Inventory; PANAS = Positive and Negative Affect Schedule; PSQI = Pittsburgh Sleep Quality Index.*

## Discussion

The evidence reviewed here converges on a consistent pattern: whether measured through objective neuropsychological testing during or after high-demand shifts, through validated self-report executive measures under chronic stress, or through meta-analysis of clinical burnout samples, exposure to occupational stress in healthcare settings is associated with measurable executive impairment. This impairment spans the core domains identified in the theoretical model of executive function, attention and processing speed (Ulupınar & Meler, 2025; Gavelin et al., 2022), working memory (Almarzouki, 2024; Ulupınar & Meler, 2025), and cognitive flexibility/set-shifting (Farahat et al., 2021; Walley et al., 2024), and is broadly consistent with neurobiological accounts of stress-induced catecholamine and glucocorticoid disruption of prefrontal circuitry.

A particularly important feature of this literature is the direct link, in two studies, between cognitive decline and a technical or behavioral proxy for clinical performance. The orthopaedic resident's study did not stop at demonstrating cognitive decline after high-stress call shifts; it showed that this decline co-occurred with objectively worse simulated surgical performance, and that higher baseline attention protected against this decline (Walley et al., 2024). Combined with the finding that WCST errors during COVID-19 ward shifts correlated directly with burnout severity (Farahat et al., 2021), this body of evidence moves the discussion of clinician stress beyond wellbeing alone and toward a direct, patient-

safety-relevant mechanism, consistent with prior observations that burnout-related impairment in attention and executive function is associated with diminished recall, attention to detail, and increased safety lapses.

The Salahuddin et al. (2025) mediation finding adds an important nuance: even using brief, everyday self-report measures of executive self-regulation rather than laboratory cognitive tests, the same underlying pathway, stress degrading executive control, which in turn degrades functioning and wellbeing, was detectable. This suggests the effect is not an artifact of a particular testing paradigm, but a reasonably robust phenomenon detectable across very different measurement approaches, from the WCST to brief self-report executive skills inventories.

Nonetheless, several methodological limitations constrain how strongly causal conclusions can be drawn. Most of the primary studies included here are cross-sectional or use single within-subject pre/post comparisons around a single shift or call period (Farahat et al., 2021; Walley et al., 2024; Ulupınar & Meler, 2025), which cannot distinguish chronic, cumulative stress-related decline from acute sleep deprivation or fatigue effects specific to that shift. Sample sizes are generally modest (n = 45 to 83 across the primary studies), limiting statistical power and the ability to examine moderators such as years of experience, specialty, or baseline hypnotizability-like individual differences in stress resilience. The meta-analytic evidence (Gavelin et al., 2022) is not specific to healthcare professionals, drawing instead on broader clinical burnout populations, most of which were diagnosed with exhaustion disorder or undifferentiated somatoform disorder rather than recruited specifically from healthcare occupations; the applicability of these effect sizes to still-working, non-clinically-diagnosed healthcare staff should therefore be treated as suggestive rather than definitive. Finally, self-report burnout and stress measures, used in nearly every included study, are themselves subject to shared-method variance with self-reported outcomes, and only a minority of studies combined self-report exposure measures with fully objective, performance-based cognitive outcomes.

Priorities for future research include: (a) longitudinal designs tracking executive function across training or career stages, rather than single-occasion or single-shift comparisons, to separate cumulative chronic stress effects from acute fatigue; (b) larger, adequately powered studies within specific healthcare professional subgroups (nurses, resident physicians, intensivists, surgeons) to allow domain- and specialty-specific effect estimates; (c) studies that combine objective neuropsychological or psychomotor testing with direct measures of clinical error or patient-safety outcomes, extending the model established by Walley et al. (2024) beyond simulated psychomotor tasks; and (d) intervention and workload-reduction trials testing whether reducing shift length, call frequency, or burnout severity restores executive performance, which would substantially strengthen the causal interpretation of the cross-sectional associations reported to date.

## Conclusion

The available neuropsychological evidence indicates that chronic occupational stress and burnout in healthcare professionals are consistently associated with measurable executive impairment, spanning attention, working memory, and cognitive flexibility, and, in at least one surgical training population, with objectively worse technical performance. These findings are consistent with well-established neurobiological models in which stress-related catecholamine and glucocorticoid signalling disrupts prefrontal cortical function. However, the evidence base remains dominated by cross-sectional and single-occasion designs, modest sample sizes, and heavy reliance on self-report exposure measures, which together limit firm causal conclusions. Longitudinal studies, larger and more specialty-specific samples, and workload- or burnout-reduction intervention trials are needed before executive-function screening or targeted cognitive-protective interventions can be confidently recommended as part of healthcare workforce wellbeing and patient-safety strategy.

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