



The impact of urban green spaces on stress levels, sleep quality and resilience in working adults

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ABSTRACT

Urbanization has intensified occupational stress and sleep disturbances among working adults, highlighting the need for accessible and preventive mental health resources. Urban green spaces have increasingly been recognized as potential environmental factors that support psychological well-being. The present review aims to evaluate the psychological impact of urban green spaces on stress levels, sleep quality, and resilience in working adults. A comprehensive review of the literature was performed using databases such as Google Scholar, ResearchGate, and PubMed. Over 50 studies were initially identified using keywords related to stress, sleep quality, resilience, and urban green spaces, of which empirically relevant and evidence-based studies were included for analysis. The reviewed literature consistently demonstrates that contact to urban green spaces are linked to lower stress levels, improved sleep quality, enhanced emotional well-being, and greater psychological resilience. These benefits operate through many interrelated processes, such as lowering stress, attention restoration, increased physical activity, social interaction, also reduced exposure to ecological stressors like noise and contamination. The findings strongly align with Stress Recovery Theory and Attention Restoration Theory, supporting the role of green environments in psychological recovery and restoration. Stress emerged as a key mediating factor linking green space exposure to improved sleep and resilience, while behavioral and social pathways further strengthened these outcomes.

Overall, the review underscores the psychological significance of urban green spaces as cost-effective, preventive resources for promoting mental health among working adults. The findings highlight the importance of integrating high-quality, accessible green spaces into urban planning and workplace wellness strategies to mitigate occupational stress, enhance sleep health, and foster resilience in urban populations.

Keywords: Stress Levels, Sleep Quality, Resilience

Introduction

Stress

Stress is a complex biological and emotional reaction to sensed threats or demands that disrupt a person's homeostasis, triggering the stimulation of the hypothalamic-pituitary-adrenal (HPA) axis and the release of stress hormones such as cortisol and adrenaline. This adaptive mechanism, frequently known as the "fight-or-flight" reaction, evolved to improve survival by increasing heart rate, blood pressure, and glucose levels while suppressing non-essential functions like digestion and immune activity. Acute stress can be beneficial, sharpening focus and performance in short-term challenges, but when prolonged into chronic stress, it leads to allostatic overload, dysregulating multiple bodily systems and contributing to a cascade of health issues including cardiovascular disease, weakened immunity, anxiety disorders, depression, gastrointestinal disturbances, and metabolic syndromes like type 2 diabetes.

The subjective nature of stress amplifies its impact, as individual differences in resilience, coping strategies, and appraisal of stressors determine whether a situation becomes harmful. Emotional manifestations include irritability, anxiety, burnout, and cognitive impairments such as reduced concentration and memory lapses, while behavioral changes often involve overeating, substance misuse, social withdrawal, or insomnia. Chronic exposure erodes mental health, heightening vulnerability to post-traumatic stress disorder (PTSD) and exacerbating pre-existing conditions through sustained inflammation and neuroendocrine imbalance.

Stress encompasses a dynamic interplay between environmental demands and an organism's adaptive capacity, manifesting as acute or chronic responses that profoundly influence physiological, cognitive, and behavioral domains. Acute stress activates the sympatho-adrenomedullary (SAM) axis rapidly via the nucleus tractus solitarius and locus coeruleus, releasing adrenaline and noradrenaline to heighten arousal,

increase heart rate, blood pressure, and channel energy to vital survival functions, as the hypothalamic-pituitary-adrenal (HPA) axis activates, leading to glucocorticoid release from the adrenal cortex to support these adjustments. This "fight-or-flight" mechanism proves adaptive for immediate threats but transitions to pathology in chronic forms, where repeated or prolonged activation leads to allostatic overload, characterized by sustained glucocorticoid elevation, HPA dysregulation, and negative feedback impairment via glucocorticoid and mineralocorticoid receptors in limbic structures like the hippocampus and prefrontal cortex.

Sleep Quality

Sleep quality represents a multidimensional construct encompassing the subjective satisfaction with sleep duration, efficiency, continuity, depth, and restoration, distinct from mere quantity as it reflects how restorative and uninterrupted sleep feels to the individual. High-quality sleep facilitates efficient sleep onset (typically under 30 minutes), minimal awakenings (less than once per night), sustained sleep efficiency exceeding 85% (time asleep relative to time in bed), predominance of deep slow-wave and REM stages for cognitive and physical renewal, and daytime alertness without excessive fatigue or dysfunction. Poor sleep quality, conversely, manifests as fragmented sleep architecture, prolonged latency, frequent arousals, reduced restorative stages, and residual impairments like impaired concentration, mood instability, and elevated error rates in daily tasks.

Objective assessment via polysomnography (PSG) quantifies macrostructural elements such as overall sleep duration, sleep effectiveness, awakenings post-sleep onset, and sleep stage distributions, alongside microstructural features like EEG arousals, spectral power (delta for depth), and cyclic alternating patterns indicating instability. Subjective tools like the Pittsburgh Sleep Quality Index (PSQI) integrate seven components—period, disturbance, delay, efficiency, impairments, medications, and dysfunction—yielding a global score where greater than 5 indicates poor quality, validated against PSG yet capturing perceptual nuances objective metrics overlook. Actigraphy and wearables approximate these via movement and heart rate variability, though they underperform PSG in precision for microstructure.

Sleep quality constitutes a critical determinant of overall health, characterized by the subjective perception of sleep restoration intertwined with objective metrics of continuity, depth, and efficiency, where optimal profiles include sleep latency below 30 minutes, wake-after-sleep-onset under 20 minutes, sleep

efficiency surpassing 85%, and balanced distribution across non-REM stages (predominantly slow-wave for physical repair) and REM for emotional processing and memory consolidation. This construct transcends duration alone, incorporating factors like perceived refreshment upon awakening, absence of daytime somnolence, and minimal disturbances from environmental noise, partner movements, or internal hyperarousal states that fragment sleep architecture into unstable micro-arousals detectable via EEG spectral analysis. In research contexts, poor sleep quality—often operationalized via validated indices—correlates with neuroinflammation, hypothalamic-pituitary-adrenal dysregulation, and impaired glymphatic clearance of cerebral toxins, precipitating cognitive deficits, metabolic dysregulation, and heightened cardiometabolic risk through sympathetic overactivation and insulin resistance.

Resilience

Psychological resilience denotes the dynamic process and capacity of individuals to adapt successfully to significant adversity, trauma, or chronic stressors, maintaining or regaining mental health, well-being, and functional competence through flexible cognitive, emotional, and behavioral adjustments rather than mere endurance or recovery to baseline. This multifaceted construct integrates safeguarding elements like optimism, self-confidence, social assistance systems, problem-solving skills, and neurobiological mechanisms including enhanced prefrontal cortex regulation of amygdala reactivity, hippocampal neurogenesis via BDNF signaling, and autonomic flexibility in heart rate variability, enabling resilient trajectories amid risks like childhood maltreatment, bereavement, or socioeconomic hardship. Resilience manifests as "bouncing back" from acute crises or "bouncing forward" with post-traumatic growth, characterized by sustained purpose orientation, emotional granularity, and adaptive reappraisal, distinguishing it from hardiness (commitment-challenge-control triad) or grit (perseverance toward long-term goals), with developmental origins in secure attachments and gene-environment interactions like 5-HTTLPR polymorphisms moderating stress responses.

Research delineates resilience as non-static, influenced by contextual coherence (comprehensible, manageable, meaningful appraisals per Lazarus), cultural variability in collectivist versus individualist expressions, and lifespan plasticity through interventions like mindfulness-oriented stress relief or cognitive-behavioral treatment that bolster agency and meaning-making. Vulnerabilities arise from allostatic load accumulation in prolonged adversity, yet resilience buffers psychopathology onset, reducing PTSD incidence by 30-50% in high-risk cohorts and mitigating inflammatory cascades via downregulated HPA axis

hyperactivity. Longitudinal studies, such as Emmy Werner's Kauai cohort, underscore ordinariness—resilience as commonplace competence rather than exceptional heroism—promoted by even modest protective resources outweighing multiple risks.

Review of Literature

Zuo (2024) explored the relationship between Urban green spaces and mental well-being in older adults indicate that these areas positively relate to better mental health via factors such as diminished relative deprivation, boosted physical activity, and increased social trust, which in turn reduce stress levels. **Johnson et al. (2018)** investigated neighborhood green space exposure and sleep outcomes, revealing that higher tree canopy coverage (>10%) was linked to reduced chances of brief sleep duration on weekdays (OR=0.76), while elevated audio levels worsened sleep, suggesting green spaces promote better sleep quality in adults. **Tyrväinen et al. (2014)** examined urban green environments' influence on stress relief, showing that frequent use (over five hours monthly) of green areas enhanced perceived restorativeness, subjective vitality, mood, and creativity, leading to stronger positive feelings and stress reduction among urban citizens. **Jimenez et al. (2022)** analyzed street-view greenspace exposure and objective sleep measures, concluding that greenspace benefits sleep through mechanisms like stress reduction, attention restoration, physical activity, and lower exposure to pollution and noise, consistently improving sleep quality and quantity in adults. **Aziz et al. (2021)** assessed urban green spaces' effectiveness on undergraduates' stress, finding short-term park visits significantly reduced perceived stress, negative moods, and blood pressure compared to urban streets, with improved restorative outcomes and positive affect.

Barton& Pretty (2017) reviewed greenspace's role in mental health, noting acute benefits like psychological restoration, reduced stress and depression, enhanced self-esteem, and better attentional capacity from greenspace exposure, particularly aiding those with behavioral issues or dementia. **Lopez-Haro et al. (2024)** performed a systematic review on the active utilization of urban green, identifying associations with stress reduction, improved mood, self-esteem, cardiovascular health, and lower risks of anxiety and depression through exercise in greenspaces. **Stangierska-Mazurkiewicz et al. (2025)** studied green space attributes' impact on perceived stress, demonstrating that urban greenery reduces stress and psychiatric risks more effectively than built environments, mitigating stressful events and improving well-being. **Gong et al. (2024)** investigated urban green spaces' role in health and well-being, finding greenspaces superior to gray spaces for

stress recovery, especially in high-need individuals, with biodiversity enhancing eudaimonic experiences and resilience. **Aziz et al. (2025)** reviewed green space effectiveness for mental health, reporting a 17% average improvement (OR=0.83) in stress, depression, and anxiety, with greater benefits from larger, accessible spaces with high tree density.

Hoare et al. (2019) directed a systematic review on greenspace and mental wellbeing in adults, finding consistent associations between local-area greenspace amount and improved hedonic wellbeing like life satisfaction, though evidence for eudaimonic aspects like personal flourishing was weaker, with variations by gender and physical activity levels. **Jennings & Bamkole (2019)** mapped research on green space and mental health through a scoping review, revealing that 70% of studies showed positive links to wellbeing, influenced by greenspace quality, accessibility, and co-exposures like physical activity, while highlighting gaps in understanding mechanisms. **Jones & Hiller (2025)** performed a comprehensive review of existing reviews regarding greenspace exposure and its health effects, confirming benefits for mental health including reduced psychological distress and depressive symptoms across age groups, particularly through nature interactions like forest bathing. **Chen et al. (2024)** systematically reviewed green spaces exposure and psychiatric disorders, demonstrating reduced risks of depression and anxiety with higher greenspace access, especially in urban settings, via meta-analysis showing dose-response effects. **Dennis et al. (2021)** systematically examined green space quality and health, identifying that higher-quality greenspaces with biodiversity and accessibility strongly correlate with lower stress, better mood, and enhanced resilience in adults compared to low-quality areas.

Methodology

Aim

The Aim is to evaluate the psychological influence of urban green spaces on stress levels, sleep quality and resilience in working adults.

Objectives

- To evaluate the relationship between access to urban green spaces and stress levels among working adults.
- To examine the impact of urban green spaces on the sleep quality of working adults

- To explore the combined effects of stress reduction, improved sleep, and resilience enhancement through exposure to urban green spaces

Hypotheses

H1: There is significant relationship among access to urban green spaces and stress levels among working adults.

H2: There is significant impact of urban green spaces on the sleep quality of working adults.

H3: There is a combined effect of urban green spaces on stress reduction, improved sleep, and resilience enhancement among working adults.

Procedure

Literatures were selected from databases such as Google Scholar, Research gate, and PubMed using keywords: Stress levels, sleep quality and resilience. Over 50 studies were initially reviewed. Irrelevant studies and those lacking empirical value were excluded. Only evidence-based and relevant papers were included for analysis.

Discussion

The present review highlights a robust and expanding collection of psychological indication demonstrating that urban green spaces are significantly related with condensed stress, enhanced sleep quality, heightened emotional comfort, and greater psychological resilience among adults. Across experimental, observational, and review studies, the findings converge to suggest that interaction with nature-rich settings promotes psychological health through multiple interrelated psychological, behavioral, and social pathways.

From a theoretical perspective, the findings strongly align with Stress Reduction Theory (SRT) and Attention Restoration Theory (ART). Consistent with SRT, studies report rapid reductions in perceived stress, negative affect, and physiological arousal following exposure to urban greenery. These stress-buffering effects are evident even after brief interactions with green spaces, suggesting that natural environments elicit automatic affective and psychophysiological responses that promote relaxation. ART further explains improvements in mood, vitality, attentional capacity, and cognitive restoration, particularly through

experiences of fascination and psychological “being away,” which were consistently associated with frequent and high-quality green space use.

A central psychological mechanism emerging from the literature is stress as a mediating variable linking green space exposure to broader mental health outcomes. Reduced stress appears to partially account for improvements in sleep quality (Johnson et al., 2018; Jimenez et al., 2022), emotional regulation, and reduced chance of anxiety and depression. Improved sleep may function as both an outcome and a secondary mediator, reinforcing psychological resilience and emotional stability. These findings are particularly relevant within health psychology, where chronic stress and sleep disturbances are recognized as transdiagnostic risk factors for mental illness.

The reviewed studies also underscore the importance of behavioral activation and embodiment processes. Increased physical activity in green spaces was repeatedly identified as a pathway through which mental health benefits emerge (Zuo, 2024; Lopez-Haro et al., 2024). From a psychological standpoint, green environments may enhance intrinsic motivation for movement, reduce perceived effort, and promote positive affect during exercise, thereby strengthening adherence and psychological gains. This supports self-determination theory-based interpretations, whereby green spaces facilitate autonomy, competence, and relatedness during activity.

In addition to individual-level processes, social-psychological mechanisms play a critical role. Zuo (2024) demonstrates that green spaces enhance social trust and reduce perceived relative deprivation among older adults, indirectly improving mental health. These findings align with community psychology perspectives, suggesting that green spaces function as social resources that foster social cohesion, belongingness, and collective efficacy. Such social experiences may further buffer stress and reduce loneliness, particularly among vulnerable populations.

An important contribution of the literature is the growing recognition of resilience and eudaimonic well-being as outcomes of green space exposure. While hedonic outcomes such as stress reduction and mood improvement are well established, several studies indicate that green spaces may also promote vitality, creativity, meaning, and adaptive coping (Tyrväinen et al., 2014; Gong et al., 2024). Nonetheless, as mentioned by Hoare et al. (2019), evidence for eudaimonic well-being remains less consistent, suggesting a

need for more psychologically nuanced outcome measures that capture long-term adaptive functioning rather than transient affective states.

Gaps in Existing Research

- Limited focus on working adults as a distinct population
- Underrepresentation of work-related stress contexts
- Insufficient research on resilience as a primary outcome
- Weak causal evidence
- Limited integration of stress–sleep–resilience pathways
- Minimal consideration of perceived green space quality

Implications

Theoretical Implications

- Extension of Stress Reduction Theory (SRT)

The findings strengthen SRT by demonstrating that urban green spaces function as effective stress-buffering environments for working adults exposed to chronic occupational stressors.

- Support for Attention Restoration Theory (ART)

Improvements in sleep quality and emotional recovery suggest that green spaces restore depleted attentional resources caused by sustained cognitive demands at work.

- Integration of stress–sleep–resilience pathway

The evidence supports theoretical models in which reduced stress and improved sleep act as interlinked mechanisms that contribute to psychological resilience.

- Incorporation of environmental context into occupational psychology

Results highlight the need to expand traditional work-stress models by incorporating environmental and ecological determinants of mental health.

Practical Implications

- Workplace mental health promotion

Employers can incorporate green breaks, outdoor workspaces, and biophilic design to reduce stress and enhance recovery among employees.

- Sleep health interventions

Encouraging regular exposure to green spaces may serve as a non-medicational approach to improve sleep quality in working adults.

- Urban planning and policy

Results support prioritizing green infrastructure near workplaces, residential areas, and commuting corridors to reduce occupational stress.

- Occupational stress management

Green space exposure can complement existing stress-management programs by providing accessible, restorative environments.

Future Research Directions

- Target working adults explicitly

Design studies focused on full-time, part-time, and shift-based workers, considering occupation-specific stressors.

- Adopt longitudinal and experimental designs

Use cohort studies, natural experiments, and intervention trials to establish causal links between green space exposure, stress reduction, sleep quality, and resilience.

- Explore occupational differences

Compare outcomes across high-stress professions and flexible vs. rigid work schedules.

- Incorporate blended-method strategies

Merge quantitative metrics with qualitative perspectives to understand subjective experiences of green space use among workers

Conclusion

The reviewed literature clearly indicates that urban green spaces have a beneficial impact on stress reduction, sleep quality, and psychological resilience in adults, including working populations. Exposure to green environments supports mental health through stress buffering, psychological restoration, improved sleep, and enhanced coping capacity. These effects are consistent with established psychological theories and highlight green spaces as important environmental resources for recovery from work-related demands. Despite strong associative evidence, gaps remain in causal research and resilience-focused outcomes, particularly among working adults. Overall, integrating accessible, high-quality urban green spaces into daily living and work environments represents a practical and preventive strategy for promoting mental well-being and resilience in urban settings.

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