

Modelling How Campus Green Space Exposure Predicts Stress Alleviation Among University Students: A PLS-SEM Investigation of Cognitive, Social, and Mood Factors

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Exploring the role of campus green spaces in alleviating stress among university students offers important insights for enhancing learning environments and promoting holistic well-being. This study investigated perceived cognitive function enhancement (PCFE), perceived social interaction improvement (PSII), and perceived mood elevation (PME) as predictors of students' perceived stress alleviation (PSA) through campus green space use. Following a correlational cross-sectional design, data collected from 995 undergraduate students across four colleges in a public university were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The analysis revealed that PCFE, PSII, and PME significantly predicted students' PSA. Moreover, perceived improvement in social interaction did not directly predict stress alleviation. The overall model explained 46.2% of the variance in PSA. Notably, PME recorded both the highest importance index (0.459) and the highest performance index (79.14) on perceived stress alleviation. The originality of this study lies in its integrated examination of cognitive, emotional, and social pathways through which campus green spaces influence students' stress management, providing evidence-based guidance for universities to design interventions for improving green infrastructure for students.

Keywords: Campus green spaces, Stress alleviation, Cognitive enhancement, Social interaction improvement, Mood elevation, Structural Equation Modelling

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INTRODUCTION

University green spaces have increasingly become recognised as essential components of healthy campus environments because they contribute significantly to students' psychological well-being, cognitive functioning, and social integration. These natural settings, including gardens, shaded lawns, parks, tree-lined walkways, and landscaped courtyards, provide opportunities for relaxation, reflection, recreation, and meaningful social interaction away from academic pressures (Davis, 2022). As higher education institutions continue to experience increasing student enrolment, academic competition, and mental health challenges, campus green spaces have emerged as valuable environmental resources capable of enhancing students' overall quality of life. A growing body of research demonstrates that regular engagement with natural environments reduces psychological stress, improves mood, restores attention, enhances cognitive functioning, and strengthens social connectedness among university students (Vella-Brodrick & Gilowska, 2022). These benefits are increasingly recognised as fundamental to supporting students' academic success, mental health, and overall well-being within higher education institutions (Chemagosi, 2024).

Within the Sub-Saharan African context, the importance of campus green spaces is particularly pronounced. Universities across the region are experiencing rapid expansion in student populations, increasing academic workloads, limited mental health support services, and growing environmental pressures associated with urbanisation. Consequently, students are exposed to multiple academic and psychosocial stressors that can adversely affect their learning, emotional well-being, and academic performance. In such settings, accessible, well-maintained green spaces offer relatively inexpensive, sustainable opportunities for psychological restoration, emotional recovery, and social interaction. Beyond their environmental and aesthetic functions, campus green spaces provide restorative settings that encourage relaxation, reduce stress, foster peer engagement, and enhance students' sense of belonging within the university community. Despite these benefits, many African universities continue to underinvest in green infrastructure. In contrast, existing green spaces often suffer from poor maintenance, inadequate accessibility, and limited institutional recognition as strategic resources for promoting student health and wellness.

The restorative benefits of natural environments are primarily explained by two complementary theoretical perspectives: the Attention Restoration Theory (ART) and the Stress Reduction Theory (SRT). ART proposes that exposure to natural environments restores depleted attentional resources by providing psychologically restorative experiences that reduce mental fatigue, whereas SRT suggests that contact with nature facilitates physiological and psychological recovery from stressful experiences (Hartig, 2021; Scott et al., 2021). Together, these theories provide a comprehensive framework for understanding how interactions with campus green spaces simultaneously promote cognitive restoration, emotional recovery, and positive social experiences. While both theories have been widely applied in developed countries, comparatively few studies have examined their combined explanatory power within African

university settings, where environmental conditions, cultural contexts, and institutional realities differ considerably from those in Western societies.

Existing empirical studies consistently demonstrate positive associations between campus green space use and improved mental health outcomes. Research has shown that exposure to natural environments enhances attention, improves emotional well-being, encourages social interaction, and reduces perceived stress among university students. However, these benefits have generally been examined independently, with studies typically investigating cognitive restoration, emotional well-being, or social interaction as separate outcomes rather than as interconnected mechanisms influencing students' psychological well-being. Consequently, limited attention has been given to understanding how these psychological processes collectively contribute to students' perceptions of stress alleviation.

This limitation is particularly evident within Sub-Saharan African universities. Although the literature extensively documents the restorative effects of nature, the mechanisms by which perceived cognitive enhancement, perceived improvement in social interaction, and perceived mood elevation jointly predict students' perceived stress alleviation remain poorly understood. Most African studies examine these constructs in isolation rather than as complementary pathways through which campus green spaces improve students' psychological well-being (Oladele et al., 2024). Furthermore, contextual barriers, such as inadequate green infrastructure, poor maintenance of existing green spaces, limited accessibility, and weak institutional policies, continue to constrain students' ability to fully benefit from these natural environments (Reinwald et al., 2021). Consequently, university administrators and policymakers may underestimate the potential of campus green spaces as strategic, evidence-based, and cost-effective interventions for promoting student well-being and reducing stress (White & Schoenfeld, 2023).

Against this background, the present study offers a distinct contribution by conceptualising perceived stress alleviation as the principal outcome of campus green space experiences. Unlike previous studies that have treated stress alleviation primarily as an independent, mediating, or secondary construct, this study positions it as the dependent variable predicted by three interrelated psychological mechanisms: perceived cognitive enhancement (PCE), perceived social interaction improvement (PSII), and perceived mood elevation (PME). This perspective provides a more integrated understanding of how the cognitive, emotional, and social benefits of campus green spaces operate simultaneously to reduce students' perceived stress. By combining these previously fragmented dimensions within a unified conceptual framework, the study advances understanding of the multidimensional pathways through which green spaces influence student well-being.

The study also contributes theoretically by extending the combined application of ART and SRT within the context of Sub-Saharan African universities, where their integrated predictive validity has received limited empirical attention. Rather than examining cognitive restoration and stress reduction independently, this research demonstrates how cognitive, emotional, and social restoration collectively explain students' perceived stress alleviation. In doing so, the study contributes to refining

environmental psychology theory by illustrating how the restorative functions of nature may vary across cultural, institutional, and environmental contexts.

From a practical and policy perspective, the findings provide empirical evidence that can guide university administrators, campus planners, and policymakers in designing healthier learning environments. Demonstrating the psychological benefits of campus green spaces highlights the need for universities to move beyond viewing green infrastructure solely as an aesthetic feature and instead recognise it as an integral component of student mental health promotion. The findings therefore support the integration of well-being-oriented green infrastructure into institutional planning, campus development policies, and environmental management strategies throughout Sub-Saharan African higher education. Guided by these considerations, this study employs SmartPLS-based Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine the predictive relationships among perceived cognitive enhancement, perceived social interaction improvement, perceived mood elevation, and students' perceived stress alleviation associated with campus green space use. By positioning perceived stress alleviation as the primary dependent construct, the study provides new empirical evidence on the psychological pathways through which campus green spaces promote cognitive restoration, emotional well-being, and social connectedness among university students in Sub-Saharan Africa. In light of the above discussions, this study is anchored on the following research questions:

R1: What are the predictive links among students' perceived cognitive enhancement, social interaction improvement, mood elevation, and stress alleviation associated with campus green space use?

R2: Does perceived cognitive enhancement significantly predict students' perceived stress alleviation with campus green space use?

R3: What is the predictive relationship between students' perceived social interaction improvement and their perceived stress alleviation with campus green space use?

R4: What is the predictive power of the hypothesised model in explaining students' perceived stress alleviation with campus green space use?

LITERATURE REVIEW

Theoretical Framework

The incorporation of campus green spaces into university environments has become a cornerstone for fostering students' psychological well-being, emotional balance, and social integration. This study examines how perceived cognitive enhancement, social interaction improvement, and mood elevation interrelate to predict students' perceived stress alleviation through engagement with campus green spaces. The theoretical foundations underpinning this study are the ART (Kaplan & Kaplan, 1989), the SRT (Ulrich, 1983), and the Social Interaction Theory (Goffman, 1963). Collectively, these frameworks provide a multidimensional understanding of how exposure to nature contributes to cognitive renewal, emotional restoration, and improved social functioning, ultimately reducing perceived stress among university

students. In much the same vein as the above theory, the ART posits that natural environments help restore depleted cognitive resources by allowing the mind to shift from directed attention to effortless fascination (Kaplan, 1995). Within the university context, green spaces such as gardens, tree-shaded lawns, and courtyards provide restorative settings that enable students to recover from mental fatigue associated with intense academic activities (Latane, 2021). This restoration of cognitive functioning indirectly alleviates stress by improving focus, memory, and self-regulation, thereby promoting mental clarity and academic resilience.

Complementing this, the SRT emphasises the physiological and affective benefits of exposure to nature. It suggests that visual and physical contact with greenery elicits positive emotional responses, lowers blood pressure, and reduces cortisol levels, key indicators of stress (Yao, Zhang, & Gong, 2021). In university environments characterised by heavy workloads and social expectations, campus green spaces serve as readily accessible venues for stress recovery and emotional balance. Recent empirical studies demonstrate that students who spend time in restorative outdoor environments report lower anxiety levels and improved stress-coping mechanisms (Ibes & Forestell, 2022). Relatedly, the Social Interaction Theory (SIT) (Goffman, 1963) introduces a sociocultural perspective and emphasises the role of shared physical spaces in facilitating interpersonal connections. Indeed, campus green spaces often act as communal environments that foster friendship, collaboration, and peer bonding (Dilliard, 2022). These improved social experiences enhance feelings of belonging, trust, and mutual support, factors that, in turn, indirectly contribute to stress alleviation by reinforcing social cohesion and emotional comfort (Li et al., 2025). By integrating ART, SRT, and SIT, this study constructs a robust theoretical lens for exploring the pathways linking cognitive, emotional, and social mechanisms to students' perceived stress alleviation. This integrative perspective recognises that stress reduction does not arise from isolated benefits but rather from the synergistic interplay of cognitive restoration, positive affect, and enriched social interaction. Consequently, the theoretical model highlights the holistic contribution of campus green spaces to student well-being and stress management in higher education contexts.

Conceptual Underpinning and Variable Identification

Building upon these theoretical insights, this section identifies the key constructs shaping the study's structural model. Drawing from ART, SRT, and SIT, the model conceptualises a set of interrelated variables, perceived cognitive enhancement (PCE), perceived social interaction improvement (PSII), and perceived mood elevation (PME), that collectively explain students' perceived stress alleviation (PSA) resulting from campus green space use.

From the ART, perceived cognitive enhancement (PCE) captures students' experiences of improved concentration, attentional recovery, and mental clarity through engagement with green spaces. These cognitive benefits enhance academic focus and psychological resilience, serving as protective factors against stress (Devlin, 2025). Under the SRT, perceived mood elevation (PME) refers to a positive affective state derived from relaxation and emotional restoration in natural environments. This

construct reflects how exposure to greenery promotes calmness, happiness, and reduced negative emotions, key mediators in the stress recovery process (AlKhathami & Petrazzuoli, 2025). Drawing on Social Interaction Theory, perceived social interaction improvement (PSII) refers to students' enhanced sense of belonging, peer connection, and interpersonal engagement while using campus green spaces. These experiences foster social support networks that buffer the effects of academic and social stressors, indirectly enhancing emotional well-being (Zagic, Wuthrich, Rapee, & Wolters, 2022).

Based on these theoretical perspectives, the key constructs are defined as follows:

- *Perceived Stress Alleviation (PSA)*: The dependent construct reflecting students' subjective experiences of relief from academic, psychological, and social stressors when engaging with campus green spaces.
- *Perceived Cognitive Enhancement (PCE)*: The extent to which students experience improved concentration, attentional recovery, and cognitive functioning due to exposure to campus green spaces.
- *Perceived Social Interaction Improvement (PSII)*: The degree to which students report enhanced quality of social interactions, peer bonding, and connectedness in green environments.
- *Perceived Mood Elevation (PME)*: The emotional upliftment and positive affective state students experience through campus green space engagement, which mediates the relationship between cognitive, social, and stress-related variables.

The hypothesised model therefore examines how PCE, PSII, and PME individually and collectively predict students' perceived stress alleviation (PSA).

Towards Hypotheses Formulation and Conceptual Model Development

Relationship between students' perceived social interaction improvement and perceived cognitive function enhancement from campus green space use

Variations in the quality of social interaction improvement often determine the extent to which students can optimise cognitive benefits from campus green spaces. Specifically, when opportunities for meaningful peer bonding or collaborative engagement are limited, students' ability to restore attention and enhance cognitive functioning may be constrained (Peters & D'Penna, 2020). Conversely, green spaces not only provide settings for relaxation but also foster group activities, discussions, and informal learning encounters, which collectively reinforce intellectual vitality (Dilliard, 2022). Moreover, social interaction improvement creates emotionally supportive environments that encourage idea exchange, collective problem-solving, and mutual encouragement, thereby shaping students' confidence and engagement with complex tasks (Van Le, 2024). Positive peer relationships also reduce feelings of isolation and cognitive overload, which in turn facilitate sharper focus (Walsham, Perlman, & Sihotang, 2023). Therefore, in resource-constrained higher education contexts, green spaces serve as accessible

platforms for social development and cognitive growth, with benefits often extending into academic engagement (Loh & Ang, 2020; Li, Wu, Luo, Fu, & Zhang, 2024). Accordingly, this study investigates the relationship between social interaction improvement and cognitive enhancement. Hence, the current study proposes to examine the relationship that:

- **H1:** Students' perceived social interaction improvement significantly influences their perceived cognitive function enhancement from campus green space use.

Relationship between students' perceived social interaction improvement and perceived stress alleviation from campus green space use

Students' social interaction improvement reflects enhanced peer bonding, collaborative activities, and supportive relationships that emerge through engagement with campus green spaces (Chacon, Levine, & Bintliff, 2023). These interactions often include group discussions, recreational activities, and informal networks, collectively strengthening social cohesion and fostering a sense of community belonging (Smith, 2022). Correspondingly, perceived stress alleviation refers to students' subjective experience of reduced tension, anxiety, and psychological strain following exposure to restorative natural environments (Puhakka, 2021). Opportunities for meaningful social exchanges within green spaces provide emotional support and companionship, which buffer the negative effects of academic and personal stress (Suaib, 2024). By improving social ties, students enhance coping strategies and experience more effective stress relief. In tropical higher education settings, where workloads and infrastructural challenges are high, green spaces thus serve as accessible interventions that simultaneously promote social connectedness and facilitate stress alleviation, creating a mutually reinforcing relationship between social and emotional well-being (Tran & Guzey, 2024; Beute et al., 2021). Hence, one could presume that:

- **H2:** Students' perceived social interaction improvement significantly influences their perceived stress alleviation from campus green space use

Relationship between students' perceived social interaction improvement and perceived mood elevation from campus green space use

In higher education, students' social interaction improvement is influenced by the extent to which campus green spaces provide opportunities for meaningful engagement, collaboration, and peer bonding (Huang, Finsterwalder, Chen, & Crawford, 2022). This construct reflects not only the frequency but also the depth and quality of interactions, which contribute to a stronger sense of belonging and community (Tripon, Gonça, & Bulgac, 2023). Enhanced social interactions create emotionally supportive environments that are critical for students' well-being. Consequently, mood elevation often emerges as a direct outcome of improved social connectedness, as greater peer support, mutual encouragement, and inclusive participation in collaborative or leisure activities foster positive emotions and reduce psychological distress (Van Der Meulen et al., 2021; Zhang et al., 2024). In Sub-Saharan African

universities, where infrastructural limitations and academic pressures are common, green spaces thus serve as accessible avenues for social enrichment and emotional restoration, reinforcing students' resilience and overall psychological well-being (Jiang, Luo, & Liu, 2025; Zhang & Shi, 2023). In view of the above discussions, we would like to assume that:

- **H3:** Students' perceived social interaction improvement significantly influences their perceived mood elevation from campus green space use.

Relationship between students' perceived stress alleviation and perceived cognitive function enhancement from campus green space use

Students' stress alleviation could further be explained as students' experience of reduced anxiety, mental fatigue, and emotional strain through restorative contact with their natural environments (Ulrich et al., 1991). On university campuses, green spaces provide accessible venues where students can relax, disconnect from academic pressures, and restore psychological balance (Kaplan, 2023). Cognitive function enhancement, in turn, relates to improvements in attention, concentration, memory, and overall mental clarity, which are essential for effective learning and performance (Berman et al., 2022). Exposure to greenery is therefore associated with dual benefits—stress recovery and cognitive revitalisation—positioning campus landscapes as key supports for students' academic and emotional well-being. Spending time in these areas reduces physiological and psychological markers of stress, thereby creating a conducive state for improved cognitive functioning (Bratman et al., 2019; Dadvand et al., 2015). In Sub-Saharan African higher education contexts, green spaces serve as low-cost, culturally adaptable interventions that simultaneously alleviate stress and enhance cognitive capacity, thereby reinforcing both psychological and academic outcomes (Ohly et al., 2016; Beute et al., 2021). Relatedly, we propose that:

- **H4:** Students' perceived stress alleviation significantly determines their perceived cognitive function enhancement from campus green space use

Relationship between students' perceived stress alleviation and perceived mood elevation from campus green space use

Students' experiences with campus green spaces are closely linked to psychological outcomes, including reduced stress, emotional balance, and enhanced well-being (Kaplan, 1995). Stress alleviation refers to the extent to which students experience relief from academic or personal pressures after engaging with natural environments, while mood elevation reflects positive shifts in emotional states, including relaxation, joy, and vitality (Ulrich et al., 1991). Campus green spaces, with their restorative qualities, therefore provide opportunities for reflection, relaxation, and recovery from mental fatigue, creating conditions that support improved affective states (Hartig et al., 2003). Regular interactions with these environments—through walking, socialising, or quiet reflection—strengthen students' coping capacity and simultaneously enhance mood (Bowler et al., 2010; Berto, 2014). Empirical evidence shows that students who engage more frequently with green spaces report lower stress alongside higher mood, highlighting the mutually reinforcing nature of stress alleviation and

emotional uplift (van den Bogerd et al., 2018; Li & Sullivan, 2016; Jiang et al., 2021). In light of the above discussions, we hold and hypothesise that:

- **H5:** Students' perceived stress alleviation has a significant relationship with their students' perceived mood elevation from campus green space use

Relationship between students' perceived cognitive function enhancement and perceived mood elevation from campus green space use

Perceived cognitive function enhancement refers to students' subjective sense of improved concentration, clarity, memory, and overall cognitive vitality resulting from engagement with campus green spaces (Zhang, 2025). Specifically, tree-shaded lawns, gardens, and landscaped open areas provide restorative experiences that help students recover from mental fatigue resulting from sustained academic tasks (Latane, 2021). Moreover, such environments act as a cognitive buffer that supports sustained attention and higher-order intellectual processes (Rai, Shree, Chani, & Asim, 2024). In addition to academic benefits, enhanced cognitive clarity contributes to mood elevation by reducing frustration, mental exhaustion, and information overload (Sim, 2020). In higher education, where workload pressures are intense, green spaces therefore serve as a low-cost, accessible means of achieving both mental recovery and emotional upliftment (Stefanović, 2023). Consequently, students who report improved cognitive functioning are more likely to experience elevated moods, which in turn reinforces engagement, motivation, and overall well-being (Tripon, Gonța, & Bulgac, 2023). Thus, this study investigates the relationship between cognitive restoration and emotional outcomes within campus green spaces.

- **H6:** Students' perceived cognitive function enhancement is positively related to their perceived mood elevation from campus green space use.

Based on the literature review and hypothesis formulation, a conceptual model was developed to illustrate the relationships among variables. This is depicted in Figure 1.

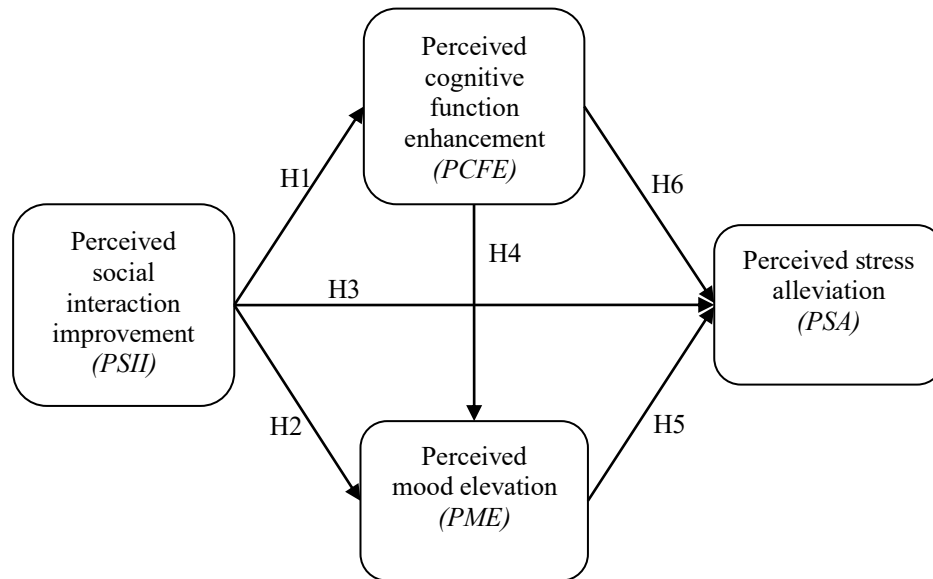


Figure 1: Conceptual Framework

METHODOLOGY

Study Context

This study was situated within the context of university green spaces in higher education institutions, where such environments provide opportunities for psychological restoration, cognitive vitality, and social connectedness. Although global research has identified benefits such as stress alleviation, improved cognitive functioning, and enhanced social interactions (Singh et al., 2024; Beute et al., 2021), African universities, largely those residing in developing countries, encounter challenges such as inadequate infrastructure, limited policies, and budgetary constraints that hinder effective green space planning (Wunubo et al., 2022). These contextual challenges affect the extent to which students experience stress alleviation from campus green spaces. Thus, this study sought to investigate how green spaces contribute to perceived stress alleviation, with a particular focus on the interrelated constructs of perceived mood elevation, perceived cognitive enhancement, and perceived social interaction improvement. This contextual grounding provided the foundation for examining stress alleviation as an integrative construct within a PLS-SEM framework.

The study employed a correlational cross-sectional design to examine predictive relationships among students' perceived stress alleviation, cognitive function enhancement, social interaction improvement, and perceived mood elevation. This design was deemed appropriate for modelling interactions among latent constructs in naturalistic university

settings, where green space use is embedded in students' academic and social routines. Data were collected from four colleges of a public university selected for their varying levels of campus greening and institutional attention to student well-being. The design ensured a systematic analysis of student experiences across diverse ecological and infrastructural contexts while maintaining comparability across institutional settings. Participants were drawn from undergraduate programmes across the four colleges to ensure diversity in academic background and year of study. A stratified random sampling approach was adopted to secure gender balance and representation across year levels (Year 1 to Year 4). The targeted sample size was 1,000 students, consistent with recommended thresholds for robust PLS-SEM modelling (Hair et al., 2022). After data cleaning, 995 valid responses were obtained, representing a 99.5% response rate, which provided sufficient statistical power for subsequent analysis. The student questionnaire was grounded in the theoretical frameworks of ART (Hartig, 2021) and SRT (Scott et al., 2021). It consisted of five main constructs: demographics (six items) of respondents, perceived cognitive function enhancement (6 items), perceived mood elevation (6 items), perceived social interaction improvement (10 items), and perceived stress alleviation (6 items). Apart from the demographic constructs, all the remaining 28 items were measured on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The items were adapted from established and widely validated scales used in prior studies on green spaces and psychological outcomes. Specifically, Kaplan (1995) and Hartig et al. (2003) informed the cognitive function measures; Ulrich et al. (1991) and Jiang et al. (2021) guided the stress reduction items; while van den Bogerd et al. (2018) and Carrus et al. (2015) informed the measures related to mood and social interaction. These instruments were carefully adapted to align with the cultural, linguistic, and educational contexts of African higher education institutions, ensuring contextual relevance and conceptual equivalence.

To strengthen validity within the local context, content validity was established through expert review by environmental psychologists and education researchers from the Departments of Psychology and Religion and Human Values. The experts evaluated the instrument for clarity, conceptual accuracy, and cultural appropriateness, resulting in minor refinements to wording and contextual framing. A pilot study involving 210 undergraduate students in a campus green space setting similar to the study site was then conducted to assess linguistic clarity and contextual suitability. Feedback from the pilot informed further minor adjustments to improve comprehension and relevance. Reliability analysis from the pilot study confirmed strong internal consistency, with all constructs exceeding the recommended Cronbach's alpha threshold of 0.70.

To address potential common method bias associated with the self-report design, procedural remedies were applied during data collection, including ensuring anonymity, reducing evaluation apprehension by clarifying that there were no right or wrong answers, and separating measurement items across constructs in the questionnaire layout. In addition, a statistical assessment of common method bias was conducted using Harman's single-factor test, which indicated that no single factor

accounted for the majority of the variance, suggesting that common method bias was not a significant concern in the dataset.

The final version of the questionnaire was administered online through the university's student portal, where participants provided informed consent electronically before participation. Participation was voluntary, and anonymity was ensured by not collecting personally identifiable information such as names, registration numbers, or programmes of study.

Completed responses were screened for completeness and consistency before analysis. The cleaned dataset was first analysed using SPSS version 26 for descriptive statistics and preliminary checks, after which it was exported as a comma-separated values (CSV) file into SmartPLS 4 for structural equation modelling. Partial Least Squares Structural Equation Modelling (PLS-SEM) was adopted due to its suitability for predictive modelling, its ability to handle complex relationships among latent constructs, and its robustness under conditions where normality assumptions may not fully hold (Hair et al., 2019). This approach was appropriate given the study's objective of explaining variance in perceived stress alleviation through the interrelated effects of mood elevation, cognitive function enhancement, and social interaction improvement.

ANALYSIS AND FINDINGS

Respondents' Profile

The study engaged a total of 995 undergraduate students across four colleges in a public university. Of this number, 54.1% were female ($n = 539$) and 45.9% were male ($n = 456$), indicating a relatively balanced gender distribution. With regard to year of study, Level 400 students constituted the largest proportion (31.8%, $n = 317$), followed by Level 300 students (28.5%, $n = 284$), Level 200 students (24.3%, $n = 242$), while Level 100 students represented the smallest group (15.4%, $n = 152$) (Table 1). This pattern suggests stronger participation among senior-level students who may have had greater exposure to campus facilities, including green spaces. In terms of academic background, respondents were drawn from diverse faculties to ensure representation across the disciplines. The majority (38.2%, $n = 380$) were from the College of Humanities and Legal Studies, followed by the College of Education Studies (26.5%, $n = 264$), the College of Agriculture and Natural Sciences (18.6%, $n = 185$), and the College of Health and Allied Sciences (16.7%, $n = 166$). This diversity reflects the study's intention to capture perceptions from multiple academic contexts where green space use may vary. With regard to mode of study, 71.4% ($n = 710$) were regular students who primarily accessed campus green spaces during day-to-day academic and social routines, while 28.6% ($n = 285$) were distance education students, whose engagement with campus facilities may have been periodic and less intensive. This distribution highlights that the majority of responses were from students with regular and direct exposure to campus environments. The demographic characteristics of the respondents are presented in Table 1.

Table 1: Respondents' Profile

Variable	Category	Frequency (n)	Percentage (%)
<i>Gender</i>			
	Male	456	45.9
	Female	539	54.1
<i>Year of Study</i>			
	Level 100	152	15.4
	Level 200	242	24.3
	Level 300	284	28.5
	Level 400	317	31.8
<i>College</i>			
	Humanities & Legal Studies	380	38.2
	Education Studies	264	26.5
	Agriculture & Natural Sciences	185	18.6
	Health & Allied Sciences	166	16.7
<i>Mode of Study</i>			
	Regular	710	71.4
	Distance Education	285	28.6
Total		995	100

Results of the Model Evaluation

This study employed SmartPLS 4.0 software to validate the proposed model that examined university students' mood elevation from campus green space use. In accordance with the standard guidelines outlined by Hair et al. (2017), the reflective hypothesised model in this study was assessed based on measurement model and structural model analyses.

Measurement Model Analysis

The measurement model for the study on university students' stress alleviation through campus green space use was assessed for multicollinearity, reliability, and validity. The evaluation covered item loadings, Cronbach's Alpha, ρ_A , composite reliability, average variance extracted (AVE), Heterotrait-Monotrait Ratio (HTMT), and the coefficient of determination.

Multicollinearity

To ensure the reliability and stability of the proposed analytical model, a multicollinearity assessment was conducted using the Variance Inflation Factor (VIF), following established guidelines by Kock and Gaskins (2016). As shown in Table 2, the VIF values for all variables ranged from -0.059 to 0.459. These values fall well below the recommended maximum threshold of 3.3, confirming that the relationships among the constructs

are sufficiently independent and that the dataset is appropriate for subsequent statistical analyses.

Table 2: Variance Inflation Factor Values

Variables	PCFE	PME	PSII	PSA
PCFE		0.449		0.168
PME				0.459
PSII	0.444	0.150		-0.059
PSA				

Perceived Stress Alleviation (PSA), Perceived Mood Elevation (PME), Perceived Cognitive Function Enhancement (PCFE), Perceived Social Interaction Improvement (PSII)

Heterotrait-Monotrait Ratio (HTMT)

According to Henseler et al. (2015), the Heterotrait-Monotrait Ratio (HTMT) is a key criterion for evaluating discriminant validity. Hair et al. (2023) emphasised that the stricter threshold requires HTMT values to be below 0.85, while a more lenient benchmark allows values below 0.90. The HTMT values for this study, as shown in Table 3, ranged from 0.176 to 0.549. Since all the values fell below the 0.85 threshold, the results confirmed that the constructs—perceived cognitive function enhancement, perceived mood elevation, perceived social interaction improvement, and perceived stress alleviation—were conceptually distinct and measured uniquely.

Table 3: Results of the HTMT assessment for the discriminant validity

	PCFE	PCFE	PCFE	PCFE
PCFE	0			
PME	0.519			
PSII	0.451	0.348		
PSA	0.389	0.549	0.176	0

Perceived Stress Alleviation (PSA), Perceived Mood Elevation (PME), Perceived Cognitive Function Enhancement (PCFE), Perceived Social Interaction Improvement (PSII)

Reliability and Validity

To assess the quality of the measurement model, reliability and validity were examined using outer loadings, Cronbach's alpha, composite reliability (ρ_A and ρ_C), and the Average Variance Extracted (AVE). The study also conducted a confirmatory factor analysis to validate the items (see Figure 2). All indicators recorded outer loadings above the recommended 0.500 threshold, confirming satisfactory item reliability. Cronbach's alpha values ranged from 0.865 to 0.981 (Table 4), while composite reliability values (ρ_A and ρ_C) ranged from 0.880 to 0.996, all exceeding the benchmark of 0.700. Furthermore, AVE values ranged from 0.680 to 0.930, clearly surpassing the minimum requirement of 0.500. Collectively, these results demonstrate strong internal consistency and convergent validity for all four constructs, Perceived Cognitive Function Enhancement, Perceived Mood Elevation, Perceived Social Interaction Improvement, and Perceived Stress Alleviation, indicating that the measurement model is robust and suitable for further analysis. The confirmatory factor analysis algorithm image is shown in Figure 2.

Table 4: Construct Reliability and Validity

Variables	Outer loadings	Cronbach's alpha	Composite reliability (ρ_a)	Composite reliability (ρ_c)	Average variance extracted (AVE)
Perceived Cognitive Function Enhancement	0.825 0.865 0.880 0.731 0.814 0.824	0.908	0.918	0.927	0.680
Perceived Mood Elevation	0.957 0.969 0.659 0.971 0.966 0.928				
Perceived Social Interaction Improvement	0.904 0.981 0.950 0.973 0.973 0.961 0.968 0.989 0.970 0.970				
Perceived Stress Alleviation	0.957 0.887 0.957 0.907 0.936 0.972	0.972	0.974	0.977	0.877

Perceived Stress Alleviation (PSA), Perceived Mood Elevation (PME), Perceived Cognitive Function Enhancement (PCFE), Perceived Social Interaction Improvement (PSII)

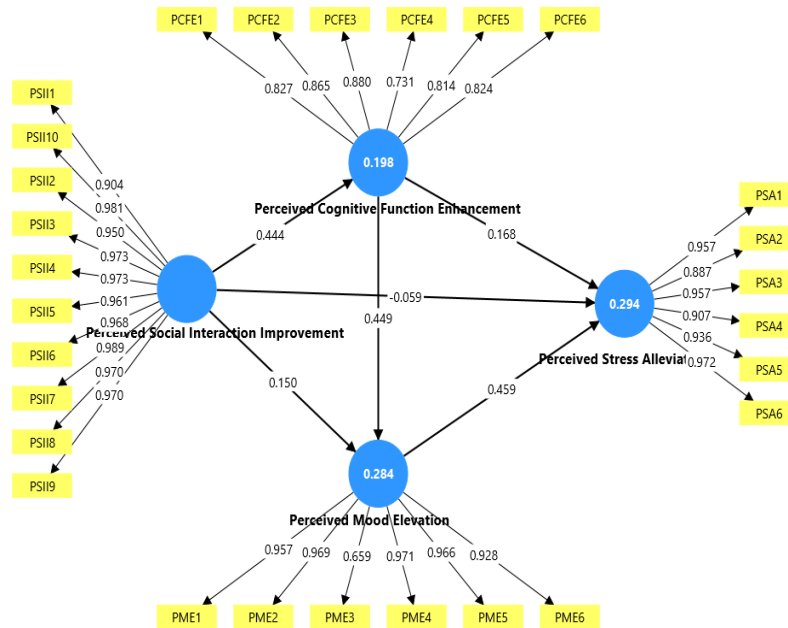


Figure 2: Confirmatory algorithm image

Assessment of the Structural Model

The evaluation of the structural model involved examining the key indices that determine the strength and significance of the hypothesised relationships, including path coefficients, t-statistics, p-values, and confidence intervals. These indicators collectively provide evidence of the predictive relevance and statistical robustness of the proposed model. In addition, an importance–performance map analysis (IPMA) was conducted to identify the constructs that exert the strongest influence on the outcome variables and to evaluate their relative performance levels.

Path Analysis and Hypotheses Testing

Bootstrapping was employed to examine the hypothesised relationships among the study constructs, providing a more reliable basis for significance testing than traditional parametric procedures, particularly when normality assumptions may not hold (Pernet et al., 2021). Consistent with methodological recommendations by Sabol et al. (2023), a bootstrapping procedure with 5,000 resamples was conducted to generate standard errors, t-values, and p-values for each structural path.

As presented in Table 5 (also illustrated in Figure 4), several of the estimated paths were statistically significant. Perceived Social Interaction Improvement exhibited a strong and significant direct effect on Perceived Cognitive Function Enhancement ($\beta = 0.444$; $t = 15.852$; $p = 0.000$) and a smaller but still significant effect on Perceived Mood Elevation ($\beta = 0.150$; $t = 4.655$; $p = 0.000$). However, its influence on Perceived Stress Alleviation was not statistically significant ($\beta = -0.059$; $t = 1.365$; $p =$

0.172), suggesting that improvements in social interaction alone may not be sufficient to reduce stress levels in this context directly.

Regarding the internal relationships among the psychological outcome variables, Perceived Cognitive Function Enhancement significantly predicted both Perceived Mood Elevation ($\beta = 0.449$; $t = 13.685$; $p = 0.000$) and Perceived Stress Alleviation ($\beta = 0.168$; $t = 4.348$; $p = 0.000$). Similarly, Perceived Mood Elevation demonstrated a strong and significant effect on Perceived Stress Alleviation ($\beta = 0.459$; $t = 13.708$; $p = 0.000$). These findings reveal an interconnected psychological mechanism in which elevated mood and improved cognitive functioning jointly contribute to reductions in perceived stress. Collectively, the results suggest that while social interaction improvement plays an essential role in enhancing students' cognitive functioning and mood, it does not directly lower stress levels. Instead, stress alleviation appears to occur indirectly, primarily through pathways that improve cognition and elevate mood.

Table 5: Path significance test

Path	Original sample (O)	Sample mean (M)	SD (STDEV)	T stat (O/STDEV)	P values	2.5%	97.5%
PCFE -> PME	0.449	0.450	0.033	13.685	0.000	2.5%	97.5%
PCFE -> PSA	0.168	0.167	0.039	4.348	0.000	0.384	0.515
PME -> PSA	0.459	0.460	0.033	13.708	0.000	0.092	0.241
PSII -> PCFE	0.444	0.446	0.028	15.852	0.000	0.393	0.524
PSII -> PME	0.150	0.149	0.032	4.655	0.000	0.389	0.499
PSII -> PSA	-0.059	-0.059	0.043	1.365	0.172	0.087	0.213

Perceived Stress Alleviation (PSA), Perceived Mood Elevation (PME), Perceived Cognitive Function Enhancement (PCFE), Perceived Social Interaction Improvement (PSII)

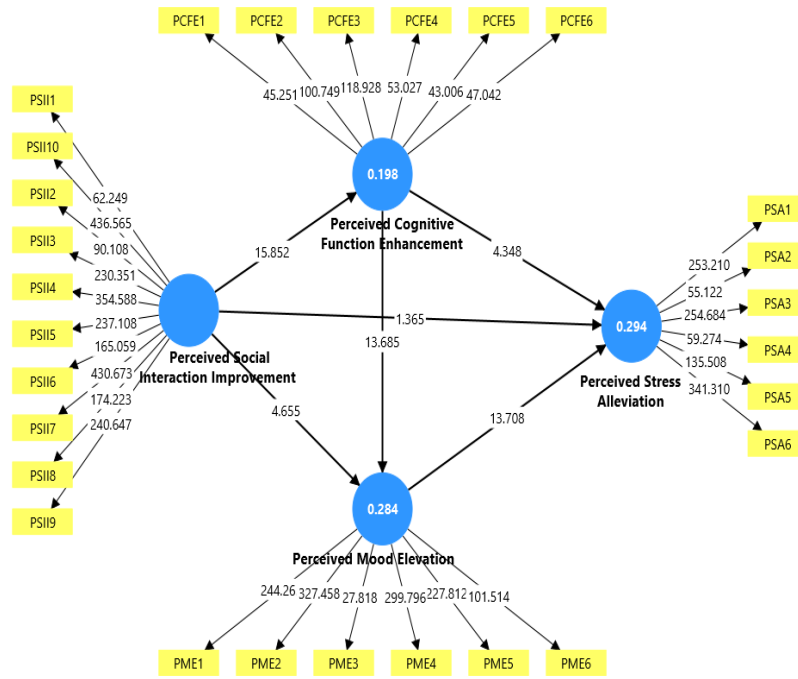


Figure 4: The Bootstrap Image

The Coefficient of Determination

The results revealed that the hypothesised model possesses a meaningful level of predictive power in accounting for students' perceived stress alleviation. As shown in Table 6, the model predictors collectively explained 46.2% of the variance in perceived stress alleviation, indicating a moderately strong explanatory capacity. In addition, the model explained 28.4% of the variance in perceived mood elevation, 29.4% of the variance in social interaction improvement, and 19.8% of the variance in perceived cognitive function enhancement. These findings demonstrate that the model provides adequate predictive strength across the key outcome variables, with its strongest explanatory contribution observed for stress alleviation.

Table 6: Coefficient of Determination (R^2)

Variable	R-square	R-square adjusted
Perceived Cognitive Function Enhancement	0.198	0.197
Perceived Mood Elevation	0.284	0.282
Social Interaction Improvement	0.294	0.292
Perceived Stress Alleviation	0.462	0.460

Importance-Performance Map Analysis (IPMA)

Ringle and Sarstedt (2016) explain the Importance-Performance Map Analysis (IPMA) as a useful extension of PLS-SEM that enables researchers to assess both the relative importance and the performance of predictor constructs in shaping a specific target outcome. Guided by this approach, the IPMA was conducted to identify the key factors influencing perceived mood elevation in the context of this study. The results in Table 7 (also illustrated in Figure 5) show that perceived mood elevation recorded the highest importance index (0.459) and also achieved the highest performance index (79.14). These results suggest that improvements in the mood of students who use campus green spaces play the most significant role in determining their stress levels.

Table 7: IPMA on perceived stress alleviation

Variables	Importance Index	Performance Index
Perceived Cognitive Function Enhancement	0.374	61.32
Perceived Mood Elevation	0.459	79.14
Perceived Social Interaction Improvement	0.176	70.23

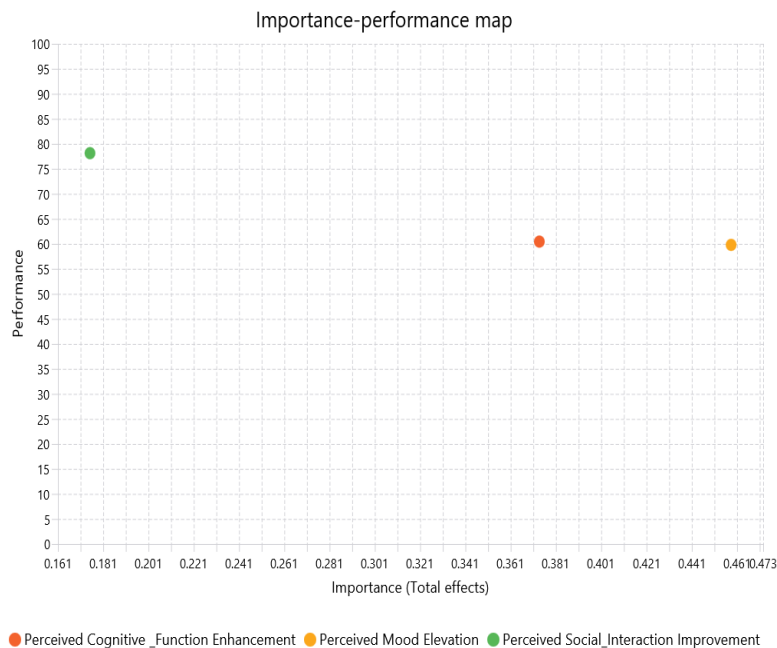


Figure 5: The graphical results of the IPMA

Model Fit

Evaluating model fit is a critical step in assessing the adequacy of a structural model, ensuring that it accurately reflects the underlying data patterns (Kline, 2015). As presented in Table 8, the SRMR values for both the saturated and estimated models were 0.078, which meet the recommended threshold of less than 0.08, indicating an acceptable level of model fit. Similarly, the d_{ULS} and d_G values for the saturated and estimated models were identical, with d_{ULS} recorded at 2.466 and d_G at 8.073. The Chi-square statistic also yielded a value of 23,967.298 for both models, while the NFI value remained consistent at 0.647. Collectively, these indices suggest that the structural model demonstrates a satisfactory degree of fitness for explaining the phenomenon under investigation.

Table 8: Model fitness

Statistic	Saturated model	Estimated model
SRMR	0.078	0.078
d_{ULS}	2.466	2.466
d_G	8.073	8.073
Chi-square	23967.298	23967.298
NFI	0.647	0.647

Perceived Stress Alleviation (PSA), Perceived Mood Elevation (PME), Perceived Cognitive Function Enhancement (PCFE), Perceived Social Interaction Improvement (PSII)

DISCUSSION

The study identified four key determinants of university students' perceived stress alleviation through campus green space use, namely perceived mood elevation, perceived cognitive function enhancement, perceived social interaction improvement and perceived cognitive function enhancement. The analysis showed that perceived cognitive function enhancement had a significant positive effect on perceived mood elevation among university students. This result aligns with previous findings by Kaplan (1995) and Beute et al. (2021), which indicate that restorative environments, such as natural settings and green spaces, enhance cognitive clarity, attention, and mental functioning, ultimately contributing to better emotional outcomes. Within the university context, this suggests that when students experience improved mental sharpness, focus, and cognitive ease through the use of campus green spaces, they are more likely to report elevated moods and enhanced psychological well-being. Second, the study revealed that perceived cognitive function enhancement significantly predicted students' perceived stress alleviation. This finding suggests that when university students experience clearer thinking, improved concentration, and better mental organisation, benefits often associated with spending time in campus green spaces, they are more likely to feel relief from stress. This supports earlier work by researchers such as Carrus et al. (2015) and van den Bogerd et al. (2018), who emphasise that restorative environments on university campuses help students regain cognitive balance and manage academic pressure more effectively.

The study also found a significant positive relationship between perceived mood elevation and perceived stress alleviation among university students. This suggests that when students experience elevated moods, often facilitated by time spent in campus green spaces, they are more likely to report reduced stress levels. Such restorative environments not only improve emotional well-being but also create conditions that help students cope more effectively with academic and social pressures. This finding aligns with previous research indicating that positive emotional states, fostered through engagement with natural settings, play a crucial role in stress reduction and psychological restoration (e.g., Carrus et al., 2015; van den Bogerd et al., 2018).

The study again found that perceived social interaction improvement had a significant positive effect on students' perceived cognitive function enhancement. This indicates that when university students engage in richer and more supportive social interactions, particularly within campus green spaces, they are more likely to experience enhanced mental clarity, focus, and cognitive functioning. Positive social engagement in these restorative environments provides emotional support, reduces feelings of isolation, and fosters a sense of belonging, all of which contribute to improved cognitive performance, as noted by van den Bogerd et al. (2018). Perceived social interaction improvement had a significant positive effect on students' perceived mood elevation from the findings. This suggests that when university students engage in meaningful social interactions, particularly within campus green spaces, they are more likely to experience elevated moods and positive emotional states. Such social engagement reduces feelings of isolation, fosters a sense of belonging, and contributes to overall psychological well-being. In practice, this implies that universities can enhance students' mood and emotional resilience by creating green spaces that encourage informal gatherings, group activities, and supportive peer interactions.

It was also observed that perceived social interaction improvement was an insignificant precursor to students' perceived stress alleviation. This indicates that, in the context of this study, variations in social interaction within campus green spaces did not meaningfully influence students' ability to reduce stress. While social engagement is often theorised to support stress management, the current findings suggest that other factors, such as individual coping strategies, time spent in restorative environments, or academic pressures, may play a more decisive role in alleviating stress. Finally, the results indicate that perceived mood elevation recorded both the highest importance index (0.459) and the highest performance index (79.14), suggesting that improvements in mood play the most significant role in shaping the target construct (Ringle & Sarstedt, 2016). This finding aligns with prior research emphasising that positive emotional states are central to students' psychological restoration and well-being in natural or restorative environments (Kaplan, 1995; Beute et al., 2021). While cognitive functioning and social interaction also contributed to the outcome, their influence was comparatively lower, indicating that interventions or campus green space designs that specifically target mood enhancement may have the greatest impact on students' stress reduction and overall mental health (Carrus et al., 2015; van den Bogerd et al., 2018).

Implications for Environmental Psychology: Policy and Practice

Drawing on insights from environmental psychology, this study highlights the importance of campus green spaces as critical environments that influence students' mood, cognition, and overall well-being. To maximise these psychological and academic benefits, higher education institutions and policymakers should adopt strategies that integrate environmental psychology principles into campus design and management practices. First, universities should design and maintain green spaces that promote cognitive restoration and emotional regulation. The analysis showed that perceived cognitive function enhancement had a significant positive effect on perceived mood elevation among university students, aligning with previous findings by Kaplan (1995) and Beute et al. (2021), which indicate that restorative environments, such as natural settings and green spaces, enhance cognitive clarity, attention, and mental functioning, ultimately contributing to better emotional outcomes. Therefore, creating quiet, well-maintained, and visually appealing areas conducive to reflection, study, and relaxation will enhance students' restorative experiences and cognitive performance. Second, planning should intentionally incorporate features that encourage social interaction, a factor shown to strengthen both mood and cognitive functioning. The study found that perceived improvements in social interaction had a significant positive effect on students' perceived cognitive function enhancement and perceived mood elevation, indicating that richer, more supportive social interactions within campus green spaces foster mental clarity, emotional support, and a sense of belonging (van den Bogerd et al., 2018). From an environmental psychology standpoint, supportive social environments within natural settings reduce stress and foster emotional balance. Campuses can achieve this by designing open lawns, shaded seating clusters, and recreational spaces that promote informal gatherings and peer bonding. Collaboration between student support services and associations in organising social or wellness events within these spaces can further amplify their psychological benefits.

Stress alleviation also emerges as a central pathway through which environmental design impacts emotional and cognitive well-being. The study revealed that perceived cognitive function enhancement and perceived mood elevation significantly predicted students' perceived stress alleviation, highlighting the importance of restorative environments in helping students manage academic and social pressures (Carrus et al., 2015; van den Bogerd et al., 2018). However, perceived social interaction improvement was an insignificant precursor to stress alleviation, suggesting that factors beyond social engagement, such as time spent in nature or individual coping strategies, may play a more decisive role in reducing stress. Universities should therefore prioritise the creation of stress-reducing environments, such as mindfulness gardens, relaxation zones, or outdoor wellness programs, to build resilience, enhance concentration, and improve learning outcomes. Furthermore, the results indicated that perceived mood elevation had the highest importance index (0.459) and performance index (79.14), suggesting that improvements in mood play the most significant role in shaping the target construct (Ringle & Sarstedt, 2016). While cognitive functioning and social interaction also

contributed meaningfully, their influence was comparatively lower, suggesting that interventions or campus green space designs specifically targeting mood enhancement may have the greatest impact on students' stress reduction and overall mental health (Carrus et al., 2015; van den Bogerd et al., 2018).

Theoretical Implications

The findings of this study offer important theoretical implications by extending and integrating existing frameworks on environmental psychology and student well-being. The results reinforce the ART by showing that exposure to campus green spaces not only restores attention but also enhances cognitive function, thereby contributing to improvements in mood and stress relief. Similarly, the observed influence of cognitive function enhancement and mood elevation on perceived stress alleviation empirically supports the SRT, validating its relevance in higher-education contexts where students face significant academic and social pressures.

Furthermore, by incorporating Social Interaction Theory, the study broadens the explanatory scope of ART and SRT, demonstrating that social engagement in campus green spaces, through peer bonding, informal gatherings, and collaborative activities, enhances cognitive functioning and mood, thereby contributing to stress alleviation. While social interaction had a smaller direct effect on stress reduction, its influence on cognition and mood indirectly supports students' ability to manage stress effectively.

Limitations of the Study

Despite its valuable contributions, this study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships among cognitive function enhancement, mood elevation, social interaction improvement, and stress alleviation; longitudinal research is needed to examine how engagement with campus green spaces affects stress alleviation over time. Second, the reliance on self-reported measures may introduce response bias, particularly in the subjective evaluation of stress, mood, cognitive outcomes, and social interactions. Third, the study was conducted within a single public university in Ghana, which may restrict the generalizability of the findings to other higher education institutions with different ecological, infrastructural, or cultural contexts. Additionally, the absence of objective physiological or behavioural measures means that inferences about stress reduction and psychological restoration are based solely on students' perceived experiences. Finally, while the PLS-SEM approach provides robust predictive insights, it may not capture all possible moderating or mediating variables that influence students' stress alleviation and overall well-being. Addressing these limitations in future research can offer a more insightful outcome of how campus green spaces contribute to student development and mental health.

Suggestions for Future Study

Building on the limitations identified in this study, several directions for future research are recommended. First, future studies should employ

longitudinal designs to capture how constructs such as stress alleviation, cognitive function enhancement, mood elevation, and social interaction improvement interact over time. This would allow researchers to establish causal pathways and provide deeper insights into the sustained effects of campus green space use on students' stress reduction and overall well-being. Second, future research should incorporate objective measures alongside self-reported data. Physiological indicators, such as heart rate variability or cortisol levels, as well as behavioural observations of students' engagement with green spaces, could complement questionnaire responses and provide a more robust understanding of the mechanisms underlying stress alleviation and psychological restoration.

Third, broader institutional contexts should be explored by including universities with varying levels of campus greening, including those in rural or resource-constrained settings. Comparative studies across different ecological and infrastructural contexts would help determine how disparities in access to green spaces influence students' stress reduction, mood, and cognitive functioning, thereby enhancing the generalizability of findings across African higher education institutions. Finally, future studies could adopt mixed-methods approaches to enrich the analysis of green space use. Incorporating interviews, focus groups, or ethnographic observations would allow researchers to capture students' personal experiences, nuanced perspectives, and contextual interpretations, complementing the predictive insights provided by quantitative modeling. This would contribute to a more holistic and culturally grounded understanding of how campus green spaces support stress alleviation, emotional well-being, and academic success.

Data Availability Statement

The dataset generated and analysed during the current study on students' perceived mood elevation through campus green space use is available from the corresponding author upon reasonable request.

Ethical Approval

This study, which explores university students' stress alleviation from campus green space use and the underlying psychological and social factors influencing this outcome, received ethical approval from Independent Review Board (Approval No. (DUH/R.6/VOL.5) of the University Health Services Directorate (Name of University Anonymised for Review). The approval followed a rigorous review process to ensure full compliance with ethical research standards, particularly regarding the protection of participant welfare, the confidentiality of personal data, and the minimisation of potential risks associated with participation.

Informed Consent

In accordance with ethical research protocols, informed consent was obtained from all participating university students. Before data collection in February 2025, participants were provided with both written and verbal information explaining the study's purpose, procedures, potential benefits, and their rights, including anonymity, confidentiality, and the freedom to withdraw at any point without penalty. Each participant signed a written

consent form, indicating their informed understanding and voluntary agreement to take part in the study.

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Conflict of Interest Statement

The authors declare that they have no financial or personal conflicts of interest that could have influenced the design, implementation, or reporting of this study on stress alleviation and campus green space use.

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List of Abbreviations

PSA = Perceived Stress Alleviation

PME = Perceived Mood Elevation

PCFE = Perceived Cognitive Function Enhancement

PSII = Perceived Social Interaction Improvement

β = Standardised Regression Coefficient

t = t-statistic

p = Probability Value (Significance Level)

PLS-SEM = Partial Least Squares-Structural Equation Modelling

SPSS = Statistical Package for the Social Sciences

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Appendix A

Appendix A University of Cape Coast Directorate of Academic Planning and Quality Assurance

Questionnaire for Modelling the Relationships Among Students' Perceived Stress Alleviation, Perceived Mood Elevation, Perceived Cognitive Function Enhancement, and Perceived Social Interaction Improvement Resulting from the Use of University Green Spaces

This questionnaire is designed to collect information on students' experiences and perceived benefits of using university green spaces. It

focuses on perceived stress alleviation, mood elevation, cognitive function enhancement, and social interaction improvement. The responses will be used solely for academic purposes to inform campus planning and promote student well-being. Your participation is voluntary, and you are free to opt out at any stage without any consequences. All responses will be kept strictly confidential, and no personally identifying information will be revealed in any report or publication resulting from this study. By completing this questionnaire, you consent to participate.

Section 1: Demographic Characteristics

1. Gender: Male ☐ Female ☐
2. Age Class: _____
3. Programme: _____
4. Department: _____
5. College: Distance Education ☐ Health and Allied Sciences ☐
Humanities and Legal Studies ☐ Education Studies ☐
Agriculture and Natural Sciences ☐
6. Level: _____

Please circle or tick. Use a scale where 1 = Disagree and 4 = Strongly Agree.

No.	Code	Statement	1	2	3	4
Perceived Stress Alleviation (PSA)						
7	PSA	Spending time in campus green spaces helps me feel less stressed.	☐	☐	☐	☐
8	PSA	Using green spaces reduces my academic pressure.	☐	☐	☐	☐
9	PSA	Green spaces provide a break from stressful daily routines.	☐	☐	☐	☐
10	PSA	Relaxing in green spaces helps me cope with personal challenges.	☐	☐	☐	☐
11	PSA	Green spaces provide a calming atmosphere that reduces anxiety.	☐	☐	☐	☐
12	PSA	Time spent in green spaces helps me regain focus after stressful tasks.	☐	☐	☐	☐
Perceived Mood Elevation (PME)						
13	PME	Being in green spaces improves my mood.	☐	☐	☐	☐

No.	Code	Statement	1	2	3	4
14	PME	I feel happier after spending time in campus green spaces.	[]	[]	[]	[]
15	PME	Green spaces help me feel more positive about my day.	[]	[]	[]	[]
16	PME	I feel refreshed and energised after using the green spaces.	[]	[]	[]	[]
17	PME	Spending time in green spaces enhances my emotional well-being.	[]	[]	[]	[]
18	PME	Green spaces make me feel more optimistic and hopeful.	[]	[]	[]	[]
Perceived Cognitive Function Enhancement (PCFE)						
19	PCFE	Using green spaces helps me concentrate better on academic tasks.	[]	[]	[]	[]
20	PCFE	After visiting green spaces, I feel more mentally alert.	[]	[]	[]	[]
21	PCFE	Green spaces help me think more clearly.	[]	[]	[]	[]
22	PCFE	Spending time in green spaces improves my ability to solve problems.	[]	[]	[]	[]
23	PCFE	Green spaces provide an environment conducive to reflection and learning.	[]	[]	[]	[]
24	PCFE	I am more productive after relaxing in campus green spaces.	[]	[]	[]	[]
Perceived Social Interaction Improvement (PSII)						
25	PSII	Green spaces make it easier for me to socialise with others.	[]	[]	[]	[]
26	PSII	I meet and interact with new people in the campus green spaces.	[]	[]	[]	[]
27	PSII	Green spaces provide a good setting for group discussions.	[]	[]	[]	[]
28	PSII	Spending time in green spaces strengthens my friendships.	[]	[]	[]	[]
29	PSII	I feel more connected to my peers when we meet in green spaces.	[]	[]	[]	[]

No.	Code	Statement	1	2	3	4
30	PSII	Green spaces enhance collaboration among students.	[]	[]	[]	[]
31	PSII	Green spaces encourage inclusive interactions among students.	[]	[]	[]	[]
32	PSII	I enjoy participating in social activities held in campus green spaces.	[]	[]	[]	[]
33	PSII	Green spaces create a sense of community among students.	[]	[]	[]	[]
34	PSII	Spending time in green spaces improves my overall social experience on campus.	[]	[]	[]	[]