



GENERATION Z PERCEPTIONS ON BLUE SPACE TOURISM ROLE AND STRESS REDUCTION AT BATU TUNGGAL BEACH, INDONESIA

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ABSTRACT

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Psychological stress among Generation Z has emerged as a growing global concern, driven by academic pressure, digital exposure, and social uncertainty, highlighting the need for preventive approaches beyond clinical interventions. Blue space tourism has gained increasing attention as a nature-based strategy to support mental well-being. This study examines Generation Z's perceptions of the role of blue space tourism in perceived stress reduction at Batu Tunggul Beach, Indonesia. A cross-sectional online survey with a retrospective self-assessment approach was conducted involving 85 respondents who had previously visited the site. Perceptions of blue space were measured using a five-point Likert scale covering relaxation, natural stimuli, social interaction, revisit intention, and psychological well-being, which were combined into a Blue Space Perception Index (BSPI) with strong internal consistency (Cronbach's $\alpha = 0.85$). Perceived differences in stress levels, based on retrospective evaluation of conditions before and after the visit, were analyzed using the Wilcoxon Signed-Rank Test, while associations between BSPI and perceived stress reduction were examined using Spearman's correlation. The results show a statistically significant perceived reduction in stress ($p < 0.05$), with most respondents reporting lower stress after visiting the beach. A positive and marginally significant relationship was observed ($p = 0.21$), indicating that higher perceived environmental quality is associated with greater perceived psychological benefits. These findings suggest that Batu Tunggul Beach may represent a valuable blue space for perceived psychological restoration; however, results should be interpreted as associative rather than causal due to the retrospective cross-sectional design.

Keywords: Blue space; perception; stress reduction; Generation Z; coastal tourism



INTRODUCTION

The increasing level of psychological stress among young people has become a growing global concern, in line with the dynamics of modern life characterized by academic demands, economic uncertainty, and the intensive use of digital technology. Research indicates that academic pressure represents a major contributor to psychological distress among youth, leading to mental health consequences such as anxiety and sleep disturbance (Pérez et al., 2025). Generation Z, as a cohort that has grown up in the digital era, faces multiple psychological challenges including digital overload, academic and career expectations, as well as broader global uncertainty, which collectively elevate their vulnerability to stress (Matilda et al., 2025). Young adults are also disproportionately affected by stress associated with economic insecurity and social pressures, which may heighten the risk of developing anxiety and depressive symptoms (Högberg, 2021; Kalwak et al., 2024). These conditions highlight the need for preventive approaches that extend beyond clinical interventions and incorporate supportive natural environmental settings to promote psychological well-being among young individuals.

In this context, nature-based solutions have gained increasing recognition as a potential strategy for supporting mental health. One emerging approach is the utilization of blue spaces, referring to natural aquatic environments such as seas, beaches, and coastal regions. Blue spaces have been consistently associated with improved mental well-being and reduced psychological distress, particularly through recreational exposure and sensory engagement with the marine environment. Recreational visits to coastal environments across multiple countries have been shown to enhance well-being and reduce mental distress, demonstrating their potential restorative value (White et al., 2021). Systematic evidence further indicates that the availability and visibility of blue spaces contribute to stress reduction, improved mood, and attention restoration, reflecting the psychological benefits of sensory interactions such as the sound of waves and coastal breezes (Georgiou et al., 2021). Evidence from qualitative studies also supports this perspective, showing that coastal environments provide opportunities for restorative experiences and emotional benefits, with visitors frequently reporting feelings of happiness, calmness, and psychological relief when in proximity to coastal blue spaces (Environment Agency, 2020). Coastal tourism, therefore, functions not only as a recreational activity but also as a meaningful setting for psychological restoration. Empirical studies demonstrate that interactions with coastal environments are associated with reduced stress, improved emotional states, and greater subjective well-being, reinforcing their restorative potential (White et al., 2021). However, these psychological benefits are not universally experienced; instead, they are shaped by perceptions of environmental quality, social experiences during visits, and emotional connectedness to marine environments, which collectively influence restorative outcomes (Georgiou et al., 2021).

Although research on blue spaces and mental health has continued to develop globally, existing studies have predominantly been conducted in urban and temperate regions, particularly in Europe and North America, and have mainly focused on general populations rather than specific age cohorts such as Generation Z (White et al., 2021; Georgiou et al., 2021). Consequently, empirical understanding

of how Generation Z perceives and experiences the restorative benefits of blue spaces remains limited, especially in tropical coastal settings. Moreover, coastal tourism studies in Indonesia have largely emphasized ecological, environmental, and economic dimensions, whereas the psychological benefits of coastal ecosystem services remain relatively underexplored empirically. Another limitation of previous studies is their tendency to focus on environmental exposure, accessibility, or proximity to blue spaces, while visitors' subjective experiences have received comparatively less attention. In particular, few studies have examined how multidimensional perceptions of coastal environments—including relaxation, natural sensory stimulation, social interaction, revisit intention, and perceived psychological well-being—collectively contribute to restorative experiences. Empirical studies integrating these dimensions within a single perception-based framework in tropical coastal tourism contexts are still scarce. To the best of our knowledge, no previous study has specifically investigated the association between multidimensional perceptions of blue space tourism and perceived stress reduction among Generation Z in an Indonesian tropical coastal destination using a composite Blue Space Perception Index (BSPI).

Batu Tunggal Beach represents a coastal tourism destination that characterizes blue space environments through its expansive seascape and recreational activities. Therefore, this study aims to analyze Generation Z's perceptions of blue space tourism in relation to perceived stress reduction at Batu Tunggal Beach. Specifically, it explores the associations between perceptions of blue space elements including relaxation, natural stimuli, social interaction, revisit intention, and psychological well-being and perceived retrospective differences in stress levels based on respondents' self-reported evaluation before and after visiting the beach. The novelty of this study lies in its focus on Generation Z within an Indonesian tropical coastal tourism setting and in the application of the Blue Space Perception Index (BSPI) as a multidimensional framework for assessing visitors' subjective experiences of coastal blue spaces. Theoretically, this study extends the blue space and environmental psychology literature by providing empirical evidence from an underrepresented tropical coastal context and by emphasizing perception-based pathways of psychological restoration among young visitors. Practically, the findings may assist destination managers and policymakers in developing well-being-oriented coastal tourism strategies that enhance the non-material ecosystem services of coastal environments and support visitors' psychological health. By adopting this approach, the study contributes to the development of well-being-oriented coastal tourism while maintaining a non-causal and perception-based perspective.

METHOD

Data Collection

Data for this study were obtained through an online survey administered to visitors of Batu Tunggal Beach. This study employed a cross-sectional design with a retrospective self-assessment approach, in which respondents evaluated their experiences and perceived stress levels at a single point in time based on recall. Importantly, this design does not involve longitudinal pre-post measurement, but

rather relies on respondents' retrospective evaluation within a single survey session. The survey approach was selected because it enables the measurement of subjective perceptions of Generation Z regarding coastal tourism experiences as a practical form of blue space exposure. Considering the digital literacy characteristics of Generation Z, data collection was conducted online to facilitate broader respondent reach and efficiency in participation and data management. Participation was voluntary, and respondents completed the survey independently.

Survey Instrument and Data Gathering Procedure

The research instrument consisted of a structured questionnaire developed using a five-point Likert scale format. The questionnaire was distributed online via Google Forms and disseminated through various social media platforms to provide broad access to the target population. The instrument consisted of three main components: demographic characteristics, perceptions of blue space tourism experiences, and perceived stress levels before and after visiting Batu Tunggal Beach. Perceived stress was measured using a self-developed Likert-type scale, in which respondents retrospectively assessed their stress levels prior to and following their visit. This approach does not utilize a standardized psychological instrument such as the Perceived Stress Scale (PSS), and therefore reflects general subjective stress perception rather than clinically validated stress measurement. Accordingly, the measurement is intended to capture perceived conditions within a retrospective context rather than objective psychological states.

Respondent Criteria and Data Eligibility

The respondents were restricted to individuals classified as Generation Z (born between 1997 and 2012) who had previously visited Batu Tunggal Beach. Only complete and valid responses were included in the analysis, while incomplete or inconsistent data were excluded to ensure data quality. Perceived stress levels were obtained through retrospective self-report for both pre-visit and post-visit conditions within a single survey administration. Thus, the change in stress levels represents a *perceived retrospective difference*, rather than an actual longitudinal measurement. The change in stress levels was calculated as the difference between pre-visit and post-visit scores, representing the level of perceived stress reduction.

Descriptive Statistical Analysis

The data analysis included both descriptive and inferential statistical approaches. Descriptive statistics were used to summarize respondents' socio-demographic characteristics and to describe the distribution of key research variables. The results were presented in tables and graphical visualizations to improve clarity and interpretability.

Reliability Analysis

Reliability testing was conducted to assess the internal consistency of the blue space perception indicators, including relaxation, natural stimuli, social interaction, revisit intention, and psychological well-being. Cronbach's Alpha was used as the reliability coefficient, with $\alpha \geq 0.70$ considered acceptable. Indicators that met this threshold were then combined into a composite variable known as the Blue Space Perception Index (BSPI) (Cronbach, 1951). In addition, the construct validity of the BSPI was established based on theoretical foundations from prior studies on blue

space and environmental psychology, ensuring that the selected indicators adequately represent the intended construct.

Analysis of Perceived Stress Differences

Differences in perceived stress levels before and after visiting Batu Tunggal Beach were analyzed using the Wilcoxon Signed-Rank Test, with the level of significance set at $\alpha = 0.05$. This non-parametric test was chosen because the data were ordinal and did not meet the normality assumptions required for parametric analysis (Conover, 1999). Given the retrospective nature of the data, the analysis reflects perceived differences rather than directly observed changes over time.

Correlation Analysis

The relationship between the Blue Space Perception Index (BSPI) and changes in perceived stress levels was examined using Spearman's Rank Correlation Coefficient. This method is suitable for assessing the strength and direction of associations between non-parametric variables (Mukaka, 2012). The results are interpreted as associative relationships and should not be construed as evidence of causal effects.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

A total of 85 participants were involved in this study, consisting of 25 males and 60 females. The age distribution was predominantly concentrated in the 18–21 age group (Figures 1 and 2), indicating that most respondents represent young individuals commonly associated with Generation Z. In terms of educational and occupational status, the majority of respondents were students, reflecting a population group that is closely engaged with academic demands and potentially more vulnerable to psychological stress.

These characteristics suggest that the respondents represent a relevant group for examining subjective psychological responses associated with coastal environments.

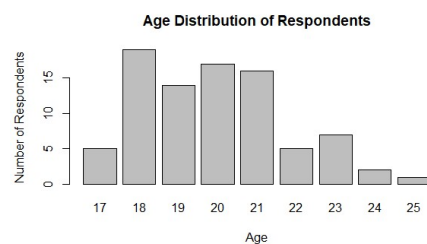


Figure 1. Age Distribution of Respondents

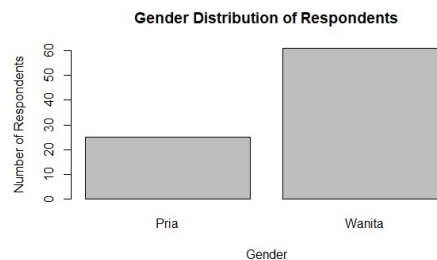
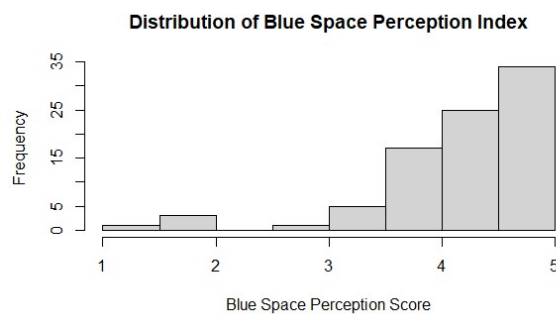


Figure 2. Gender Distribution of Respondents

Perception of Blue Space Tourism

The Blue Space Perception Index (BSPI) reflects respondents' evaluation of their psychological experience at Batu Tunggal Beach, measured using a five-point Likert scale. The index includes indicators such as relaxation, natural sensory stimulation, social experience, revisit intention, and perceived psychological well-being. Reliability testing indicated strong internal consistency (Cronbach's $\alpha = 0.85$), supporting the use of a composite index. The distribution of BSPI scores (**Figure 3**) shows that most respondents reported high perception levels, with values largely concentrated at scores 4 and 5. These results indicate that respondents generally perceived Batu Tunggal Beach as a positive and psychologically supportive environment; however, this measurement reflects subjective evaluation and does not constitute an objective assessment of environmental quality.

Figure 3. Blue space perception index (* Cronbach's $\alpha = 0.85$)

Changes in Perceived Stress Before and After Visiting the Beach

A comparison of perceived stress levels before and after visiting Batu Tunggal Beach shows a clear difference both descriptively and statistically. The boxplot (Figure 4) indicates that pre-visit stress levels were generally higher, whereas post-visit stress levels show a lower median and a narrower distribution.

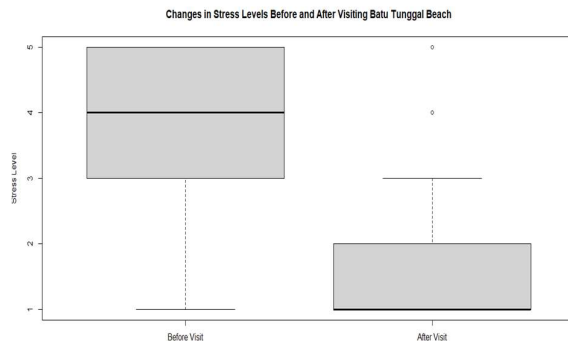


Figure 4. Changes in Stress Levels Before and After Visiting Batu Tunggal Beach

The Wilcoxon Signed Rank Test confirmed that this difference is statistically significant at $\alpha = 0.05$, indicating that respondents experienced a meaningful decrease in perceived stress following their engagement with the coastal environment. These findings empirically support the restorative role of blue space in contributing to psychological relief, particularly in reducing perceived stress

among Generation Z visitors. It is important to note that these measurements are based on retrospective self-assessment collected at a single point in time, in which respondents recalled and evaluated their stress levels before and after the visit within the same questionnaire. Therefore, the observed difference should be interpreted as a perceived retrospective difference, rather than as a result of longitudinal or experimental pre-post measurement. Accordingly, the findings indicate a reported decrease in perceived stress following the visit, but do not imply actual measured change over time or causal effects.

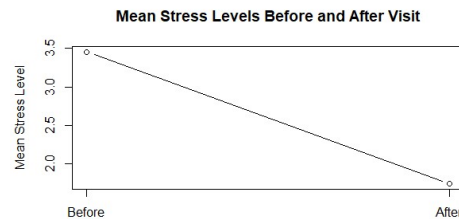
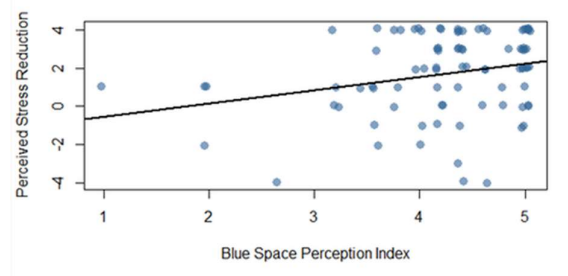


Figure 5. Mean Stress Levels Before and After Visit

Relationship Between Blue Space Perception and Stress Reduction

Spearman's rank correlation analysis was conducted to examine the relationship between the Blue Space Perception Index and perceived stress reduction. In this study, stress reduction is operationalized as the perceived retrospective difference between recalled pre-visit and post-visit stress levels. The results indicate a positive relationship ($\rho = 0.21$), suggesting that higher perception scores tend to be associated with greater reported reductions in perceived stress. However, the correlation is weak and only marginally significant ($p = 0.05042$), indicating that the association should be interpreted cautiously. This finding reflects a statistical association between subjective variables and does not establish causal linkage.



* ρ : 0.21, P-value: 0.05042

Figure 6. Relationship between blue space perception index and the perceived stress reduction

DISCUSSIONS

The demographic profile of respondents in this study is dominated by Generation Z university students, accounting for 91.8% of participants, who are primarily residents of Bangka Belitung Province. The remaining 8.2% of respondents originated from outside the province, including regions such as Central

Java, West Java, Jakarta, and Sumatra. Generation Z is frequently characterized in recent literature as experiencing elevated psychological vulnerability, including heightened levels of anxiety, stress, and depressive symptoms. Park et al. (2024) report that psychological instability is common within this age group due to academic pressures, transitional life stages, and social expectations. However, the same study indicates that many Gen Z individuals retain strong spiritual or religious orientations, which may function as a psychological coping mechanism associated with reduced depressive tendencies. This contextual background aligns with the findings of the present research, in which respondents *reported perceived emotional relief, calmness, and improved psychological state based on retrospective self-assessment* following coastal exposure. Previous studies have emphasized that interaction with natural environments contributes significantly to psychological restoration. Ojala et al. (2022) demonstrated that visiting natural settings after routine daily activities enhances mood, reduces mental fatigue, and improves perceived psychological recovery more effectively than urban environments. In this study, these outcomes should be understood as subjective perceptions recalled at a single point in time, rather than directly observed psychological changes. Similar patterns are reflected in the present study, where respondents experienced reduced perceived stress following their visit to Batu Tunggal Beach. This is consistent with Indrianty and Putri (2025), who found that participation in “healing tourism” activities generates feelings of peace, relief, and emotional stability. Gender distribution in this study shows higher participation by females. However, both male and female participants demonstrated similar psychological responses to blue space exposure.

Perception of the coastal environment at Batu Tunggal Beach was measured using the Blue Space Perception Index, consisting of indicators related to relaxation, natural sensory stimulation, social experience, revisit intention, and perceived psychological well-being, assessed using a five-point Likert scale in which higher values represent more positive perception. Reliability testing indicated strong internal consistency (Cronbach’s $\alpha = 0.85$), confirming that the items validly form a single composite construct. In addition, the construct validity of the BSPI is supported by theoretical foundations from prior studies in blue space and environmental psychology, ensuring that the selected indicators adequately represent the intended construct.

The score distribution demonstrated that most respondents reported high perception levels, with values predominantly clustering at scale points 4 and 5, while only a limited number of responses were recorded below 3. These results indicate that Batu Tunggal Beach is generally perceived as a highly pleasant and psychologically supportive blue space environment. The consistently high perception scores observed in this study align with the reduction in perceived stress reported by respondents after visiting the site. However, this alignment should be interpreted as an association between subjective perceptions rather than as evidence of direct psychological effects. Accordingly, Batu Tunggal Beach can be considered a blue space with meaningful psychological value within the broader framework of coastal and marine ecosystem services.

Analysis of perceived stress levels before and after visiting Batu Tunggal Beach shows a clear decline in stress among respondents. The stress reduction variable, calculated as the difference between pre-visit and post-visit stress scores,

demonstrated a positive central tendency with a mean value of 1.71 and a median of 2.00, indicating that most respondents experienced a two-point decrease in perceived stress on a five-point scale. The distribution further showed that 75% of respondents reported stress reductions of up to four points, while only a small proportion experienced minimal or negative change, as reflected by the minimum value of -4. It is important to emphasize that this “stress reduction” represents a *perceived retrospective difference*, derived from respondents’ recall of pre-visit and post-visit conditions within a single survey session, rather than a longitudinally measured change. Statistical testing using the Wilcoxon Signed Rank Test confirmed that this difference was significant ($V = 2554.5$; $p = 1.205 \times 10^{-8}$, $p < 0.05$), indicating that the difference in reported stress levels was not due to random variation. Therefore, these findings reflect patterns in perceived experience and should not be interpreted as causal evidence of psychological change.

The correlation analysis indicates a positive and marginally significant relationship between the Blue Space Index and stress reduction (Spearman’s $\rho = 0.2116$; $p = 0.05042$). In this study, stress reduction refers to the perceived retrospective difference in self-reported stress levels, and the correlation therefore represents an association between subjective variables. This finding suggests that respondents who perceived Batu Tunggal Beach as having higher-quality blue space characteristics such as scenic coastal views, environmental quality, and aesthetic appeal tended to experience greater psychological relaxation following their visit. However, the relatively weak strength and marginal significance of the correlation indicate that the relationship should be interpreted cautiously and does not imply a strong or causal linkage. The relatively weak correlation may indicate that perceived environmental quality represents only one of several determinants influencing stress experiences among Generation Z. Previous literature suggests that mental well-being in this age group is simultaneously shaped by multiple interacting factors, including academic pressure, social relationships, financial concerns, digital media exposure, and individual coping capacities (Dwidienawati et al., 2025; Budiman et al., 2025). Consequently, although respondents generally perceived Batu Tunggal Beach positively, variations in perceived stress reduction may have been influenced by these additional psychosocial factors that were not directly measured in the present study. Moreover, the predominantly high BSPI scores observed in this study may have reduced response variability, thereby limiting the strength of the statistical association. These findings suggest that positive perceptions of coastal environments do not necessarily translate into equivalent restorative experiences across individuals, as psychological recovery is likely to emerge from complex interactions between environmental attributes and personal circumstances. This nonetheless supports the growing body of coastal tourism literature emphasizing the importance of marine environmental quality in shaping visitors’ emotional and experiential outcomes. This reinforces the importance of maintaining high-quality marine and coastal environments in supporting visitor well-being within coastal tourism contexts. In line with previous studies, higher visibility and accessibility of coastal environments are associated with lower psychological distress and stronger social interaction, further highlighting the social and recreational value of blue spaces (Ting & Bahauddin, 2022). Proximity to the coast has also been linked to improved mental health conditions, where communities living closer to coastal areas generally demonstrate better well-being outcomes (Rahman & Sulaiman, 2024).

The findings of this study align strongly with literature indicating that coastal environments promote relaxation through multisensory experiences. Respondents frequently mentioned natural sensory stimuli such as wave sounds, sea breeze, scenic ocean views, and sunset as the dominant elements shaping their restorative experience at Batu Tunggal. These observations support Roe (2019), who argues that contact with natural environments can reduce human stress, induce calm, and help individuals temporarily disengage from stressors by directing attention toward soothing environmental stimuli such as the sound and feel of water. Such coastal sensory experiences contribute to emotional comfort and enhance the recreational value of marine tourism destinations. These findings can also be interpreted through the Attention Restoration Theory (ART) and Stress Reduction Theory (SRT) frameworks in environmental psychology. According to ART, natural environments containing softly fascinating stimuli, such as rhythmic wave sounds, sea breezes, and expansive ocean views, allow individuals to temporarily disengage from cognitively demanding tasks and restore depleted attentional resources (Kaplan, 1995). Meanwhile, SRT proposes that exposure to aesthetically pleasing natural settings evokes immediate positive affective responses and physiological relaxation, thereby reducing feelings of tension and psychological stress (Von et al., 2016). The sensory characteristics frequently reported by respondents in this study closely reflect these restorative mechanisms, suggesting that Batu Tunggal Beach may facilitate perceived psychological recovery through both attentional restoration and emotional stress reduction. Therefore, the low correlation coefficient should not be interpreted as evidence that blue spaces are unimportant for stress recovery, but rather that their restorative influence constitutes only one component within a broader and multifactorial system of determinants affecting psychological well-being among Generation Z.

Furthermore, natural coastal soundscapes have been documented to support bodily recovery processes and improve attentional stability, contributing to enhanced relaxation among visitors (Matt, 2019). Combined with visually appealing seascapes, geomorphological uniqueness such as rocky formations, and gently sloping coastal profiles, Batu Tunggal Beach demonstrates characteristics of a restorative ecotourism setting that encourages repeat visitation while supporting mental relief. These characteristics also align with Arnberger et al. (2018) and Georgiou et al. (2021), who emphasize that blue space environments not only support relaxation but may also encourage positive behavioral engagement such as light recreation and social interaction, which further strengthens their contribution to public health. From a blue space tourism perspective, the results demonstrate that Generation Z's perceptions of Batu Tunggal Beach play a significant role in shaping perceived stress reduction. Nevertheless, this role should be understood within the context of subjective evaluation and associative relationships rather than as a direct causal mechanism. The perceived quality of the coastal blue space, including visual aesthetics and environmental comfort, enhances its experiential value. Thus, the findings highlight the importance of perceived environmental quality while remaining limited to retrospective and perception-based assessment.

CONCLUSIONS

This study suggests that Batu Tunggal Beach may function as a valuable blue space in supporting perceived psychological well-being among Generation Z visitors. Positive perceptions of the coastal environment were found to be associated with a reduction in perceived stress levels based on retrospective self-assessment. These findings highlight the potential importance of maintaining coastal environmental quality to support the perceived restorative benefits of blue space tourism and provide additional evidence regarding the potential role of blue spaces in promoting psychological well-being. However, given the cross-sectional and retrospective nature of the study, the results should be interpreted as associative rather than causal relationships. Future research is recommended to employ longitudinal or experimental approaches and validated psychological instruments to further examine the relationship between blue space exposure and mental health outcomes.

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