RESTORATIVE ENVIRONMENT IN JUIZ DE FORA, MINAS GERAIS (MG): FROM TEXTUAL ANALYSIS TO THE CONSTRUCTION OF A PROPOSITIONAL AGENDA ABOUT THE UFJF BOTANICAL GARDEN

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ABSTRACT
This research had as its object of study the Botanical Garden of the Federal University of Juiz de Fora (UFJF). From the concepts of environmental psychology implying the Attention Restoration Theory (ART), the study aimed to analyze the perception of visitors who made public comments available on the digital platform Google Reviews, being filtered based on Bardin's (2011) content analysis (CA) technique. Thus, the exploratory and descriptive research used the support of the Voyant Tools (2025) online tool for data processing aiming at a textual analysis from the Cirrus word cloud and the analysis called Link. The results based on a textual corpus formed by (n=813) comments revealed that the UFJF Botanical Garden is widely perceived as a space that promotes contact with nature, complying with criteria associated with the theory in question about restorative environments. Finally, a purposeful agenda, which offers subsidies both for planners and managers, as well as for researchers and other interested parties, was created with four main focuses: (1) Recovering attention; (2) Relieve stress; (3) Contribute to the quality of life; (4) Combat seasonality from the uses of the UFJF Botanical Garden. Future studies can expand the methodological design to include primary data measured by questionnaires

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and interviews, which can contribute to analyzing an important aspect of ART: the role of individual stories for the symbolic interaction that restorative environments can elicit.

Keywords: Restorative environments. Botanical garden. Environmental Psychology. Digital Platform.

INTRODUCTION

The Botanical Garden of the Federal University of Juiz de Fora (UFJF) presents itself as a space dedicated to environmental conservation, ecological education, and the promotion of well-being in urban contexts (UFJF, 2024). In a scenario of increasing urbanization and socio-environmental pressures, this environment offers opportunities for meaningful interactions with nature, providing experiences that can favor mental and emotional recovery. Based on the principles of environmental psychology, the present study is based on the Attention Restoration Theory, by Kaplan and Kaplan (1989), which evidences the potential of natural environments to reduce stress and revitalize cognitive resources.

Accelerated urbanization and the environmental challenges that mark cities reinforce the importance of planned and accessible green spaces, capable of meeting the demands of leisure, education and mental health of the population (Szabo, 2018). Understanding the perceptions of users of these spaces is essential to improve their functionalities and contribute to their efficient management.

Within this context, the UFJF Botanical Garden emerges as a relevant object of study to investigate the implications of restorative environments in urban settings. Therefore, the research problem is configured as: What is the potential of the UFJF Botanical Garden to be perceived in evaluation platforms as a restorative environment for the city of Juiz de Fora in Minas Gerais (MG).

To this end, the research presents general and specific objectives, and the general objective was to identify perceptions of visitors to the UFJF Botanical Garden, considering its potential as a restorative space and the challenges associated with its infrastructure. The specific objectives were: (a) to analyze the Attention Restoration Theory, by Kaplan and Kaplan (1989) as a marker of conceptual theoretical categories; (b) understand the role that digital platforms that allow online evaluation, such as Google Reviews, can have for the perception of built environments.

The exploratory and descriptive research, of a qualitative nature, adopts a qualitative approach, based on content analysis according to Bardin (2008; 2011), based on public testimonies extracted from digital platforms, named online comments. In addition, the textual analysis tool Voyant Tools (2025) online is used, using term frequency and occurrence resources. In this way, the work contributes to the academic debate on the role

of the UFJF Botanical Garden in promoting well-being, quality of life and sustainability in contemporary urban contexts, notably in the city of Juiz de Fora in MG.

The work is organized in this introductory section, in a literature review that involves both the Attention Restoration Theory, by Kaplan and Kaplan (1989) in the context of Environmental Psychology, and Digital Platforms. Then the methodological aspects adopted are added, demonstrating the backbone of the research. Finally, before the conclusions, the results are presented and discussed in order to answer the research problem.

CONCEPTUAL THEORETICAL FOUNDATION

ATTENTION RESTORATION THEORY, BY KAPLAN AND KAPLAN (1989)

The concept of attention restoration gained prominence in the 1980s, with research conducted by a series of authors, such as: Altman and Wohlwill, Kaplan and Kaplan, Ulrich and Korpela, among others. In general, the studies sought to understand the characteristics of environments that trigger sensations of pleasure or displeasure, emphasizing factors that influence the perception and experience of individuals. According to Silveira (2017), environmental restoration occurs when emotional, mental, and behavioral states return to a condition of normality after periods of stress.

Kaplan and Kaplan (1989) defined four essential characteristics for an environment to be considered restorative: (1) escape, (2) scope, (3) fascination, and (4) compatibility. In addition, individual factors, such as the individual's personal history with the location and the positive experiences associated with the environment, play a crucial role (Kaplan and Kaplan, 1989). This subjective dimension implies that the same space can be perceived in different ways by different people, being influenced by memories, experiences, and social interactions. Also, as Kuhnen and Bernardes (2014) state, exposure to restorative environments not only reduces mental fatigue, but also contributes to general well-being and disease prevention.

The theories that underlie the concept of environmental restoration are widely discussed by Kaplan and Kaplan (1989, 1995) and Ulrich (1984). For example, the Attention Restoration Theory (ART) explores how natural environments aid in the recovery of directed attention, especially when it is fatigued after intense activities. Another example, the Psychoevolutionary Theory, proposed by Ulrich, highlights the biological predisposition of human beings to respond positively to natural stimuli, promoting the recovery of

psychophysiological resources impacted by stress. Both theories converge in recognizing the central role of natural environments in restoring psychological and physical health (Ulrich, 1984).

Recent studies reinforce these assumptions, for example Stevenson et al. (2018) noted that natural environments are widely perceived as more restorative than non-natural environments, playing a significant role in promoting psychological well-being. Similarly, Van Hedger et al. (2019) identified that natural soundscapes, such as birdsong and the sound of running water, increase the restorative capacity of environments. Hartig et al. (2020) emphasized that the inclusion of green spaces in urban areas is indispensable to reduce stress and improve public health. In addition, Van den Berg et al. (2019) demonstrated that even brief interactions with nature can bring substantial benefits, reinforcing the importance of ensuring everyday access to these spaces.

One of the core elements discussed by Kaplan and Kaplan (1989, 1995) is directed attention, a cognitive process that requires conscious effort to focus on specific tasks while blocking distractions. When maintained for prolonged periods, this form of attention can generate mental fatigue, characterized by symptoms such as irritability and decreased cognitive efficiency. Restorative environments, by offering naturally attractive stimuli, allow the recovery of attention without conscious effort, promoting relief and renewal. According to Alves (2011), these spaces are fundamental for the maintenance of mental and emotional health, especially in urban contexts.

The relationship between restorative environments and significant places also deserves to be highlighted, because, as observed, environments can have different meanings from an individual perspective. Fernandes (2014) argues that, through the construction of symbolic, social and affective meanings, a natural space that can be differentiated by individual perspectives, can become a place that promotes restorative experiences. This perspective highlights the importance of individuals' subjective interactions with the environment, expanding the possibilities of approaching and planning these places. Thus, understanding the dynamics between people and restorative environments is essential to integrate solutions that promote quality of life and sustainability, which can be perceived both in *on-site* research and those with secondary data from the advancement of digital platforms.

DIGITAL PLATFORM

The study of Brazilian botanical gardens is complex (Pereira and Costa, 2010). With the advancement of the World Wide Web (www), from the web from 1.0 to 4.0, from the world wide web - Internet, it is noted that there is an increasing convergence between digital and real environments and this needs to be understood within the complexity in which Brazilian botanical gardens are contained. Lévy (2011) already dealt with the relevance of the convergence between real, virtual and imagined. Latorre (2018) detailed the history of the web, demonstrating that the passage from web 1.0 to web 2.0 brought to light not only the consumption of digital content, but also the production of content, thus emerging on digital platforms the possibility of online comments that influenced and influence the behavior of users. Chart 1 allows us to understand the crucial historical advance:

Table 1. Temporal Web Considerations

Temporal considerations	
1990 (a)	It appeared in 1990 with a focus only on the reading part, being static (a).
2004 (a)	Inauguration of Web 2.0, changing cyberculture with a focus on innovation aimed at collaboration (a); Initiating various forms of interaction and giving rise to social networks (b).
2010 (b)	Web 3.0 or semantic arises, which allows the search for knowledge based on terms and collaborations in a network. Problems with data privacy, generation of prejudice and inequalities are intensifying, worrying the various *stakeholders*, that is, interested parties (b).
2016 (a)	Web 3.0 is focused on predictive issues and a notion of intelligence, including articulations related to decisions and desires (a).
2020 (b)	Scenario of uncertainty for social networks and digital platforms.

Source: Prepared by the authors based on (a) Latorre (2018); (b) d'Andréa (2020).

In line with Chart 1, in temporal terms, on the side of scientific production, it is observed that scientific research on digital platforms introduces a field called "Platform Studies" started in the 2010s. In general terms, it focuses on debates about the content produced on social networks (d'Andréa, 2020). It is observed that: "(...) the platforms appropriate the logics of connection and enhance them as part of a strategy – commercial above all – that aims to encourage users to leave traces of their relationships, preferences, etc. (...)" (d'Andréa, 2020, p.18).

Although the very meaning of virtual has been revised (Galvão, 2016), it is noted that with regard to commercial strategies, Lecinski (2011) made a critical analysis of the moment of truth in the provision of services. That is, the logic of the moment of truth, originally proposed by Carlzon in the 1990s (see Carlzon, 1994), is linked to the provision

of the service at the time it occurs, with the advances of digital platforms it is shifted to the internet, thus giving rise to the zero hour of truth.

At this point, digital platforms become a source of data (traces, as Andréa, 2020 explained) about diverse experiences, implying goods and services. For example, in the tourism sector, online travel reviews (OTRs) - that is, comments available online - from digital platforms such as TripAdvisor (2025a) become essential for advancing knowledge about perceptions of consumption of tourist space, including aspects that may be linked to the observation of the Theory of Attention Restoration, by Kaplan and Kaplan (1989).

This seems to be the case of the Botanical Garden of Juiz de Fora (MG), which is even on the digital platform TripAdvisor (2025b) among the first thirty attractions targeted for visitation. However, digital platforms such as Google (2024) allow a more homogeneous view to analyze the Theory of Attention Restoration, by Kaplan and Kaplan (1989) regarding the writing of comments, not differentiating them by visitors who are residents or tourists. This is further detailed in the methodology adopted in the present study.

METHODOLOGY

As mentioned, the research is exploratory and descriptive and had as its object of study the Botanical Garden of the Federal University of Juiz de Fora (UFJF) in Juiz de Fora, Minas Gerais (MG), and the central question: to answer about the perceptions of visitors, their potential as a restorative space, and their challenges associated with its infrastructure.

It should be noted that through a quantitative approach, with the support of the online tool Voyant Tools (2025), we sought to describe the potential of this space as a restorative environment by the perception of users of the digital platform Google Evaluation (2024), including the date November 28, 2024, for data extraction. In terms of theoretical-conceptual foundation, the Attention Restoration Theory, by Kaplan and Kaplan (1989), was used. Thus, data collection (3.1) and treatment (3.2) are detailed below.

DATA COLLECTION

The data were collected through comments extracted from the public online evaluation platform called Google Evaluations (2024), configuring a Platform Study, as detailed in the conceptual theoretical foundation by d'Andréa, (2020) and contextualized by the history of the web itself (Latorre, 2018).

This method of collecting public online comments, which can be considered indirect - as it does not collect primary data as it traditionally could be done from a *survey* or interview - allowed access to robust content (n=1689) comments collected until November 28, 2024. Only the evaluations that had textual data (n=813) were treated using the Content Analysis (CA) technique of Bardin (2011) and were part of the textual corpus that was inserted in Voyant Tools (2025) available online.

The comments extracted from the Google Evaluations Digital Platform (2024) were analyzed in order to identify aspects of the Attention Restoration Theory, by Kaplan and Kaplan (1989) as a marker of conceptual theoretical categories; as well as understanding the role that digital platforms that allow online evaluation such as Google Evaluations (2024) can have for the perception of built environments. The processing of the data is detailed below.

DATA PROCESSING

The data treatment was conducted based on the content analysis (CA) methodology proposed by Bardin (2011), which stands out for its careful organization and rigor in its investigative process. This method comprises three main steps: (1) pre-analysis; (2) the exploration of the material and (3) the treatment of the results for the formation of the textual corpus to be inserted in Voyant Tools (2025), as shown in Chart 2:

Table 2. Investigative process for the formation of the textual corpus

Steps	Description	Findings
Pre-analysis	Evaluations of the Botanical Garden were selected up to November 28, 2024.	n= 1689
Exploration of the material	The exploration of the material involved categorizing the data, with the creation of analytical categories that reflected the main characteristics and benefits described by visitors.	n= 813
Treatment of results	The treatment of the results enabled the in-depth interpretation of the perceptions, highlighting restorative aspects, such as tranquility, connection with nature and the aesthetics of the space.	n=813

Source: Prepared by the authors based on Bardin (2011)

The formation of the textual corpus with n=813 enabled a clear and detailed representation of the visitors' perceptions, highlighting both the most frequent terms from the Cirrus type of analysis, and the concurrences of terms from the analysis called Link, provided by the use of the online tool Voyant Tools (2025). It should be explained that the combined use of traditional techniques such as that of Bardin (2011) and advanced

technologies, such as the support of Voyant Tools (2025) proved to be a relevant methodological strategy for the production of an innovative analysis based on the Attention Restoration Theory, by Kaplan and Kaplan (1989). Next, in the next section, the results are presented from the characterization of the object of study to the interpretation of the data.

RESULTS

Fulfilling one of the objectives of the study, the contrast of visitation data with the public comments of the online platform allows precious insights into the role of online platforms (4.1.). In addition, the data are interpreted against the Attention Restoration Theory, targeting a set of conceptual theoretical categories extracted from the literature, which allowed us to understand the role that digital platforms can play in platform studies (see d'Andréa (2020), (4.2), with a view to creating a new agenda useful for the planning and management of space (4.3).

CHARACTERIZATION OF THE OBJECT OF STUDY IN VIEW OF THE ROLE OF AN ONLINE PLATFORM

The relevance of the UFJF Botanical Garden as a space sought after by the population, especially in leisure periods, such as school vacations in Juiz de Fora is evident in Chart 3. In addition, the variation in visitation over time shows that the space is sensitive to seasonal factors, with low and high seasons.

Table 3: Visitors to the UFJF Botanical Garden

Month	2023	2024
January	3.784	4.993
February	3.047	2.856
March	5.254	3.360
April	3.360	5.128
May	5.857	5.103
June	3.347	3.791
July	*	9.888
August	3.424	6.179
September	5.643	6.741
October	3.103	2.520
November	3.451	2.169
December	4.062	*
Total	44.600	52.728

Source: Prepared by the authors - *the data was not identified in the source consulted

Chart 3 shows the phenomenon of seasonality in the UFJF Botanical Garden, which is a natural space for leisure, since the highest number of visitors (n=9,888) was in July 2024.

This month corresponds to the school vacation period, potentially generating more free time for leisure and tourism purposes. In this context, it is noteworthy that Kiyotani et al. (2015) already highlighted the positive role that tourism in conservation areas has when analyzing the Benjamim Maranhão Botanical Garden, in João Pessoa (PB). On the other hand, the lowest number of visitors in the period investigated (Chart 3) occurred in November 2024, when visitors were recorded (n=2,169). This result may also be related to seasonal factors, such as the beginning of the rainy season or greater focus on school and professional activities, which limit free time for visits.

The monthly variation described in Chart 3 demonstrates the phenomenon of seasonality by sets of months, as examples: January, March and September presented more expressive numbers of visitation; (b) October and November were lower in terms of visitor frequency. Therefore, this phenomenon of seasonality points to the importance of planning and management strategies to generate greater balance in this area, which implies, among other issues, the conservation of the environment. Thus, the analysis was deepened based on comments collected as described in the methodology section:

Chart 4: Comments on the Digital Platform on the UFJF Botanical Garden

Platform	Number of reviews	Period
Google Reviews	813	2019-2024

Source: Prepared by the authors

The results achieved with the processing of data from the use of the Voyant Tools tool (2025) are presented and discussed below. These two results instrumentalize a purposeful agenda for the planning and management of the UFJF Botanical Garden, in view of the Attention Restoration Theory (ART) applied to secondary data from the digital platform Google Evaluations (2024).

RESULTS AND DISCUSSIONS IN THE LIGHT OF ATTENTION RESTORATION THEORY AND VOYANT TOOLS

As detailed in the Methodology section, the use of the Voyant Tools tool (2025) was integrated into the process of processing textual corpus data to optimize the identification of patterns and trends in the light of the Attention Restoration Theory (ART). In Figure 1,

the Cirrus result, that is, word cloud, evidenced the most frequent terms in the textual corpus, which crossing the Attention Restoration Theory can be seen that the words: "nature", "beautiful", "wonderful" and "great" indicate a broad appreciation of the positive characteristics of the UFJF Botanical Garden, as a natural and welcoming environment. In this sense, according to Kaplan and Kaplan (1989) there are four essential characteristics for an environment to be considered restorative: (1) escape, (2) scope, (3) fascination and (4) compatibility, and the terms "beautiful", "wonderful" can be linked to some type of fascination. On the other hand, the term "nature" is linked not only to the possibility of "escape", but also to "scope".

Figure 1. Cirrus

Source: Prepared by the authors

Additionally, in Figure 1, terms such as "family", "quiet" and "picnic" reveal that the UFJF Botanical Garden is often perceived as an appropriate place for social activities, leisure and rest in contact with nature, which justifies the data on seasonality described in Chart 3, but also reinforces the qualitative analysis of its role as an environment that expresses a context (scope) relevant to the experience provided.

As Van Hedger et al. (2019) identified that natural soundscapes, including birdsong, and the sound of flowing water, increase the restorative capacity of environments, it is noted that the term "nature", "entrance", "outside", "city", can lead to understanding that this "natural" aspect is linked not only to the escape explained by Kaplan and Kaplan (1989), but also to natural experiences concerning what Van Hedger et al. (2019) described, since the term "peace" is prominent.

Figure 2 allows us to more effectively understand occurrences by link between terms. Articulating with the theoretical and conceptual aspect of ART, it is recalled what authors such as Hartig et al. (2020) emphasized about the inclusion of green spaces in urban areas as indispensable to reduce stress and improve public health.

Figure 2. Link

Source: Prepared by the authors

In Figure 2, the semantic structure presented in the graph points to the multiple dimensions that consolidate the Botanical Garden as a space for promoting well-being, contemplation and connection with nature in the urban context. For example, from the TRA it became evident that "contact" with "nature" indicates the valorization of direct interaction with the natural environment. On the other hand, the chain between "nature", "wonderful" and "beautiful" qualifies the Botanical Garden as an "escape" that is "excellent", "great" and "perfect", but that requires "care".

NEW AGENDA

Understanding how natural environments can promote attention recovery, relieve stress, and improve quality of life is a challenge that unites theory and practice. In short, the UFJF Botanical Garden proved to be an essential space for the integration of environmental conservation of the natural environment, and can make use of assumptions such as: environmental education and strategies to promote well-being, including to combat seasonality.

Thus, based on the characterization of the object (4.1) and the application of the TRA to the findings with the application of Voyant Tools (2025) (4.2.), it is possible to build this new propositional agenda, as shown in Chart 5 below, which can help urban planners and managers, and on the other hand, favor the bidirectional flow between academia, science, and the world of work.

Table 5. Propositional agenda for the UFJF Botanical Garden

Actions	Description
1	Recovering attention: from the fascination of entering a natural space within the city and that seems to be outside the city.
2	Relieve stress: with contact with nature.
3	To contribute to improving the quality of life through actions that involve families and groups in a process of environmental education and nature conservation activities.
4	Combat seasonality: by attracting other audiences such as tourists and researchers.

Source: Prepared by the authors

In summary, this agenda for the UFJF Botanical Garden illustrates the relevance of restorative environments in contemporary cities, standing out as an example of how green spaces can harmonize environmental preservation, leisure and education. The strengthening of strategies that integrate urban planning, sustainability and inclusive public policies can further enhance the positive effects that are triggered by this agenda.

CONCLUSION

The study fulfilled the general objective by analyzing the role of restorative environments in the scope of environmental psychology. This, using the object of study Botanical Garden of the Federal University of Juiz de Fora (UFJF), notably from secondary data collected on the digital platform Google Evaluations (2024) and with the support of the textual analysis tool Voyant Tools (2025) online.

Through the Attention Restoration Theory (ART), Kaplan and Kaplan (1989) and the Bardin (2011) technique, it was possible to contextually understand how the UFJF Botanical Garden, as a natural environment, can promote: (1) the recovery of attention, (2) relieve stress and (3) contribute to improve quality of life; (4) combat seasonality, taking into account the perception of visitors who communicated this from the online platform.

Finally, it should be explained that the role of this Botanical Garden, as an interdisciplinary and multipurpose space, is an opportunity not only for UFJF and the local community, but for the city of Juiz de Fora to position itself in the regional scenario of trips aimed at nature, health and wellness tourism, as well as scientific tourism itself. This is thanks to adjectives such as: "wonderful", "perfect" which, among others, denote satisfaction with the contact with nature provided.

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