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The Growing Influence of Environmental Psychology in Architectural Design

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Abstract— **The traditional way of conceptualizing cities has drastically changed over time. Today, certain metropolises such as London, Paris, Dubai, Marrakech, Johannesburg, Kigali, and Athens stand out as global cities, dominating the global landscape not only through their economic influence but also through their unique architecture. Our study subscribes to the field of environmental psychology and aims to delve deeply into how urban architecture shapes our mindset, thoughts, emotions, moods, sensations, behaviors, and concentration. The goal is to demonstrate, through a field study, the significant impact that architecture can have on the daily lives of individuals. Much like the technology that defines smart cities through its everyday applications, architecture plays a crucial role in enhancing urban life quality. By incorporating thoughtful design elements and considering the psychological needs of residents, cities can become spaces that are not only more functional but also more inspiring. This research seeks to establish a concrete link between the physical structures of a city and the psychological experiences of its inhabitants. By studying cities with marked and diverse architectural characteristics, we hope to highlight the various ways in which architecture can positively or negatively influence urban life. Thus, the findings of this study could offer valuable insights for future urban development projects, emphasizing the importance of designing spaces that promote mental and emotional well-being.**

Keywords— smart city; architecture; environmental psychology; well-being; concentration; motivation; performance

I. INTRODUCTION

In contemporary times, global cities are increasingly becoming centers of attraction due to their unique characteristics and offerings: London is renowned as "the place to be", Houston is known as the "hub of black gold", Shanghai represents "the great leap forward", Sydney is celebrated as the "metropolis down under", Mumbai epitomizes "Indian globalization", Seoul is hailed as "the success story", Johannesburg is recognized for "the gold of the ghettos", Tokyo for its "centralized power", Jerusalem as "the holy city", Los Angeles as "the capital of cinema", Dubai as a "playful and luxurious city", Athens as "the mythical and Olympics' city", Marrakech for its "architecture, color, and palm trees", Paris as "the city of lights transitioning to the future" and Kigali as a beacon of "African greenery".

This study focuses on the architectural structure of these cities. Nestled within the realms of architectural and environmental psychology [1],[2], this article aims to demonstrate, through comprehensive field studies both nationally and internationally, how the architecture of specific cities can profoundly impact our thoughts, emotions, behaviors, concentration, and moods. Whether by design or by default, the architecture of a city is a fundamental aspect of the human and social dimensions encapsulated within the concept of a "smart city".

We would display through tangible examples how urban architecture can modify our emotional states and enhance our cognitive focus, paralleling the transformative potential of AI in our personal and professional lives. This exploration will include presenting scientific studies from the United States and Sweden, alongside a parallel study being conducted in Moroccan cities such as Rabat, Tangier, and Tetouan. The objective is to elucidate the intelligent role that architecture can play in fostering mental well-being, highlighting how thoughtfully designed spaces can act as catalysts for improved mental health and productivity. This research underscores the significance of architectural influence in urban environments and aims to contribute to the ongoing discourse on sustainable and psychologically considerate urban planning.

II. METHODOLOGY

a. Moroccan Context (Rabat, Tangier, and Tetouan)

This study has to do with the dynamics of real social and mental experiences, unfolding within the architectural environments of Rabat, Tangier, and Tetouan. It examines their impact on the thoughts, feelings, and behaviors of students or learners in general. By delving into the daily experiences of participants, the study aims to understand how

architecture directly influences their educational and social experiences.

b. Data Collection and Analysis

The perspectives and opinions shall be derived from systematic and participatory observation. This method involves a deep immersion into the group being studied, allowing for an intimate understanding of the dynamics at play. The data collected are both natural, reflecting spontaneous behaviors in an unaltered setting, and rational, stemming from targeted and structured interactions.

Students were observed during their verbal interactions, through questions posed during direct interviews, and via online platforms such as Facebook and WhatsApp. The use of these digital tools for interviews not only reaches participants in a setting where they feel comfortable but also allows for the real-time collection of data, facilitating a more dynamic and immediate analysis of their reactions and responses.

c. The Role of Participatory Observation

Participatory observation, a central element of our methodology, requires the researcher to actively engage with the group under study. This approach not only captures authentic data on daily interactions and emotional responses of students but also provides a firsthand perspective on the nuances of the architectural environment and its tangible influence on individual behaviors and mental processes.

This methodology seeks to capture the essence of the lived experience of students within distinct architectural settings, assessing how these environments influence and shape their cognitive abilities and emotional well-being. The anticipated results aim to enhance our understanding of the connections between architecture and environmental psychology, offering insights for more conscious and inclusive urban interventions.

III. What is a city?

A city is more than just a collection of buildings and roads; it is a vibrant entity that significantly influences the lives of its inhabitants. The architecture of a city and the environment it creates play crucial roles in shaping the health and well-being of those who live there. Defined as a community of inhabitants united to manage their common interests and self-govern according to their laws, a city embodies the essence of urbanization. This urbanization is designed to enhance aspects such as hygiene, safety, comfort, commerce, lighting, sewage systems, fire prevention, open spaces, quality services, hospitals, and most importantly, architecture [3], [4], [5], [6].

Cities are the defining pillars of a country. The cities of today, which began to take their modern shape in the early 21st century, are characterized by their magnetic allure. Currently, over half of the world's population resides in urban areas, a figure that is steadily increasing. Reflecting on the past, Jean-Jacques Rousseau in the 18th century viewed cities critically, stating, "Men are not made to be crowded into ant hills but scattered on the earth, which they must cultivate.". He described the city as the "abyss" of the human species—a view that, while intense, highlights the challenges of urban living.

It is difficult to assert that Rousseau's perspective is widely shared today, as cities continue to evolve dramatically. Drawing on depictions from the seventh art, like the films "Metropolis" and "Blade Runner," future cities are often imagined as overpopulated, tyrannical, and chaotic environments. In such cinematic universes, both the underprivileged and privileged urban dwellers often dream of escaping the commotion, even if just for a weekend.

Recent statistics confirm that urbanization is an unstoppable trend, with more than half of the global population now living in cities, and this number is on the rise [7], [8]. We must recognize that the architectural trends shaping the cityscapes of tomorrow—from London to Hong Kong, Boston to Buenos Aires, and Dubai to Johannesburg—are pivotal. These trends are not only redefining the physical space of cities but also their social fabric and the psychological well-being of their residents.

While the cities of today bear little resemblance to those of Rousseau's era, and will continue to evolve away from the dystopian visions seen in film, they remain complex environments. The challenge for modern urban development is to balance growth and livability, ensuring cities are places where people do not just live but thrive.

IV. Greenery and Concentration

Cognitively, especially concerning concentration abilities, the spatial environment plays a crucial role. A confined space does not influence an individual in the same way as an open one. The views offered by a residence can significantly impact the mind. A simple glance out the window can immerse someone in a daydream or reverie. One might even describe it as a distraction. In this context, meditating or contemplating natural landscapes like forests, rivers, mountains, cliffs, or waterfalls can undoubtedly enhance concentration[3], [9], [10], [11].

In 2000, a study conducted by psychologist Nancy Wells at Cornell University in New York closely followed children aged 6 to 13 before and after they relocated. The researchers compared the environment of the old residence with the new one, which featured green, clean, and colorful settings. The results were remarkable; the children felt comfortable, displayed high morale, and showed improvements in concentration and attentiveness.

A similar study we conducted with students in Rabat residing at the Moulay Ismail campus revealed that students on the 3rd floor, who had views of nature, the sea, or forests from their rooms, were more focused and

attentive than those whose views were limited to other buildings.

Green spaces could also be highly beneficial for students experiencing attention disorders and dispersion. The same students from the university campus in Rabat confirmed that after spending time playing and walking in open green spaces, their ability to concentrate significantly improved during academic tasks (lectures, practical work, and directed studies) and follow instructions. They attested that stress and attention disorders became rare and less pronounced when they relaxed in clean and green spaces.

This correlation between green spaces and concentration underscores the critical importance of integrating nature into urban and educational environments. Not only do these spaces enhance psychological well-being, but they also promote greater efficiency in learning and in performing tasks that require sustained attention.

V. The Positive Impact of Light

Light is a fundamental element in urban design, impossible to overlook in any discussion about city planning. Paris, often celebrated as the "City of Lights" serves as a prime example of how integral light is to urban aesthetics and functionality. In the era of smart cities, the role of light extends beyond mere illumination; it becomes a crucial component of urban life quality. Natural light, in particular, offers substantial benefits to the occupants of buildings, significantly influencing health and well-being by synchronizing our biological clocks [6], [12], [13].

The natural daylight helps outline our circadian rhythm—the cycle that alternates between wakefulness and sleep. This internal clock of the human body not only adapts our biological rhythm to the 24-hour daily cycle but also regulates key psychological or biochemical processes such as sleep, wakefulness, eating, meals, and work patterns. Exposure to adequate natural light during the day helps maintain alertness and promotes better rest at night, optimizing our overall function.

However, the absence of sufficient natural light can have detrimental effects, especially on children. For example, a study conducted in Sweden in 1992 involving children aged between 4 and 9 years in four different classes demonstrated significant health impacts over a year. Researchers found that the cortisol levels in the blood—a hormone linked to stress, depression, and anxiety and regulated by the circadian rhythm—were abnormally low in classrooms that lacked adequate natural lighting. This deficiency could potentially lead to various emotional and cognitive issues, highlighting the importance of architectural designs that maximize natural light.

Furthermore, enhancing natural light in urban environments not only supports biological functions but also improves mood and energy levels, reducing the reliance on artificial lighting which can save energy and reduce costs. Urban planners and architects are increasingly recognizing the value of designing spaces that harness the power of natural light, promoting not only environmental sustainability but also enhancing the quality of life for city dwellers. In summary, the strategic use of light, particularly natural light, in urban settings is vital. It not only beautifies the space but also plays a critical role in health and environmental sustainability. As cities continue to evolve, the intelligent integration of light into urban design remains a priority, ensuring that urban environments are both aesthetically pleasing and conducive to the well-being of their inhabitants.

In a focused study conducted in Tetouan, Morocco, we surveyed students in preparatory classes to evaluate the influence of natural light on their academic achievements. A total of 63 students participated (36 females and 27 males), and their feedback underscored the significant role that sunlight plays in enhancing their academic results. The students reported that adequate exposure to natural light not only boosted their academic performance but also increased their perseverance and overall performance.

To further support these findings, we can refer to a comprehensive study from 1999 in the United States. Researchers specializing in energy-efficient building design analyzed the academic performance of 21,000 students across California, Washington, and Colorado. They used photography, architectural plans, and on-site visits to measure the amount and intensity of light in 22 classrooms on a scale from 1 to 6. The results were compelling: over the course of a year, students in classrooms with more sunlight and better overall lighting demonstrated significant improvements in reading (30% faster progress) and mathematics (28% faster progress) compared to those in less well-lit environments.

In contrast, our study in Martil, a city known for its student population during the academic year, highlighted the challenges of inadequate lighting. We surveyed 59 students from various faculties, including the Ecole Normale Supérieure, the Faculty of Arts and Humanities, the Faculty of Legal, Economic, and Social Sciences, and the Faculty of Theology. The findings were as follows:

- 23 students who installed additional lighting to achieve normal brightness experienced increased levels of depression, stress, and fatigue.
- 26 students living in dimly lit conditions reported that they could only effectively read and study outside their homes; they felt compelled to sleep upon returning home due to the poor lighting.

- 10 students residing in well-lit accommodations reported rare symptoms of depression and expressed a preference for studying at home rather than seeking alternative locations like cafes or gardens.

These observations are further corroborated by an international study conducted in 2008 in Amsterdam, the Netherlands. Neuroscience specialists led by researcher Rixt Riemersma-Van der Lek conducted a study in retirement homes, selecting 10 facilities where they installed lighting at varying brightness levels of 1100 lux, 400 lux, and 100 lux. The outcomes varied significantly:

- At 1100 lux, residents maintained a normal circadian rhythm and brain function.
- At 400 lux, hormonal fluctuations were observed among the residents.
- At 100 lux, there was a noticeable decrease in circadian rhythm and disruptions in metabolism.

These studies collectively highlight the critical role of proper lighting in educational settings and living environments. They emphasize that adequate lighting not only supports academic and cognitive performance but also significantly impacts psychological well-being and physical health. The evidence suggests a clear link between light exposure and both mental and physiological health, reinforcing the need for architectural and urban planning standards that prioritize natural and appropriate artificial lighting.

VI. Furniture ARRANGEMENT

The layout and arrangement of furniture play a critical role, impacting the psyche and potentially influencing social interactions. Research in environmental psychology has shown that the arrangement of seating in care facilities is not arbitrary; it significantly affects mood and actively engages individuals. For instance, it has been found that placing chairs along the walls in common areas does not promote socialization. Conversely, organizing furniture in an orderly manner and small, dispersed groups within a confined space facilitates interactions and effective communication among residents, tenants, or occupants.

To illustrate these points, researchers in psychology conducted a field study in 1999 at the University of Magdeburg in Germany and Uppsala University in Sweden, focusing on students. For three months, a group of students used tables and desks arranged linearly. Subsequently, for a similar period, the researchers changed the setup to a semi-circular arrangement around the teacher. Observations from the second setup showed that the students transformed—they became more motivated, dynamic, concentrated, and attentive. The students participated actively and posed numerous questions. They were so engaged that they even managed to motivate the teacher.

These observations underscore the importance of furniture arrangement as a key factor in enhancing individual engagement and productivity in both educational and professional environments. This suggests that spaces can be strategically designed to encourage greater interaction and collaboration, which are essential for personal and professional development. By creatively thinking about how we structure our common workspaces, we can significantly influence collective behavior and individual outcomes, transforming ordinary environments into dynamic and interactive spaces that foster learning and growth.

In a comprehensive field survey at the National School of Applied Sciences (ENSA) in Tangier, Morocco, we explored the impact of furniture arrangement on student engagement and mental state, involving 81 students (51 females and 30 males). The unanimous feedback from students highlighted that the layout of tables and desks significantly influences their mental engagement and inspiration. According to their responses:

- Arranging desks in rows fosters an environment that encourages independent work and maintains discipline within the classroom. This setup appears to enhance focus and personal accountability among students.
- Conversely, arranging tables in a loop or circular shape facilitates open communication and ease of expression in public speaking settings. This arrangement promotes a more collaborative and interactive classroom atmosphere, encouraging students to participate more freely.
- Disordered or aligned tables and desks lead to boredom and disengagement, causing students to simply wait for classes to end. This setup contributes to a soporific and monotonous learning experience, which can result in a loss of confidence and patience. Ultimately, students feel demotivated and may experience depressive states.

Furthering our investigation into environmental factors affecting academic and professional settings, we conducted another field survey at the Faculty of Medicine in Tangier. This study involved 75 students (45 males and 30 females). It focused on the impact of flooring on the morale of not only patients and their families but also medical staff including doctors, nurses, and administrators.

At Mohammed VI Hospital in Tangier, medical students participating in the survey noted that carpeting and well-maintained, clean flooring significantly increased the duration of visits by friends and family of patients. Doctors corroborate that social support plays a crucial role in the healing process, even if the benefits are primarily psychological. Despite the aesthetic and comfort advantages of carpeting, some students pointed out its drawbacks, particularly in terms of hygiene.

Carpeting, while potentially more challenging to clean than standard hospital floors, presents a health hazard, especially in high-traffic areas like emergency services. However, in long-term stay rooms and less critical services, the benefits of carpeting might be utilized more effectively, leveraging the positive psychological impact without compromising health standards.

These studies underline the importance of considering every aspect of environmental design—be it furniture arrangement or flooring choices—in educational and medical facilities. Each element not only contributes to the functional aesthetics of these spaces but also significantly impacts the psychological well-being and productivity of individuals using them. As we continue to explore these dynamics, it becomes clear that strategic design decisions can transform ordinary spaces into supportive environments that enhance learning, healing, and overall engagement.

VII. Conclusion

While it is true that research in environmental psychology has historically been modest, there is a noticeable trend toward increasing interest and expansion in this field. Traditionally, researchers have concentrated their efforts on public buildings such as schools, hospitals, and retail environments, often overlooking the nuances of private spaces. However, the landscape is shifting, with a growing body of research each year that underscores the beneficial impacts of thoughtful architectural design.

Recent studies illuminate how the strategic arrangement of rooms and openings, the application of specific colors, the management of light sources (including the nature and quality of light), the selection of furniture, and the choice of flooring materials all play pivotal roles in enhancing human well-being. These elements are not merely aesthetic considerations; they are foundational to creating environments that positively influence the daily experiences of individuals in both living and working spaces.

The impact of these architectural choices is profound and multifaceted. Well-designed spaces can improve mood, increase productivity, enhance comfort, and promote physical and mental health. For example, the use of natural light has been repeatedly shown to affect mood and cognition positively, reducing symptoms of depression and increasing cognitive function. Similarly, the choice of colors in an environment can influence stress levels, with calming hues often used in spaces designed for relaxation and vibrant colors employed to energize and stimulate activity.

Moreover, as the field of environmental psychology continues to grow, there is an increasing recognition of the need to apply these insights more broadly, extending beyond public spaces to include private dwellings. Homeowners, architects, and interior designers are beginning to embrace these principles, recognizing that the environments where people spend the majority of their time can significantly benefit from the same careful planning and consideration that have traditionally been applied to public spaces.

In conclusion, the expanding research in environmental psychology is reshaping our understanding of how architecture impacts human behavior and well-being. It is becoming increasingly clear that thoughtful design choices in both public and private spaces are not merely aesthetic decisions but strategic ones that have a profound influence on the quality of life. As this field continues to evolve, it will undoubtedly contribute to more humane and effective architectural practices, enhancing the well-being of individuals and communities alike.

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