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Restorative urban environments for healthy cities: a theoretical model for the study of restorative experiences in urban built settings

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ABSTRACT

Urban landscapes are becoming the main ecosystem for human life. Given that urban living can be associated with poor psychological health, one specific challenge faced by cities is related to psychological well-being. The current essay discusses how restorative environments research can offer significant insights into the strategy of healthy cities by guiding the exploration of their restorative outcomes. We propose a theoretical model elucidating the physical and symbolic features of urban settings that can aid processes of active and passive restoration—based on theory and evidence from restorative environments research. Future research should consider urban psychological restoration in a broader sense and lend greater relevance to the exploration of the restorative potential of the full range of urban built settings.

HIGHLIGHTS

1. There is a need to explore the characteristics of urban built settings that support psychological health.
2. We propose a three-level model of restoration that discusses supportive features and potential benefits.
3. Active restoration—activated by top-down features—enhances positive affect and well-being in non-stressed individuals.
4. Future research should broaden theoretical definitions and explore the full range of restorative built settings.

KEYWORDS

Psychological well-being; restorative environments; urban built settings; attention restoration; stress recovery; healthy cities

Introduction

Cities are becoming the main ecosystem for human life. Since 2007, more than a half of the human population has dwelt in cities, and 68% of the world population is projected to live in cities by 2050 (United Nations [UN], 2018). In recent years, a new understanding—that urban environments can become healthy places—has emerged. From a policy perspective, the European Landscape Convention (Council of Europe, 2000) recognised the value of everyday areas, such as

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streets, squares, and buildings, and highlighted their contribution to people's quality of life and well-being; among its Sustainable Development Goals (UN, 2015), the UN included the pursuit of good health and well-being for all (Goal 3), and inclusive, safe, resilient, and sustainable cities (Goal 11). Further, the European Landscape Convention's Social Determinants of Health model (WHO, 2015) stressed the impact of daily living conditions, structural power, and economic inequities on people's health, well-being, and life expectancy. Informed by these policy guidelines, numerous cities in the world are developing strategies for healthy cities meant as settlements, which continually improve their physical and social environments to enable people to perform life functions effectively (WHO, 2022; see, for example, Healthy London Partnership[1], Vancouver Healthy City Strategy[2], Paris 15-minute city strategy[3]).

One specific challenge of the healthy city is related to psychological well-being because prior evidence has suggested that urban living is associated with worse psychological health than rural living (Peen et al., 2010). Psychological well-being is affected by several aspects of urban living, one of which is the physical and symbolic environment (Roe & McCay, 2021). Hence, identifying the tangible and intangible characteristics of environments that can support psychological well-being is of high importance. Despite contributions from different disciplines (Jacobs, 1961; Lynch, 1984; Nasar, 1994), no encompassing theory exists on the effects of environments on psychological well-being. We argue that restorative environments research (Hartig, 2004; Kaplan & Kaplan, 1989; Ulrich, 1993; Ulrich et al., 1991) can offer significant insights to identify such characteristics. Indeed, a recent systematic review examined the restorative potential of urban built settings and concluded that some urban built settings can support restoration (Weber & Trojan, 2018). Building on the review by Weber and Trojan (2018) and on theory and empirical evidence on restorative processes in urban built settings, the current essay proposes a conceptual model on the physical and symbolic features of urban environments likely to afford restorative benefits, thus bringing together different disciplines. The overarching goal is proposing a conceptual model that assesses the characteristics of urban and built settings contributing to psychological restoration to ultimately guide future research.

Restorative environments and the role of urban built settings

Restorative environments research

The field of restorative environments has emerged in the late 1980s and has gained greater relevance in the last decades within environment–behaviour and landscape research (Hartig et al., 2011). The field explores the environmental characteristics that support psychological well-being, often quantifying such outcomes. Restoration has been defined as the recovery from the psychological resources that diminish after meeting everyday demands (Hartig, 2004), including cognitive (e.g. attentional performance), affective (e.g. positive mood, energy) or social resources (e.g. communication, leadership). Here, scholars distinguish between restoration (the recovery from a psychological depletion) and instoration, which is the strengthening or development of other personal abilities or competences (Hartig, 2017)—with the literature having tended to focus on the former and lending relatively scant attention to the latter. Restorative environments research has been guided by two main theories: Attention Restoration Theory (ART; Kaplan & Kaplan, 1989) and Stress Recovery Theory (SRT; Ulrich, 1993; Ulrich et al., 1991). Both theories posit that contact with environments that possess certain characteristics may help recover from attentional fatigue and emotional distress and improve people's psychological state. Despite the relative conceptual differences between ART and SRT summarised here, research on psychological restoration usually integrates both perspectives (Subiza-Pérez et al., 2019). ART and SRT frame nature, or certain natural environments, as the prototypical providers of restorative experiences. ART postulates that restorative environments are characterised by four restorative properties: awakening a feeling of psychological distance from daily nuances (being away), displaying a rich and well-organised content (extent), providing aesthetic value and

generating interest (fascination), and fulfilling people's needs and inclinations (compatibility). These authors recognised that the environments meeting these conditions can be restorative (Kaplan & Kaplan, 1989, pp. 182–198); however, they also stated that while nature environments tend to score high in all of them, urban settings hold a much lower restorative potential due to being demanding in cognitive terms (Kaplan, 1995; Kaplan & Berman, 2010).

By its part, Roger Ulrich's SRT presented urban environments—especially the ones lacking green or water features (Ulrich, 1993, pp. 94–96)—as settings precipitating cognitive and emotional fatigue due to their limited aesthetic potential and the presence of noise, traffic, and a high number of people (Ulrich, 1991, pp. 205–206). He explicitly stated that humans are not readily prepared for restorative responses in most urban built settings (Ulrich, 1993, pp. 99–100; Ulrich et al., 1991, pp. 208–209) and found that it is natural environments specifically that promote affective recovery (Ulrich, 1993).

Drawing on these theoretical premises, most research on restoration has compared the restorative potential of natural versus urban built settings, exhibiting the benefits of contact with nature (Lindal & Hartig, 2015; White & Gatersleben, 2011). These ideas have also influenced policy and practice, and one direction adopted by international institutions and governments to address the need for healthy settings has been the naturalisation of cities through green infrastructure (GI) and nature-based solutions (NBS; European Commission, 2015). Consequently, interventions have been implemented in the Western world to include building-integrated vegetation (White & Gatersleben, 2011), pocket parks (Nordh et al., 2009) and street vegetation (Hoyle & Sant'Anna, 2020; Lindal & Hartig, 2015) in cities. However, arguably, the implementation of GI and NBS in cities cannot be the only way forward for healthy cities as it might not always be possible—either due to the decreasing amount of available free space in current cities (van den Berg, Hartig, & Staats, 2007) or due to other practical reasons (e.g. budget, maintenance costs). Additionally, the COVID-19 pandemic has highlighted the importance of the immediate residential surroundings (Nieuwenhuijsen, 2020) due to travel restrictions and limitations to visit natural spaces outside cities. Considering all the aforementioned elements, we propose that improving urban built settings is a solution for improving population health and well-being.

Cities and psychological well-being

Our conceptualisation of urban built settings—also referred to in the literature as grey settings (Bornioli et al., 2018a; Subiza-Pérez et al., 2019)—is related to those outdoor and indoor places that are mostly built in essence and that may or may not contain green or blue elements; however, these remain non-predominant. Examples include streets with minimal vegetation (Bornioli et al., 2018a), urban squares (Subiza-Pérez et al., 2019), museums (Mastandrea et al., 2018), and cafés (Staats et al., 2016).

The concept of restorative environments is, in principle, an excellent candidate for assessing the psychological outcomes of contact with urban built settings. However, few empirical works have specifically paid attention to restoration processes in urban built settings. Additionally, when comparing the restorative potential of natural and urban settings, an important methodological bias of setting selection has been flagged by previous works (Scopelliti et al., 2018; Staats et al., 2016; Weber & Trojan, 2018); the tendency has been to compare *positive* natural areas (e.g. beautiful, tranquil, and aesthetic recreational forests or parks) with *negative* urban built settings (e.g. ugly, busy, noisy non-recreational streets). Indeed, when examining the current literature, in most cases, urban settings used in previous experimental studies were unattractive commercial or peripheral areas with motor traffic (Hartig et al., 2003; Tilley et al., 2017; Ulrich et al., 1991). This practice might have negatively affected the quality of the evidence on the restorative potential of urban built settings and contributed to reinforce the negative perspective regarding

city environments. Arguably, this view tends to be of limited help in developing guidelines to improve the overall quality of cities—the main ecosystem for human life.

Nevertheless, the fact that certain natural settings outdo urban built ones in terms of restoration should not discourage research on the latter (San Juan et al. 2017, p. 3). Prior evidence has demonstrated that exposure to positive[4] urban built settings without nature could lead to affective and/or cognitive benefits (i.e. San Juan et al., 2017) or null or negative effects (Hartig et al., 2003; Staats et al., 2003; Tilley et al., 2017). Settings such as historic places (Brancato et al., 2022; Fornara, 2011; Masullo, Ozcevik Bilen, et al., 2021; Masullo, Toma, et al., 2021; Scopelliti et al., 2019), museums (Kaplan et al., 1993; Mastandrea et al., 2018), commercial streets (Barros et al., 2021), cafés (Staats et al., 2016) or urban cemeteries (Nordh et al., 2017) were also found to support restoration (Weber & Trojan, 2018). Additionally, a recent study found that, among a sample of around 800 Finnish and Hungarian students, only 56% selected a natural setting as favourite place used for psychological recovery (Korpela et al., 2020).

Despite growing evidence, the specific features that can explain restorative experiences in urban settings remain unclear, and little is known regarding what exactly contributes to making an urban setting positive. In the planning, design, and architecture fields, seminal work by Lynch (1984), Jacobs (1961), Norberg-Schulz (1979), and Nasar (1994) theorised the idea that aesthetics and attractiveness contribute to positive experiences as they improve the legibility, familiarity, and meaning of places. The New Urbanism movement, based on these principles, emphasises the importance of beauty, aesthetics, and human-scale design (Katz, 1994). In the words of Cuthbert (2008), an urban setting is aesthetic if it provides citizens with pleasurable sensory experiences, a pleasing perceptual experience and pleasurable symbolic associations. Thus, the experience of urban aesthetics emerges from the conjunction of sensorial perception, cognition and meaning. Several works in architecture and aesthetics have highlighted the notions of order, proportion, harmony (Moughtin & Mertens, 2003) beauty (Carlson & Berleant, 2004), diversity (Blumentrath & Tveit, 2014), and sublimity (Shapshay, 2013). Empirical evidence that correlates aesthetics with psychological health is vast (Renalds et al., 2010), including in the emerging field of neuroarchitecture (Coburn et al., 2017; Joye & Dewitte, 2016). Further, attractiveness contributes to psychological health by encouraging physical activity, which, in turn, promotes health (Saelens et al., 2003); however, concrete definitions of what attractiveness is and which aspects of it contribute to well-being are still lacking (Coburn et al., 2017). Interdisciplinary work has identified some characteristics that might support perceived restoration, and these are moderate building height, architectural variation, and moderate complexity (Lindal & Hartig, 2013; van den Berg et al., 2016).

Another line of work suggests that top-down characteristics can make environments restorative. Authors have highlighted that the restorative power of settings might not be exclusively intrinsic to the physical environment but also originate from personal experiences and perceptions (Ratcliffe & Korpela, 2016, 2017), and it might make favourite places restorative (Korpela et al., 2008). A growing number of studies has reported that the greater the psychological attachment to a given place, the greater the experience of restorative outcomes (Liu et al., 2020; Subiza-Pérez et al., 2020, 2021). These ideas echo Nasar's (1994) concept of symbolic aesthetics, indicating that positive perceptions are mediated by internal representations and meanings associated to buildings, as well as Norberg-Schulz's (1979) work on the importance of meaning and authenticity in architecture.

Place identity can be a powerful trigger of psychological restoration. Research has demonstrated that settings matching relevant personal identities (e.g. religious identity) offer larger restorative outcomes (Ysseldyk et al., 2016) and that simple experimental manipulations of environmental identity change the perception of restorative properties (Morton et al., 2017). In Liu et al. (2020), not only did local urban green spaces scored higher perceived restorativeness than non-local ones, but the insertion of more endemic iconic design elements enhanced it.

Considering the need to develop knowledge around the healthy city, we now propose a model on restoration in urban built settings that describes key concepts and characteristics

necessary to make the (psychologically) healthy city, based on theories and evidence of restorative environments.

A model to study restoration in urban built settings

The model, based on existing evidence, summarises the characteristics of urban built settings that support restoration (Figure 1). It describes a hierarchy of restorative potential, the characteristics necessary to allow restoration, and the related benefit type in terms of restoration. We have conceptualised three levels of restoration: containment, passive restoration, and active restoration.

The most basic layer of containment is a process in which neither negative nor positive psychological changes occur; this is proper of settings that do not possess negative features and can, in principle, permit—but not promote—future restorative experiences. This indicates the neutral pre-requisites necessary for subsequent restorative processes. These include, first, the absence (or low level) of environmental stressors, such as noise, visual pollution, and crowds, which have been identified by scholars as elements that may elicit a negative subjective and objective psychological response (Evans, 2003; Hartig et al., 2003; McCay et al., 2019). Second, the above-mentioned pre-requisites also include perceived safety and non-threatening social landscape because previous research has demonstrated that situations of perceived danger can compromise stress recovery (Gatersleben & Andrews, 2013). Third, they include subjective acceptable climatic and thermal conditions, which are also a pre-condition to human well-being (Jeong et al., 2016). These elements represent the bottom of the triangle and constitute a pre-condition for environments to be restorative. In the presence of these pre-requisites and absence of other restorative properties, individuals will likely not experience any relevant psychological improvement; however, no further psychological impairment or emotional distress attributed to environmental features can be expected either.

The second layer is that of passive restoration, which reflects classic theories of restoration and refers to bottom-up features whose restorative potential resides in the perceptual characteristics of the object itself. Here, the individual does not actively contribute to the restorative experience with top-down contents and associations, but is a receiver of bottom-up environmental characteristics, which translate into stress reduction, negative affect reduction, enhancement of positive affect, and attention restoration. With reference to urban settings, it has been well

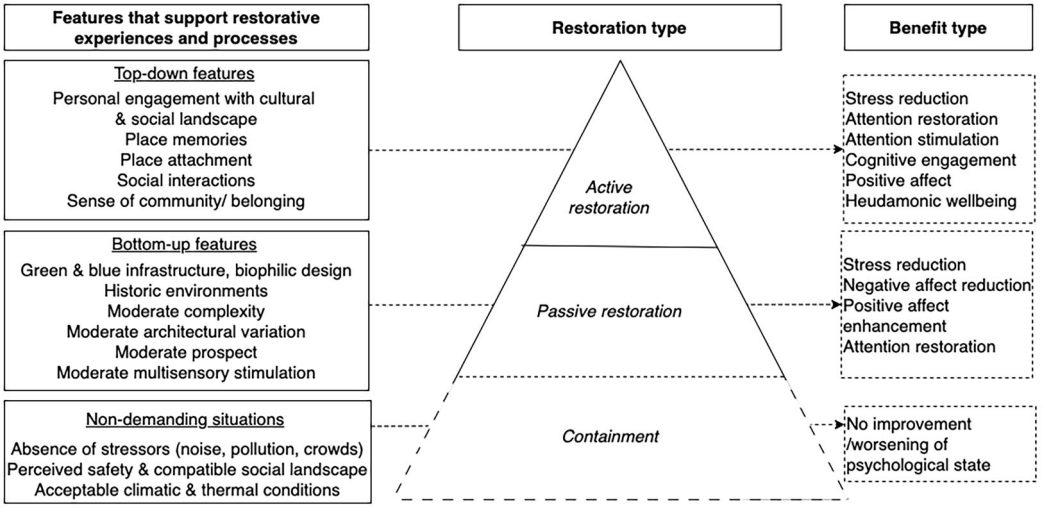

Figure 1. Psychological restoration in urban built settings.

established that the presence of GI and NBS (Lindal & Hartig, 2015, 2013; White et al., 2010; White & Gatersleben, 2011) and of biophilic, nature-like designs (Coburn et al., 2017) supports restoration; however, even in the absence of nature, other features can support restoration. These include, first, the presence of historic elements (Brancato et al., 2022; Fornara, 2011; Masullo, Ozcevik Bilen, et al., 2021; Masullo, Toma, et al., 2021; Reece et al., 2022; Scopelliti et al., 2019) as, according to Weber and Trojan's review (2018), historical places exhibit the highest restorative value among urban built settings. Second, they include a series of perceptual properties: moderate perceived complexity (Van den Berg et al., 2016); moderate architectural variety (Lindal & Hartig, 2013); and a certain level of prospect (San Juan et al., 2017), all of which support restorative processes according to previous research. These findings are also in line with theories derived from environmental aesthetics on the importance of enclosure, complexity, and order (Nasar, 1994), and of combinations of formal architectural aspects, such as building styles, colours, and materials (Cuthbert, 2008). Among the perceptual characteristics that seemingly support passive restoration is also a moderate multisensory stimulation, such as in a café (Staats et al., 2016) or a lively square or city centre (Barros et al., 2021; San Juan et al., 2017). These positive experiences may arise from being in a lively and interesting social landscape (e.g. pedestrians walking by, children playing in a square or people chatting in a café) or the contemplation of the surrounding architectural features. Other urban space features that might be related to restoration are within the so-called perceived sensory dimensions (e.g. serene, culture or social; Peschardt & Stigsdotter, 2013).

The third layer of the triangle refers to active restoration/instoration, which is specific to urban settings. It includes top-down features, e.g. those enabling restorative processes which also depend on the observer's personal inputs. Active restoration entails the acquisition of new resources, thus recalling Hartig's (2007) idea of instoration, and acts as a booster of restoration. This phase can be experienced by both individuals who are in a neutral or desirable psychological state and not necessarily exhibiting the need to recuperate depleted resources, and by those benefitting from the restorative effect of place (second layer). In both cases, active restoration entails the enhancement of their well-being, with acquisition of new resources in terms of enhancement of positive affect, active cognitive engagement, and heudamonic well-being (Ryan & Deci, 2001). Active restoration occurs when individuals actively engage with the cultural and social landscapes (Bornioli et al., 2018b), thus triggering place attachment, place memory, and place identification (Ratcliffe & Korpela, 2016; Subiza-Pérez et al., 2021), social interactions (Bornioli et al., 2018b), and a sense of community and belonging to the city (Thwaites et al., 2011). These psychological processes clearly echo the notions of pleasurable symbolic associations assigned by Cuthbert (2008) to urban aesthetics. During these interactions, individuals contribute with their own content in terms of meanings, memories, identities, and socialisation (Liu et al., 2020; Morton et al., 2017; Ratcliffe & Korpela 2016). These elements offer restoration benefits in a more holistic sense: not only do they promote stress and attention recovery (such as in the case of memories and associations—see Ratcliffe & Korpela, 2016), but they also aid positive affect and cognitive engagement and enhancement of heudamonic well-being, which refers to meaning and self-actualisation (Ryan & Deci, 2001). For example, personal engagement with the landscape can contribute to the reinforcement of self-esteem, realisation regarding one's own role in the world, fulfilment of life objectives, and feeling of oneness with the world (see Bornioli et al., 2018b: individuals feeling connected to past ages and to communities). These concepts echo Kaplan and Kaplan's (1989) idea of 'reflective phases of restoration' (see also Herzog et al., 1997, 2003), within which individuals reflect about their role in the world, their feelings of oneness with nature and the world, and their objectives in life and relations with others, and they feel connected 'to a larger world' (Kaplan, 1995, p. 174). In other words, the psychological benefits of experiencing a place might be more beneficial if personal or social meaning is attributed to it, in comparison with the experience of unknown/non-personally relevant settings.

This personal connection may imply greater restorative outcomes or strengthen the obtained instorative benefits.

Discussion

The current paper discussed the restorative potential of urban built settings and presented a theoretical model that conceptualises it. It aimed to elucidate how restorative environments research can offer insights into making cities more supportive of psychological well-being, based on contemporary theoretical ideas and empirical evidence from different disciplines. The model presents several advantages. First, it introduces the concept of active restoration, which is a key aspect of restorative processes in urban settings, thus stressing the importance of experience, engagement, and perceptions. Active restoration extends the concept of place benefits from the mere recovery of depleted cognitive, affective, and social resources (Hartig, 2004) to the more holistic concept of the enhancement of heudamonic well-being (also described as instoration). The top-down features offer stimulation towards holistic well-being; additionally, the third stage of the model serves to conceptualise and understand the experience of individuals in a desirable psychological state, for whom visiting a positive place may result in other positive psychological outcomes. This also lends room to explore whether such instorative benefits vary according to the personal connections to such a place (e.g. place attachment). Second, it identifies a series of features that can support urban restoration, and these are a starting point for future research on restorative urban environments. Third, it contributes to policy by informing research on healthy cities because it shifts the role of cities from simplistic negative elements (e.g. Evans, 2003) to positive environments, thus reflecting recent views adopted by policy institutes on the healthy city (Council of Europe, 2000; UN, 2015; WHO, 2015).

As the proposed model is a conceptual framework, an important limitation is that future empirical research is needed for the validation and verification of the suggested pathways and for the expansion of the proposed mechanisms. We conclude by discussing a series of practical applications and recommendations for future research on restoration.

Guiding future research on the restorative potential of everyday urban settings and of their characteristics

Thus far, restorative environments research has tended to 'romanticise' natural settings and focus on ideal green environments. Moreover, recent evidence suggests that places other than natural places are also sought for psychological recovery (Korpela et al., 2020; Subiza- Pérez et al., 2021). Therefore, assessing the psychological value of the full range of urban built settings, including positive settings, is necessary. The proposed model guides the identification of potentially restorative environmental features and/or pathways towards different restorative effects. As examples, researchers should consider urban built settings that are protected from environmental stressors (level 1; e.g. noise, pollution, or social disorder) and that possess tangible (level 2) and intangible features (level 3), which might allow passive and active restoration. In this sense, car-free open spaces, such as historic public squares, may be highly restorative places (see San Juan et al., 2017) due to the absence of stressors, presence of bottom-up elements (moderate stimulation and prospect, architectural quality, and multisensory stimulation) and top-down features (potential personal engagement with the landscape, social interactions, and sense of belonging). Hence, future research should identify further examples of historic environments that can offer restorative benefits, and also examine the social and cultural components of urban restoration, thus investigating the meanings that can support restorative processes among diverse individuals and societies.

Additionally, further research on which urban places can offer restoration should explore how specific characteristics of urban settings can support restoration (the width of sidewalks, height and diversity of buildings, amount and distribution of recreational places, arrangement of features such as greenery and equipment, and combinations of these elements), thus extending the research on environmental preference (Lindal & Hartig, 2013; Nasar, 1994; Tabrizian et al., 2020).

Advancing theoretical definitions of restoration

The model suggests pathways of restoration in urban environments, which can be further advanced from a theoretical perspective. Classic works and empirical research have mainly focussed on experiences in quiet, tranquil, and serene natural/green spaces, which might offer opportunities to relax and rest. However, arguably, the psychological experience of urban built settings inherently implies a greater dynamism and presence of people and activities that do not correspond to tranquillity and stress recovery, and might offer other positive psychological consequences currently overlooked by researchers. In this sense, Bourrier et al. (2018) defined restorative environments as places with few demands on directed attention and presenting interesting stimuli. Further, previous studies have indicated that urban built settings can support affective recovery from under-stimulation or boredom (Staats, 2017)—echoing Ulrich's (1984) idea that a lively street can be more restorative than a quiet green area—and the reinforcement of self-worth and esteem (Thwaites et al., 2011). Therefore, theoretical mechanisms explaining active restoration and the full range of positive affective and cognitive states (cf. Hartig, 2021) deserve attention.

Informing methodologies to explore urban restoration

The model hints at the complexity of mechanisms facilitating restorative experiences, which can be affected by both top-down and bottom-up features, and result in a variety of restorative benefit types. This highlights the need for integrating the experimental approach with a broad range of methods that include, for example, qualitative and visual methods research (Bornioli et al., 2018b; Nordh et al., 2017), survey-based research (Subiza-Pérez et al., 2021), VR immersion studies (Newman et al., 2022; Reece et al., 2022), social media analyses (Wilkie et al., 2020), and a combination of the above. The field of neuro-urbanism can also offer interesting insights and methodologies, including the use of the electroencephalogram (EEG; Li et al., 2021; Reece et al., 2022). Such combinations of methods enhance the ecological validity of studies and allow the exploration of personal perceptions and preferences.

Conclusions

The present essay has presented the case to establish a more solid line of enquiry regarding the restorative potential of urban built settings. This need builds on current and future urbanisation trends and on the necessity to make our cities healthier and more liveable—in line with the global strategies of healthy cities. We suggest that efforts must be directed towards not only the naturalisation of cities but also the improvement of built elements. We have proposed a theoretical model of urban restoration that includes both passive and active restoration and attempts to clarify when urban environments can hold restorative potential, to improve the quality of the urban environment and health and well-being of citizens worldwide.

Notes

1. https://www.healthylondon.org/
2. https://vancouver.ca/people-programs/healthy-city-strategy.aspx
3. https://www.paris.fr/dossiers/paris-ville-du-quart-d-heure-ou-le-pari-de-la-proximite-37
4. Here, we use the term *positive urban settings* following Corral-Verdugo et al. (2015), who described them as settings that meet people's needs, produce well-being, and provide people with resources and meaningful experiences.

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