

*Vision without action is useless.
But action without vision
is directionless and feeble.
Vision is absolutely necessary
to guide and motivate.
(Donella Meadows)*

*Interactions between different logical levels
produce phenomena unseen at either level.
(Gregory Bateson)*

No. 11

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Dipartimento di Scienze della Vita e Biologia dei Sistemi - Università degli studi di Torino Via

Accademia Albertina, 13 – 10123 Torino - Italy

www.iris.sostenibilita.net

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Our wellbeing in modern built environments is rooted in our evolutionary history. Are we aware of this?

Rita Berto

GUEST EDITOR

LEAF – Laboratory of Affective Ecology, Department of Human and Social Sciences, University of Valle d’Aosta.

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Corresponding Author: Rita Berto, rita.berto@hotmail.it

Dear Readers,

Today, to create the places in which individuals dwell, work, learn, have fun, recover from illnesses, etc., basically where they live, and to achieve the aesthetics, functionality and comfort they desire, is not only a demanding quest for architects, planners and designers, but also – and above all - for those experts addressing the individual’s psychological, physiological, emotional and cognitive sustainability needs. This concern pertains specifically to Environmental Psychology, a discipline which falls in between the procedure, practices and techniques of a builder and the experience and talent of an architect. Though having a lot in common, the dialogue between environmental psychology and architecture has so far been limited. Architecture is the profession of designing built environments, while environmental psychology asks how individuals make their way through the environment, how one makes sense of, copes and gets along in those environments (natural and built) planned by architects. The editors of *Visions for Sustainability*, Giuseppe Barbiero and Martin Dodman, conceived of this special issue as a way of investigating what environmental psychologists and architects share, maybe without knowing it. In order to

face this challenge, they asked an environmental psychologist (myself) and an architect (Cristian Suau) to be guest editors of an issue dedicated to “Wellbeing in daily built environments”. Words like “wellbeing” and “stress” are currently much in vogue and the editors were wondering exactly about how architects and environmental psychologists address these “popular” concepts from a scientific point of view. This editorial is an endeavour to outline what they discover.

We can start by saying that environmental psychology and architecture are closer than expected since there is a link between individual’s internal state and external environments. In fact, just as we affect the world around us, in turn, the world affects our behavior, thoughts, emotions, and actions; accordingly urbanization is the most important “behavioral influence on the environment” (Gallagher, 1993). A place that is “good” for us is neither boring, nor agitating, but rather promotes the right level of arousal for the ongoing task. While this kind of setting attracts us and makes us feel physiologically and psychologically comfortable, those spots we tend to avoid are likely to have problems with their quantity and/or quality of environmental information (Figure 1).

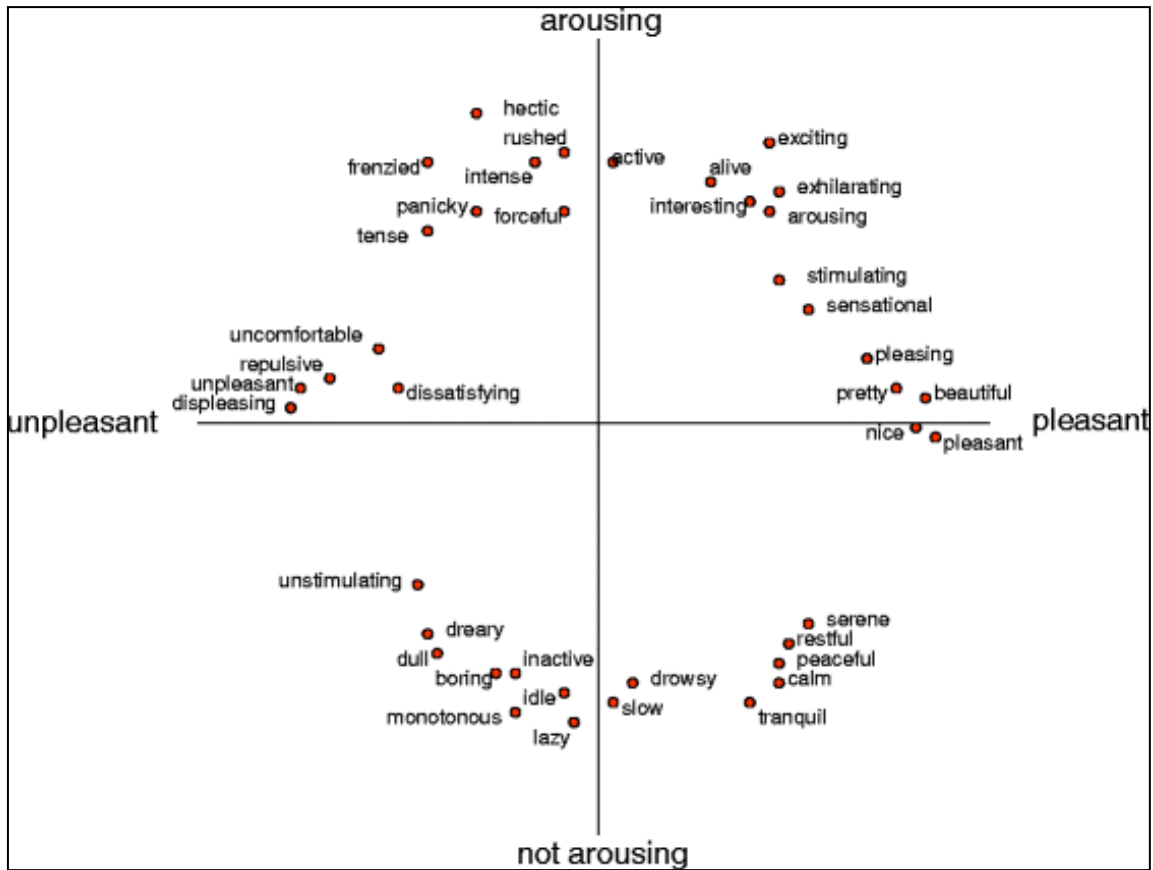


Figure 1. The model shows that when individuals describe an environment they use various adjectives to indicate the level of pleasure (X-axis) and arousal (Y-axis) of their experience (Russell & Lanius, 1984).

Though increasing numbers of architects and designers are attempting to balance the level of environmental information in artificial-urbanized settings, they still neglect how the kind of places and objects we find intriguing and we gravitate towards are rooted in our evolutionary history (Kaplan & Kaplan, 1982). Humans are profoundly influenced by their evolution, have endured danger and

difficulty and certainly are a product of those hardships. Experience can affect all aspects of human behavior, even experiences that happened a very long time ago. What is inherited here is not behavior, but structure (Figure 2); those experiences have left some trace on the relationships between human needs and the patterns of stimulation provided by the environment (Kaplan, 1972).

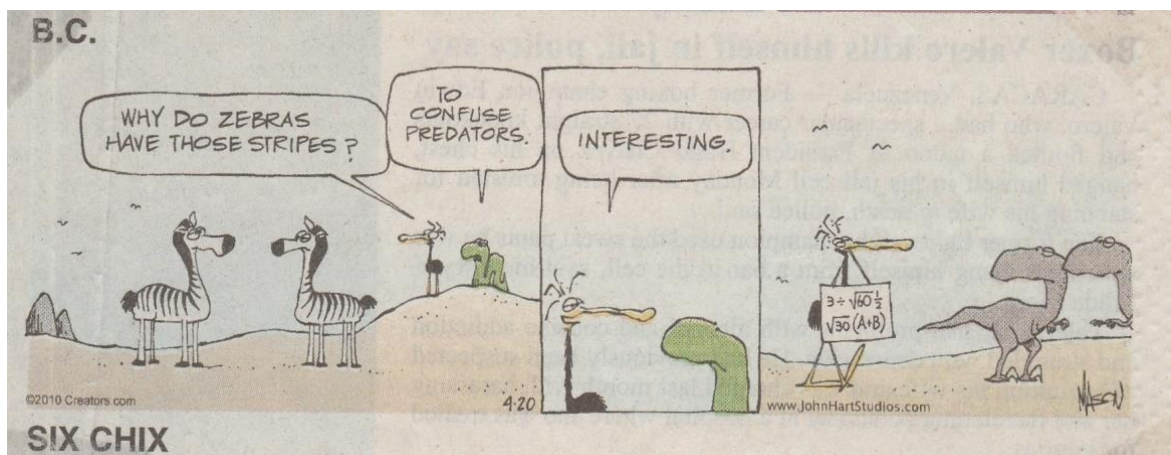


Figure 2. Source: "Las Vegas Review-Journal".

From the evolutionary point of view, humans' predisposition to recognize the aesthetic qualities of a certain habitat reflects the adaptations designed by natural selection aimed to help us to choose the place where to live (Kaplan, 1992; Orians & Heerwagen, 1992). Unfortunately, this choice is not that simple nowadays; quoting Gallagher (1993, p. 19): "The technological and social changes associated with this unprecedented worldwide development mean that *before* (my emphasis) we superficially adjust to a new, lower status quo, our ever-adaptable species must understand what a good environment really is, in a community as well as forest, in an office and school as well as home". Humans are programmed by evolution and experience to handle a wide range of challenging environments, but this has its limits in terms of the psycho-physiological resources that need to be recovered in a way or another. As individuals have increased their capacity to influence the environment, they have also increased their capacity to make it incomprehensible and stressful. Accordingly, individuals are in desperate need of places that support the biological needs of making sense and exploring (Kaplan & Kaplan, 1989) which, in turn, sustain environmental preference and perceived restoration. Since our ancestors lived in a Nature-filled environment, when we are exposed to natural environments we feel more comfortable, more relaxed, more "like home"; in

this respect, Nature's ability to restore human attention, to recover from stress and to enhance positive feelings and emotions has been supported by a wide range of studies (for a review see Berto, 2014).

In *The Stones of Venice* (1851-1853) John Ruskin pointed out three virtues of a built environment, in that: 1) it acts well, 2) it looks well and 3) it speaks well. Points one and two are relatively easy to achieve. In the first place, a built environment "acts well" when it fulfills the human need to find a refuge. Secondly, it "looks well" when it meets human aesthetic requirements. For Ruskin Nature is the model for beauty and he relied so heavily on the design seen in Nature that to him lines and shapes in architecture should stem from the natural environment. But what did Ruskin mean with "it speaks well"? For me, a built-artificial environment "speaks well" to us when it fosters our *emotional attachment* to it. Emotional attachment appears to be an emergent property of individuals interacting with environments that are pleasing both aesthetically and functionally because they present some properties of the environment in which humans evolved. This attachment facilitates the vision of an interaction between "form" and "function", which in turn stimulates progressively stronger positive emotions towards the environment itself (see Figure 3).

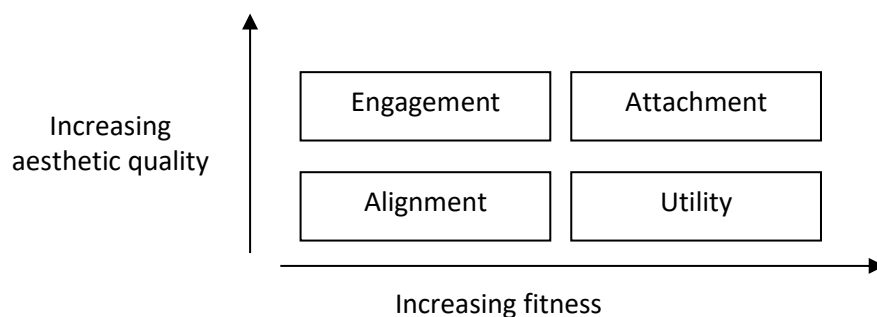


Figure 3. Petrich's attachment matrix (2015).

As one becomes increasingly attached to the aesthetic properties of an environment one can be said to be engaged with it. While becoming increasingly pleased with an environment's functional fitness, one experiences the satisfaction of the environment's emotional utility and becomes attached to it (Petrich, 2015). It is not necessarily the case that we are aware of the reasons for our attachment, but we undoubtedly become effortlessly and unconsciously attached to environments that support our informational needs (making sense, exploring solutions for adaptation) and steered towards psychological benefits (stress recovery and attentional restoration). Despite our individual differences, we share a similar mental model that recognizes in the natural environment the most supportive and adaptive among the environmental contexts. This

strengthens the Biophilia hypothesis according to which in our evolutionary history we have developed a complex of learning rules that can be teased apart and analyzed individually (Wilson, 1993, p. 31). From this perspective, people's ability to perceive the restorative value of an environment could be traced back to our genetic predisposition to recognize in the natural environment "the" environment that allows a fast and deep psycho-physiological restoration (Barbiero, 2011; 2014; Berto et al., 2018). For this reason architecture should draw inspiration from both Nature's *content* and *process* and the Man-Nature evolutionary relationship in planning built-artificial environments in order to promote wellbeing.

Barbiero and Dodman's concern originated from wondering about the effect pro-environment solutions

have on individual's wellbeing: Are sustainable buildings, blocks, cities but also pieces of furniture, illumination systems, etc. enough to guarantee an individual's wellbeing? Wellbeing is a *subjective* condition more often than not associated with projects striving towards environmental sustainability and energy saving, as the architect Sears Barrett states (2010, p.69): "Soon we will measure design quality with new criteria. A home's lightness, energy consumption, and sustainability will redefine the concept of beauty in architecture". However

environmental sustainability doesn't cover the individual's need for cognitive clarity (Berto, 2011) and psycho-physiological restoration (Berto & Barbiero, 2017); sustainable solutions do not foster *tout court* positive feelings and emotions or functional behaviors and do not lead to appreciation of and satisfaction for the physical environment. On the contrary, individual wellbeing can find a meaningful operationalization in perceived restoration and in restorative design (Barbiero & Berto, 2018; Figure 4).



Figure 4. Pictures show the renovation of a regular classroom (rated low on the *Biophilic Quality Index*, BQI; Berto & Barbiero, 2017) into a "restorative classroom" (rated high on the BQI). The "restorative schoolroom" is the explorative work in progress of Barbiero et al. (2017) at the primary school at Gressoney-La-Trinité, Italy. Barbiero's project is aimed to highlight the role of the physical environment in sustaining environmental education. Specifically, the picture on the left depicts "the refuge" corner of the schoolroom where children can individually or in a small group benefit from a micro-restorative experience (Tennessen & Cimprich, 1995). The immersion experience is helped by the "wave like" bookshelf, the presence of a green cushion on the floor and of a cork-oak wall. The picture on the right depicts "the prospect corner", here children standing or sitting down on steps can benefit from a different perspective of the schoolroom (Appleton, 1975); to foster in children the experience of observing the schoolroom from the "outside", walls are covered by cork-oak where at the center a green insert smelling of real grass is present (Photos: Nicola Maculan). Source: Barbiero & Berto (2018).

Today, it is not difficult to single out physical characteristics of the environment causing the unpleasant *stress response* (e.g. an unsafe and deteriorated block, poorly illuminated schoolrooms, office spaces lacking in acoustic and/or visual privacy, an apartment overlooking an industrial area, etc.), and in parallel fashion *wellbeing* is associated with projects covering environmental sustainability. It is typical to say: if building quality is certified then individual's wellbeing is guaranteed. *Wellbeing*, *cognitive sustainability* and *aesthetics* are difficult goals to achieve in building certification protocols which neglect the Man-Nature evolutionary relationship and the central role of environmental affordances in the Man-Environment *daily* relationship. *Affordance* is the term coined by James J. Gibson (1979) to explain what the environment offers the individuals; the individual perceives the world not only in terms of object shapes and spatial relationships but also in term of object possibilities for action. Gibson developed an interactionist view of perception and action

that focused on information available in the environment, where perception drives action. Too much technology, extreme design (becoming an end to itself) and an idea of sustainability which is blind to the individual's needs may alienate people; a "wrong" perception leads to negative feelings (no emotional attachment) and appraisal (low environmental preference) and compromises environmental cognition and functional behavior (no vision of an interaction between form and function). Design too often challenges human's primary needs of making sense and exploring the environment because it doesn't offer the right affordances (Figure 5). This gap can be filled by restorative design which enhances the individual's biophilic bond with Nature, sustains cognitive processes and covers the need for psycho-physiological restoration. According to restorative environment design, human evolution is central to an understanding of modern human relation with the environment (Berto & Barbiero, 2017).



Figure 5. because of the absence of an evident perceptual cue this pavement doesn't immediately offer the "step" affordance; detail of Gae Aulenti Square, Milano –Italy. Photo: Rita Berto.

These are the questions raised by Barbiero and Dodman in launching their call for this special issue. The authors of the published papers have replied in various ways. For Kotradyova, Petruskeviciute and Bilotta et al., an individual's wellbeing originates from social community. Kotradyova highlights the importance of maintaining local identity –meant as the DNA of a society–within the typology, morphology and semiotics of crafted products (buildings, interiors, landscape). Petruskeviciute explains a method which, through integrated decision making and bottom-up governance, can improve urban sustainability and create healthy outdoor environments. In this way, Bilotta et al. describe a model that local municipal administrators could easily apply to encompass multi-risk contexts and perceived insecurity in order to improve inhabitants' quality of life. On the other hand, Marchetti offers an intimate insight into the Man-Environment relationship by taking it back to the home, as both the start and the arrival place to foster individual's wellbeing, proposing fresh reflections on a topic lately neglected in environmental psychology. Neilson et al. reconsider the theory behind restorative design and the authors question whether the leading theory in this area of research is really useful to enhance individual's wellbeing in the field. On the contrary, Brondino et al. give an excellent example of how experimental research can serve the understanding of human behavior in real environments using virtual reality simulations; their method can be used to gauge arousal and pleasantness in a dynamic situation before implementing a given design. Finally, in their extended abstract, Curtis et al. analyze the relationship between self-reported frequency of exposure to Nature and

wellbeing measured in terms of emotional physiological and cognitive variables.

I deeply thank the authors – environmental psychologists and architects – who have contributed to this issue. Each paper gives a specific and interesting insight into the Man-Environment relationship. At the same time, each paper addresses the wellbeing issue "rigorously" from its standpoint, leaving little room for cross-disciplinary forays and evolutionary insights, which could, however, be further developed in the future. Special thanks also to the editors of *Visions for Sustainability* that host this special issue. I imagine they will conclude that environmental psychologists and architects need more time and to encounter more situations in order to really understand they are working on a common ground and thereby build cross-disciplinary bridges that will help enhance the individual's wellbeing in daily built environments. The hope is that the time required does not go beyond that of our evolution ...

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Circular design in everyday urbanism: Towards regenerative and restorative dynamic spaces in cities

Cristian Suau Ibáñez

GUEST EDITOR

Studio Pop, founding director, United Kingdom.

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Corresponding Author: Cristian Suau Ibáñez, cristian@studiopop.net

Foreword

Circa 60% of the urban areas that will exist in 2050 have not yet been built. Urban settlements are placed where most materials are used and wasted, and where buildings, lands, and other infrastructures are constantly underutilised. Environmentally, about 75% of the consumption of natural resources occurs in cities, which produce around 50% of global waste and between 60% and 80% of CO2 emissions.

What makes our urban environment a transformative place? What does a circular economy contribute to the perception and creative change of our post-industrial cities? The urban circularity offers a restorative and regenerative opportunity to respond to these challenges by creatively rethinking the way how we perceive materials and use the as ecological sound products and services. It leads to envision alternative forms of co-creation towards an *"Architecture of Enjoyment"* (Lefebvre, 1973), with high social and cultural value.

Within our material culture, what would happen if we creatively reuse waste by designing sensorial spaces, products and materials; promoting a long-term cyclical routine; and maintaining or improving its perceptual value within different scales of intervention in the cities?

The selected manuscripts in the *Visions for Sustainability* (special issue 11) on *"Wellbeing in Daily*

Built Environments" reflect on wellbeing and the perception of citizens in everyday city life by interconnecting and balancing psychological, environmental, socio-spatial and cultural challenges. The article titled *"Surprise, Arousal, and Pleasantness in Entering a New Space"* put emphasis on dynamic perceptions and environmental experiences by examining movement through spaces. The article titled *"Local Identity in Material Culture as Part of Wellbeing and Social Sustainability"* bridges local identity and material culture into the design of contemporary regional buildings or ecofriendly products. The article named *"From the City of Gaps to the City of Wellness"* reflects on DOT TO DOT© an experimental community garden. It connects regenerative urban design, sensory gardens and creative waste reuse in vacant lands situated in deprived areas of Glasgow by sharing an innovative methodology of community-based participatory research and somatic outdoor learning. The article titled *"I Care (My Home)"* highlights the importance of biophilic design and nature-based solutions applies in domestic environments, offering an approach based on an all-inclusive exploration of the instinctive human proximity with nature. The article titled *"A Review of Restorative Nature Aspects for the Improvement of Urban Living: Perception, Attention, and Aesthetics"* stresses that several attributes

of restorative environments are needed in cities and these new urban settings can be taken from rural landscape and the Attention Restoration Theory.

All chosen studies represent both retrospective and prospective approaches in the areas of perception and design in dynamic spaces. They reconceptualise theoretical frameworks and principles; analyse paradigmatic cases, models and innovative research methodologies; and study heterogeneous geo-cultural and perceptual environments towards a collaborative transition from grass-root innovators in local communities to cultural worldviews. Findings allow strengthening the notion of *circularity* of the act of making and perceiving our cities by sharing new concepts, mindsets and methodologies in order to address common challenges at multiple scales.

The Circularity of Design

This article analyses and explores innovative ways to activate spaces into sensorial places in cities using circular design in restorative and regenerative actions throughout co-creation, social innovation and nature-based solutions. In order to change the perceptions in cities, citizens demand the-right-to-the-city with democratic occupancies of commons (Mitchell, 2003).

The underlining fundamentals of the New Urban Agenda Habitat III (Andersson, 2016) and also the UNICEF principles for innovation and technology in design development stress that humanity needs to tackle the pressing challenges whilst maintaining social, economic, health, environment and climate balances on our urbanised planet Earth. What has to be the role of design and of the designer to be ethically useful to society? Cities necessitate the implementation of design principles for the real world, so-called the politics of design (Papanek, 1971). The new notion of regenerative and restorative urbanism is not limited to recycling and the elimination of residual and toxic waste, but also focuses on the design of the cycles for biological and technical materials, the so-called *nutrients*. Circular design explores the creative use of materials, flows and spaces in systematic, experimental, local and inclusive ways.

What should we (re)make beyond the phenomenon of Petropolis or carbonised cities? In order to envision the circularity in design science, we should learn from significant books: [a] *Spaceship Earth* by Fuller, B. (1968); [b] *Ecopolis* by Tjallingii, Sybrand P. (1995); and [c] *Cradle to Cradle (C2C)* by McDonough, W. & Braungart, M. (2002), from a global, urban and local approach respectively.

We are all astronauts on a little spaceship called Earth. Bucky Fuller (1968)



Figure 1. The new urban question (photomontage). Source. Suau, 2019.

Bucky Fuller in his oeuvre *Operating Manual for Spaceship Earth* (1968) refers to the Earth as a spaceship, being the sun our primal energy supplier. He represents our planet as a mechanical vehicle that requires frequent maintenance and if we do not keep it in good shape it will

stop to function. In this metaphor, cities are also considered spaceships. In the doctoral thesis titled *Ecopolis: Strategies for Ecologically Sound Urban Development* (1995), Sybrand Tjallingii interrogates and deals with cities and sustainability, linking general

strategies to concrete practical tools and planning proposals, drawing lessons taken from several pilot projects in medium sized cities in the Netherlands. The strategy framework of Ecopolis is represented as part of/in the urban ecosystem. Ecopolis means a city of flows of energy, water, waste and traffic applied in distinctive urban areas -such as the city core, suburban and periphery- and for self-organisation and co-participation in the marketplace, learning organisations, etc. In their masterpiece “Cradle to Cradle: Remaking the Way We Make Things” (2002), McDonough and Braungart reflects on a system of lifecycle development called upcycling. Once produces have reached the end of their useful life, they become either biological or technical nutrients. Biological nutrients are materials that can return directly to the environment whilst technical nutrients are elements that remain within closed-loop industrial cycles.

Towards a Circular City

The regenerative/restorative model of Circular Economy (EC, 2014) demands the implementations of new design principles in the fields of urban planning, architecture, product design and environmental psychology. Tangible products and services are the most obvious parts of this changing economy, but we also need to redefine and redesign services, business models, exchange relationship, markets and many more aspects.

The new regenerative urbanism does not limit itself to recycling and disposal of residual and toxic waste but focuses on designing cycles for biological and technical materials (nutrients) from the beginning. The new principles of circularity are:

- [a] *There is no city waste anymore, but only recycling and flows of nutrients.*
- [b] *No more resource squandering, depletion and exploitation in cities but resource use in cycles.*

However, how the perception of innovative solutions is performing at city level to stimulate a circular effect rather than linear? Circular city is a strategy framework, which envision systemically how cities have elaborated and implemented urban strategies in context of the following economy dimensions:

- [a] *Sustainable use of resources, natural and cultural capital, i.e.: Waste or water.*
- [b] *Circular mobility, i.e.: Smart, green and integrated public transport networks.*
- [c] *Resource efficient buildings and urban spaces, i.e.: Urban regeneration and reactivation of gap sites.*

Circular city requires a widening focus from the city-products to material flows, production processes and conditions, as well as aspects of use and reuse. It needs an extended systemic view as well as profound understanding of ecological principles.

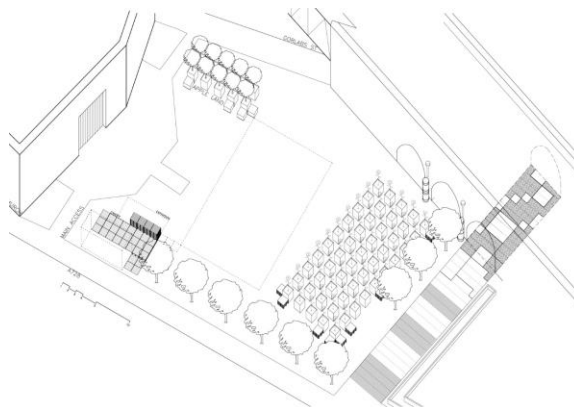


Figure 2. Everyday Urbanism, grassroots masterplan and design charrettes at MOBILELAND© site, Glasgow. Source. Suau, 2015.

Remaking the City

Urban economies promulgate a new geography of centrality and marginality not only expressed between regions or countries but within cities. Social asymmetry is the new urban question worldwide (Secchi, 2013), which is conveyed by the abrupt inequity of income distribution; environmental disasters; demographic shrinkage; inner displacement of urban communities; rising of informal cities; and the proliferation of vacant lands and buildings, which are stigmatised, residual and contaminated spaces.

According to Henry Lefebvre an abstract space is a geographic space of bureaucratic politics that produces, imposes and reinforces social homogeneity. On contrary, the perceived space is the first dimension in the production of space. It is followed by the conceived space and lived space. Nonetheless, the notion of *Everyday Urbanism* (Lefebvre, 1974; Chase, Crawford & Kaliski, 1999) requires strong research and discourses on understanding the social use of public spaces and finding its meanings in everyday life, in which the daily reality of the occupants becomes the focus of interest.

According with Margaret Crawford (2005), the key principles of Everyday Urbanism are [a] *refamiliarisation* that seeks to make hostile spaces more liveable by trying to domesticate and appropriate them, and [b] *dialogic*, in which words, languages or meanings of perceived spaces interact between designers and community, becoming deprived, isotropic and then interchangeable ones. Everyday Urbanism is based on heteroglossia, multiplicity and heterogeneity. It is radically experiential and highly site-specific rather than abstract.

Circular design is a dialogic theory of action. It is a systemic interdisciplinary research framework that experiments with visionary, disruptive and real-world impact, exploring urban challenges and transformations through grassroots actions and didactic methods using resources creatively.

It is known that the challenge of managing and reducing urban waste is a growing sustainability problem for governments and local authorities. For instance, recycling rates are increasing, but this is not enough to address the environmental challenges faced by the throwaway material culture.

What does radical remake mean? Radical here means primal, fundamental. Etymologically, the term derives from late-Latin *radicalis*, "of or having roots"; from Latin *radix*, "root, going to the origin". Rather than linear, radical means a close loop, a circle. The act of remake is multi-sensorial, offering something to make again or anew with special value. Its agile design features are portability, sensory and temporariness. In order to rescue

or repair critical environments or habitats in risks at different scales, author suggests that situations (and scenarios) of everyday urbanism are categorised in six groups: [a] Extreme (severe and remote environments); [b] Essential (elementary spaces); [c] Fantastic (utopian and fictional); [d] Transgressive (edgescapes); [e] Transformative (social forms in motion); and [f] Informal (survival architectures).

Challenging Perceptions in Circular City-Making

The city is not just a morphological phenomenon but also environmental, social and political. Cultural, aesthetic and technological advancements as well as the evolution of advanced design tools and trans-disciplinary demands for tackling city problems in multiple scales have radically changed the way designers research, experiment evaluate, communicate and disseminate knowledge exchange (Fikfak & Suau, 2015).

Let's focus on the challenges of remake culture and place-learning. Nowadays, high education and research pathways in architecture and urbanism are in urgent need for adaptation and transformation as result of rapid changes in demographic, mobility patterns, economic flows and social accessibility inclusion in cities. Academically it denotes the exploration of circularity in new competences, mindsets and methods of design and city-related professions to address these challenges at all scales by designing community based on experiential learning. Learners are not passive consumers anymore but experimenters.

To envision better greenspaces, author employs three design principles: [a] Place-Making; [b] Remake, [c] Place-Learning by experimenting with regenerative and restorative projects applied for resource-efficient cities (Suau, 2019). Author works at Studio Pop CIC www.studiopop.net as an agile think tank of circular design. Methodologies combine research by design (project-based and theoretical) and community-led experiments, supported by qualitative and quantitative techniques and open demonstrations to test/pilot live projects, clinics, community consultations, design charrettes, among other tools. Our main research themes are waste reuse, water innovation and gaps reactivation:

On waste reuse: Author has previously led and explored the structural capacities of timber pallet boards and whole care tyres for the development of affordable modular dwelling frames, creating the PALLET HOUSE© (2003) and TYRESpace© (2006). Since 2017, Studio Pop is developing a creative reuse of packaging plastics called REPLASTICO© www.replastico.com which invites to redesign with plastic junk in inventive ways, from neglected polyethylene-made grocery bags into wearable accessories and artwork, giving it great social value.

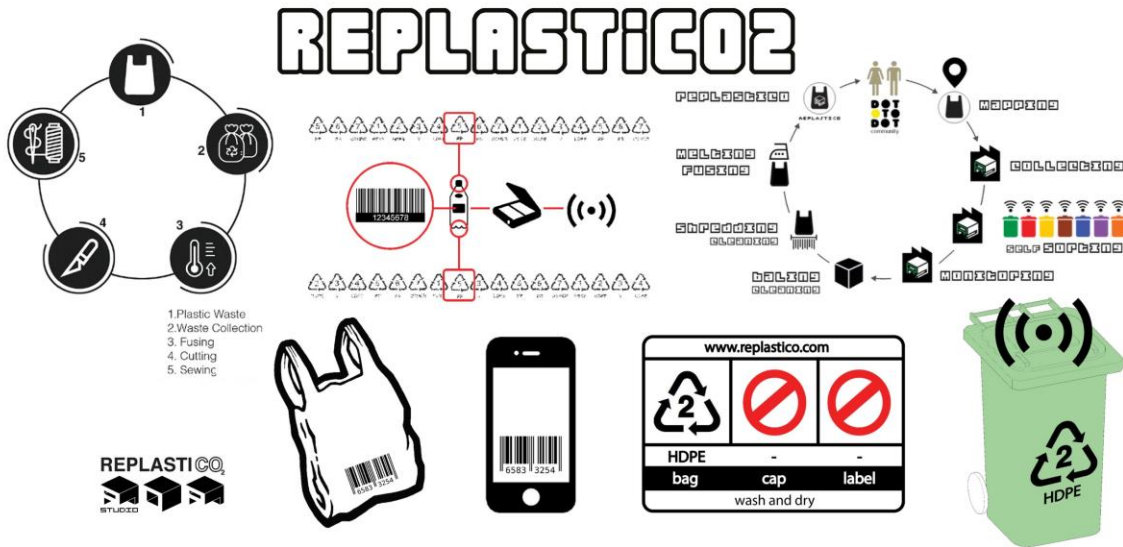


Figure 3. REPLASTICO© long-life cycle scheme. Source. Studio Pop, 2019.

On water innovation: The United Nations WHO recognizes water access as a human right, as well as an essential instrument for the realization of all other human rights. Water is essential for life, health and dignity in extreme emergency situations, crucial for hydration, cooking and hygiene. Poor communities depend on the seasonality of extra water supplies in low-income regions, where it is polluted, unreliable and/or unaffordable. The future of water is in the air. Fog collection can effectively contribute to alleviate water scarcity in water-stressed regions harvesting, treating and distributing clean drinking water in remote settlements. The recent development of textile-responsive water technologies can play a key role in the improvement of local water planning participatory and user-centred design, experimentation, and self-maintenance of water supply systems for disadvantaged groups. Since 2010, author has developed several

experiments condensing water from fog promoted by physical surface effects such as cooling, coalescence and condensation in arid sites with high fog occurrence: FOGHIVE© (2010), AIRDRIP© (2016) and 3DFOGTECH+© (2019). They are portable water stations for survival in regions with frequent fog occurrence, enabling to develop, run and maintain autonomous urban water systems in poor/disadvantaged communities worldwide. These 3D devices follow the multi-directionality of winds. It is a passive water technology of fog collection powered without any active energy demand to obtain at least 7,5 litres of fresh drinking water per 1 m² of selected mesh surface. This water tower (space-frame type) offers effective methods to measure fog water yield, quality and affordability by catching more water than conventional fog collectors in remote and low-income communities (Suau, 2018).

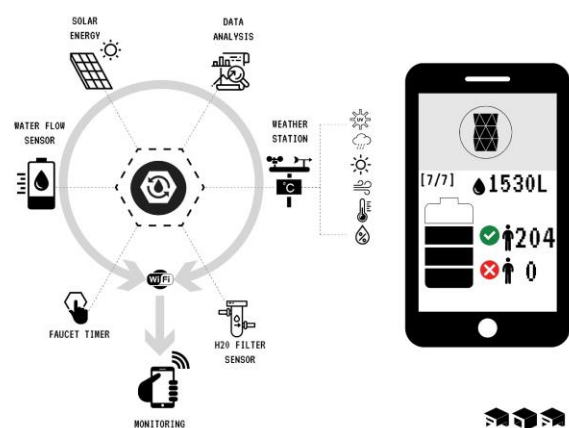


Figure 4. Advanced development of 3D fog collection: Circular model of water e-monitoring and simulation of portable fogtraps in the Namib desert. Source. Suau & Studio Pop, 2018.

On urban reactivation: Author has explored in everyday urbanism initiatives under the framework of “Remaking the City” (Suau, 2017). The earliest case was NOMADIC ALLOTMENTS© (2010) <http://www.nomadicallotments.co.uk/>, an agile solution to grow food on mobile mini-gardens made of Euro-pallets. They debuted at Borough Market. As result of an invitation made by Stalled Spaces Glasgow, MOBILELAND© (2015) <https://mobilelandglasgow.wordpress.com/> was the first

temporary community garden, which applied a C2C model to transform creatively biological and technological nutrients, including an open phytoremediation garden in Gorbals. DOT TO DOT© (2017) www.dots.scot is another live experiment of everyday urbanism situated in a brownfield at Maryhill, a post-industrial area with a profound historical heritage in risk. It acts as urban reactivator to restore creatively a derelict land improving the perception of deprived areas and disadvantaged groups in North Glasgow.



Figure 5. MOBILELAND©, YELLOWFIELD© planters (2015): Deployment of nature-based solutions and phytoremediation techniques in an outdoor sunflower garden. Source. Suau, 2015.

All subject-related cases enable researchers, educators, local residents, entrepreneurs, and youth to transform the city by connecting creatively waste and design through ecologically sound solutions using material and site experiments, nature-based solutions (NBS), somatic learning, community-based participatory research and grass-root local policy making. These innovations were focused on the relationship between emerging/changing societal and environmental challenges for the co-production of the built environment.

In order to increase wellbeing in cities you have to increase the qualitative attributes of the spaces we live in. The value of good places is made by the interplay between local resources and communities. It implies that any successful place-making initiative requires to upturn the levels of social interaction in outdoor learning and

organisational autonomy of local resources. The more remake and place-learning we implement, the best place-making we achieve.

The Circularity of Everyday Cities

Environmental characters along with atmospheric and sensorial qualities are becoming key factors in the definition of circular city, even from its economic standpoint. Nonetheless, is it possible to combine the different sensibilities to everyday urbanism with sensorial attributes able of offering a wider understanding of circular flows whilst contributing with the enhancement of the commons?

Within circular cities, mental, physical and sensory wellbeing is required in public spaces. Paradigmatic cases of regenerative services and products include community

gardens, remake stations, upcycling projects, bartering networks, food-sharing apps, collaborative consumption, tool libraries (open source) and time-banking, among others. These examples of grassroots innovations aim to

ultimately offset waste through agile social and technical arrangements, either by reducing material consumption and dealing with waste perception in a more creative way to deliver no-waste lifestyles.

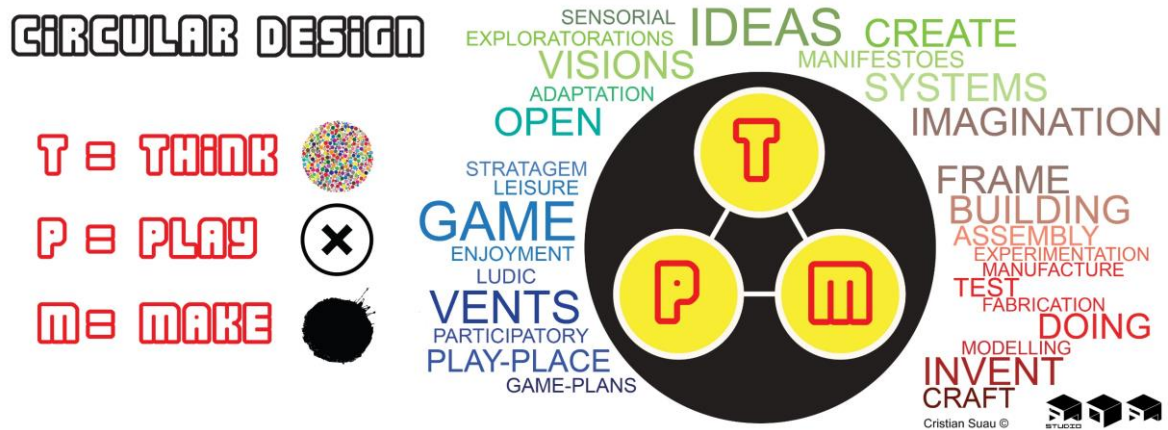


Figure 6. Think2Play4Make is sensorial learning model applied to circular design. Source. Suau, 2019.

To achieve these innovations, we have to design community first. Once done, projects can potentially envision radical solutions for more sustainable community waste management. Local initiatives should include practical place-based experiments, sensory learning, live projects, charrettes (intensive design and planning workshops) and then design-based codes to support public decision-makers and other stakeholders to work more closely with innovators by offsetting waste creatively and employing socio-technical systems, social practice theory and grassroots innovations (Seyfang & Haxeltine, 2012; Seyfang & Smith, 2007; Shove & Surling, 2013).

Circularity offers a twofold pathway. On one hand, it is a return to envision new spatial structures of the perceived city by citizens as experimenters and, on another hand, it reveals the importance that the construction of the circularity has in building it. Its design framework allows the activation of public spaces as ecosystems with widespread porosity, permeability and accessibility; considering the sensorial quality of the cities that preceded us and rethink about its collaborative dimensions.

Conclusions

The phenomenon of urban shrinkage has deteriorated the urban tissue in many post-industrial cities creating an archipelago of voids, derelict lands and brownfields. They often become stigmatised spaces and battlefields between the conflicting interests of municipalities, innovators, developers and disadvantaged communities. Being an unresolved environmental and social problem, urbanites see waste as a valueless material far from synergies to offset, reuse and repurpose it and therefore build ecologically sound smart communities.

The wellbeing of everyday life is a sensorial condition associated with initiatives striving to interlace

environmental sustainability and circular economy, displaying appreciation and fulfilment in occupants for the recovery of the built environment.

Circular city becomes a replicable urban framework with high potential for community-led grassroots innovations to contribute with a lower-waste future locally by reconceptualising waste reduction and management in diversified schemes.

In order to implement a viable circular scheme, it should include to: [a] define and map waste systems and practices; [b] study the scope, scale and character of the community waste sector; [c] evaluate the impacts of community waste projects; [d] investigate the potential, and challenges faced by this sector; [e] experiment remake touchpoints in chosen sites; [d] building capacities on circular design by training urban innovators and managers; and [e] evaluate local community versus authority-led initiatives to improve waste reduction and recycling.

This study proposes to rethink and remake the everyday city by challenging the mono-sensorial dominance of the visual in the urban environment and offering a systemic approach of the environmental qualities, perceptions and sensory dimensions of urban life. Hence it is an incitement to collaborate with the shift towards a future of thriving cities that are liveable and adaptive, using the wide range of policy instruments at all scales, from grassroots innovations to route maps or urban codes.

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Local identity in material culture as part of wellbeing and social sustainability

Veronika Kotradyová

Institute of interior and exhibition design, Body Conscious Design laboratory, Faculty of Architecture, Slovak University of Technology in Bratislava

Abstract

The act of bringing local identity into material culture – into the design of buildings, interiors and products – is a part of socio-cultural well-being and social sustainability. In the contemporary era of globalisation and unification in material culture, it is very important to maintain and apply elements and concepts that are special and unique for single localities and regions. Cultural identity and tradition are inseparable parts of every society and can influence the character of a local built-environment and its elements. The socio-cultural aspects affects the typology/morphology and semiotics of crafted products and architecture, and it creates the basics of the design language of a country or region. Local identity can be understood as the essence of a cultural heritage and genius loci and plays a very important part in self-identification of individuals and social groups. This is unfortunately very often misinterpreted in the design of contemporary building or products. Although there exist many research studies in the field of architecture and design theory, ethnography, cultural anthropology, history and archaeology, they are very rarely available and understandable for practising architects, designers, investors, producers and services providers directly in the regions. Preserving local identity is also a big challenge for local industry and eco-tourism. The last part of the study is questioning the ways of working with “the known” and shows some examples from Europe and Slovakia.

After an evaluation of the relation between regional identity and wellbeing, we have set four main issues dealing with local identity as reflected in material culture that contribute to the well-being of users during all kind of interactions with built environment, and these are: attachment to place –building a self- and social group identity; comfort from interaction with “the known” – shared cultural values and signs, archetypes, and stereotypes; authentic experience and satisfaction through one’s own hands-on experience and interaction with handcrafted objects. Together with the phenomena of local self-identity, they are explored further on in the paper. The paper also shows the first results of the project – IDENTITY SK – a common platform of design, architecture and the social sciences in the form of regional concepts for products and services, coming from interdisciplinary literature and field research and storytelling.

Key words: local identity, material culture, regional products, environment, human being, human centred design, interdisciplinary research

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Corresponding Author: Veronika Kotradyová, veronika.kotradyova@stuba.sk

1. INTRODUCTION

Aspects of wellbeing and Local /Regional Identity

1.1. Principles of well-being applied in human centred design.

Wellbeing can be supported by 11 principles that were summarized after long-term multidisciplinary research of human centred design on the BCDlab platform. Wellbeing can be defined as the state of absence of stress and it can be supported by:

- feeling of safety, combined with the competence to manage risks and attractions,
- possibility to combine prospect with refuge, usually related to protecting one's back with a simultaneous overview of the situation in a given space. It is clearly reflected in space occupation, especially in public spaces. This need also relates to seeing and being seen, whereas humans need to have this status strongly under control
- contact with the outdoors, at least visual, during the day and the possibility to control it – which is still strongly undervalued in many working and housing environments
- need for personal and intimate space, one's own territory, and the competence to occupy and control it
- possibility to switch between privacy and socialisation in dependence on the current situation
- appropriate scale and harmonised proportions of buildings and their indoor environment –with possibility of adaption in spaces for long-term stay
- possibility (or competence) to be attached to a place or products, to have the competence to adapt and personalize them, to mirror and extend the self /ego into the occupied space where the human lives, and thus gain a state of self-identification.
- protecting or implementing local identity in private and public spaces and preventing its loss as a result of globalisation and equalisation
- possibility to prevent pain and body deformation due to the using of inappropriate products and environmental settings; freedom in choice of body position and use of body-conscious products are needed here
- selection of adequate sensual stimuli – less stimulation in spaces of long-term stay
- choice of appropriate materials, prevailing of authentic natural materials supporting biophilia and regenerative effects for the nervous system, that can also influence the measurable parameters of well-being.

The objective of this paper is to explore more deeply the topic of local identity - protecting or implementing local identity in private and public spaces and preventing its loss as a result of globalisation and equalisation.

1.2. Theoretical framework with Hawkes, Podoba, Danglova & Sartori

Putting socio-cultural comfort/wellbeing and local identity in material culture as a prior interest of this paper gives another perspective to other issues of well-being. At the beginning it necessary to investigate the phenomena in social sciences like anthropology, ethnography and environmental psychology.

According to Hawkes (2001) knowing where we have come from helps us to discover where we want to go. Our social memory and our repositories of insight and understanding are essential elements to our sense of belonging. Without a sense of our past, we are adrift in an endless present. The role of the museum and the protection of built heritage are obvious aspects of this area (both benefit from creative initiatives concerning their current use, for example, outreach programs, active community interaction). But there is much more that can be done. Perhaps most important is the acknowledgement of the extraordinary diversity upon which our present is founded.

What we do in the breaks between the struggle to survive is profoundly important to our wellbeing, to our sense of belonging and connectedness, to our understanding of ourselves and our relationships – to our culture.

Tradition and regional- local identity can be seen as something that is special for a place, or was spread in the region and has been transferred, used and popularised through many generations. At the same time, it is a socio-cultural and socio-economical process.

The search for tradition and coming back to roots leads very often to “folk kitsch” a misinterpretation of tradition. To find solutions that satisfy this need for continuity is interrupted in post-communist societies but also in other strongly modern - postmodern societies, where human beings need to be surrounded by something stable and known as a reaction to the constantly changing forces in society. This contemporary strong “thirst” of the market for traditional and regional solutions is clearly based on the rupture of cultural continuity that feels the need to be healed by something traditional and stable, something that we can rely on. It is also an obvious reaction to strong social transformations in late modernity societies.

According to the anthropologist Juraj Podoba (2018) pre-modern societies are characterised by their regional differentiation, while modernization processes erase those differences. Depending on geographical and historical contexts, the extent of the decay/transformation of regional and cultural characteristics varies in line with the pressure of innovations. At the same time, however, the “invention of tradition” appears within the modernization processes. Podoba is here inspired by Eric Hobsbawm's theoretical concept of the “invention of tradition” which highlights the ambivalent relationship between autochthonous local traditions and the fostering of folklore as a tradition. In late

modernity societies, it becomes impossible to separate local cultural traditions from this “invention of tradition” as represented on the level of the nation state, since the two are deeply interconnected. Hobsbawm’s paper analyses the phenomenon of the regional peasant cultures, which are supposed to become the base for the construction of invented tradition, created by the professional designers of artefacts/items/objects/environment, created for use by the people of the late modernity era. He focuses on the phenomenon of (vernacular) architecture, which has been dominant in the efforts to create regional identity(ties) characteristics. Invented tradition works with pictures of a past that is ‘under construction’ and in constant transformation.

We can see the solution in changing the attitudes of respected and admired social and economic elites from ignoring local identity and cultural context. This can happen through building one’s own house or public workplace, e.g. in the countryside a local medical doctor can sensitively convert and rebuild an old house for the purposes of his clinic, or a local business man can settle his company in a sensitively reconstructed or tastefully designed building as opposed to some irrelevant new built luxurious setting.

We can also interpret the role of elites in municipalities where investors that create public space use the opportunity to educate and to show a good example to a wider range of consumers. Institutional support of this process is clearly also necessary.

In the post-communistic countries there exists the phenomenon of big housing projects constructed during the later communist era and considered to be cultural equalization.

Sixty years ago there were enough traditional vernacular objects that were used for their original purposes. Now these are mostly objects in institutional care and under protection, but still there are “gatherings” of traditional objects – usually in more remote previously poor regions where, being in the lower part of social stratification, being attached to tradition and local identity was a matter of survival. Now these localities have become interesting for new forms of tourism and are often already protected like preserved memorial zones.

According to Danglova (2006), a key role in the forming of local identity can be ascribed to territorial space. The good news for local and regional development is that the inhabitants identify themselves emotionally with the living space of the village or region. Emotional ties encourage more active involvement in the treatment of local issues, inspire the enhancement of local community and so of local culture. Indifferent ties and ignorance of the living space are likely to result in negligence that contributes to devastating of the community and can end up in thoughtless treatment of the surrounding environment. Emphasis on decentralization, autonomy of local authority or on the local community is therefore of extreme importance. Decentralized society means putting the accent on the the key

position of the local community. The more varied are the fruits of decentralization, the more identified the key figures of local life and local authority become in the local micro-world; the more they understand its needs and wishes but also its seamy sides, which they are then in a position to artfully overcome.

According to Sartori, human beings do not live happily alone and in ideological disorientation, which is why they are constantly trying to belong somewhere, to be in gatherings, to identify themselves with organization and organisms.

An important accessory of identity is being different – what we are depends on what we are not, If we are not surrounded by “the others”, no “we” can be created.

Although according to Danglova (2018) it is natural for the rural environment to be heavily influenced by external globalization forces which erode the ties to the region, landscape and culture, the importance for its inhabitants to identify with the surrounding local space remains, and does not disappear despite the presence of "modern life" in rural areas. For local and regional development, it is a positive phenomenon for the people to emotionally identify themselves with the living space of the local amenities. Emotional attachment encourages intensifying involvement and engagement in local issues and so improving the situation in the local community and local culture. Lack of perception of the living environment leads to neglect of the community and to an indifferent relationship to the surrounding environment. If this indifference prevails, it will wipe out the abundance of vivid live tracks of local regional cultural differences. In this context, Danglova concludes with a paraphrase of Zygmund Bauman: Europe represents the greatest cultural diversity and extraordinary mosaic of ways of life - often two different strains less than 20 kilometers away – but this Europe will disappear if local traditions do not fight for their survival.

1.3. Regionalism and local identity

Maintaining cultural sustainability through a fostering and strengthening of local identity in the built environment and life style - this means bringing local materials, principles, concepts and legends back into the material culture – architecture, housing, lifestyle, product design.

These ideas were expressed already in 80thies in theory of critical regionalism. It was first used by the architectural theorists Alexander Tzonis and Liane Lefaivre in their publications and, with a slightly different meaning, by the historian-theorist Kenneth Frampton (1983). The stylings of critical regionalism seek to provide an architecture rooted in the modern tradition, but tied to geographical and cultural context. Critical regionalism is not simply regionalism in the sense of vernacular architecture. It is a progressive approach to design that seeks to mediate between the global and the local languages of architecture. Due to Thorsten Botz-Bornstein (2015) in architecture, the concept of critical regionalism gained popularity as a synthesis of universal, "modern" elements and individualistic elements derived from

local cultures. Critical Regionalist alternatives are more than a postmodern mix of ethno styles but integrate conceptual qualities like local light, perspective, and tectonic quality into a modern architectural framework.

And what about social stratification and local identity? We can observe that the "blue collars" usually live their lives in contact with the local identity whereas white collars leave their former local community and constantly search for a new one. But in the traditional community too we can see enthusiasts coming from outside working contentedly. For older adults, being in an environment that reminds and supports local culture and place of origin is highly appreciated. If it is not possible to do this on a general level, it is at least possible within one's own microenvironment, as was mentioned in the previous section.

Another need and necessity is being a valid part of participatory and activities and projects in the local community. Older adults can share their wisdom, experiences and deeper cultural values with younger generations, and thus support socio-cultural sustainability. This can secure identity in private and public spaces and prevent the loss of local identity associated with globalization.

Individual "coming back to roots" usually happens later in life, often after one has their own family, and brings with it higher respect for parents and their values. Continuity is thus ensured.

1.4. New forms of tourism and well-being

Regional or local identity can also be massively supported by new forms of responsible and sustainable tourism, thus the local identity has to be experienced, explored and shared, to be alive. Here we can speak about the potential of agro-tourism, eco-tourism, ethno-tourism that need also infrastructures with built environments and their elements – products to be used during the experience or brought home as reminders or displays connected with an attachment to certain objects.

It is not possible to describe local identity without respecting the geomorphology together with the climate of the place, which essentially is a main creator of everything that ever happened to human beings. Only a connection with the nature and cultural signs and marks can bring a complex overview about a locality or region.

So why nature watching? Practicing nature watching brings an overall slowing down during exploration as well as the experience of amazement and fascination, respect and empathy for the natural environment and nature self. It offers relaxation and regeneration for the nervous system, being in flow, being here and now and having authentic experiences connected to a place. At the same time, it addresses our origin as gatherers and hunters.

According to the Norwegian architect Tormod Amundsen (2016), a specialist in architectural objects for nature watching, one key understanding is that architecture is not a goal in itself; of outmost importance is how we engage with nature. The

conception of the architect as someone working with nature in a meaningful way and not at the expense of nature is just emerging, and its opportunities are wide-ranging.

Agrotourism is another tourism concept that is nature-bounded. It represents a coming back to roots in the period when human beings were farmers bound to the soil and the place and processing the first fruits of their agro, forest and horticultural work. It reminds us of our later past, deeply inbuilt in our genetic memory. It also transforms the clan/tribe into the agricultural community, where other social skills were needed.

Here there is always a gap where this kind of activity starts to be relaxation and an escape from urban life and not normal daily life, where man experiences all the difficulties connected with a way of life often remote from civilization's conveniences.

The need for a deeper relation to the earth shared with a community is reflected in the contemporary concepts of urban farming, community gardens in cities etc. or by the moving of families to remote rural areas and the attempt to carry out a certain sort of traditional or permaculture farming in a consequent way.

Even when ethno-tourism is defined by Guevara (2012) as a series of activities that are linked with travelling, where the tourist participates actively and is involved in a "town" or "race" that articulates the elements of cultural history value and convictions, and also the daily activities that represent them, it can nonetheless function also in civilized cultures. For example, it can become the sort of tourism that we define as visiting local authentic storytellers, places that have interesting histories, etc.

The power of storytelling has a significant role in wellbeing and is particularly presented in every culture by fairytales, especially national ones, told to children. But story telling also for adults too is strongly present in for example Irish culture. It is also deeply analyzed in the books of psychoanalyst and story teller Clarissa Pinkòla Estes (1995). Maintaining regional language dialects of course forms a part of local social sustainability.

For this kind of infrastructure are needed tangible material objects - visitor centres, hotels, restaurants and buffets, shelters, regional products and gifts - slow architecture and design objects. All of these create an opportunity to implement the principles of local sustainable design and performance. Good service design and conscientious people to manage and guide this kind of business are crucial issues. Together they can create a positive user experience connected with wellbeing. These objects, in the ideal case also holders/stakeholders in a local identity, contribute significantly to creating a place, a site, tangible point, point of interest, motivation to come and reach the goal, an attachment point.

One of examples of infrastructure for nature watching was student project EWCC of Faculty of Architecture and Bergen school of Architecture in 2015/2016 that have led to building of wooden birdwatching platform DUNA on river Danube, 18 km from Bratislava (Fig.1).



Figure 1: DUNA bird watching near Bratislava is a great occasion for observing birds and other nature, a project of the Faculty of Architecture and the Bergen school of Architecture, Source: www.watchamber.com, photo: Noro Knap

The issue of wellbeing is also part of the social sustainability agenda and is related to the sustaining of local identity. After evaluation of the relation between regional identity and wellbeing, we set four main issues for dealing with local identity as reflected in a material culture that contributes to the well-being of users during all kind of interactions with built environment - these include:

- attachment to place – building an identity for the self and the social group
- comfort from interaction with “the known” – shared cultural values and signs, archetypes, and stereotypes
- authentic experience
- wellbeing from own hands-on experience and from interaction with professionally crafted objects

These are the main issues of local identity that are related to the well-being phenomena and, together with a phenomena of local identity self, need to be explored further.

The main idea of the interrelation between local identity and well-being or socio-cultural comfort is the awareness of one’s own origin, roots and own role in it. Being surrounded by the marks of local identity creates support for this process – the process of coming back to the roots and the “Self”.

In describing the phenomena of “coming back to roots” or back to the “Self” we can build upon the theory of individuation coming from the father of psychoanalysis – Carl Jung. In the broadest possible

way, individuation can be defined as the achievement of self-actualization through a process of integrating the conscious and the unconscious.

The tradition and the culture, as shared knowledge and preferences, is a part of both the conscious and the unconscious. The process of coming back to the “Self” is a main part of building one’s own personal identity and integrity.

2. ATTACHEMENT TO PLACE

Building a self- and social group identity

Human beings build the “Self” through extending, mirroring, processing and getting feedback and self-identification through the extensions as were defined by Hall (1969), which is why we need the possibility to be attached to objects, places and environmental settings.

The important thing is to have the possibility (or competence) to be attached to a place or products, to have the competence to adapt them, to personalize, mirror and extend the Self /ego into the occupied space where the human lives, and thus gain a state of self-identification. This feature is important for the human as a cultural creature, but also as an animal that needs its own marked habitat. This need is extremely intensified during aging.

According to the environmental psychologist Robert Gifford (1996), place attachment represents a deep experience of feeling part of a place. It is related to the richness of meaning and sense that is developed out of acquaintance with a place and, subsequently, when the place gets to be more familiar. This attachment can be to

our homes, properties, communities or local nature sceneries and settings. Where the attachment rises, the intensity and meaning of the place and the meaning of Self become affiliated. Then the meaning of the place can become so strong that self-identity starts to be restricted by the place. On a smaller scale, many people are identified with their neighborhood, quarter, village, farms, house and rooms.

Attachment to a place has some serious implications. Its close relative - the identity of the place / place identity, is an important dimension of the personality of the individual. The ability to adhere to spaces and things, to mirror them, to build the Self upon them, to identify oneself with them, are very strong human needs. Each individual has a different intensity of projection of unprocessed unconscious issues into their immediate living space, into the things they own, depending on their life strategy and the evolutionary stage of personality development. With elderly people, the process can be very intensive. The meaning of place can be so intensive that somebody's Self-identity is bordered /limited by the place.

Through identification with a place, we build our own personal identity, whereas changes inside of a person are reflected in the desire and action to change the surrounding environment, and vice versa. To have the choice and the ability to change anything (on one's own body or in the immediate space around the person) means creating an opportunity to continuously grow.

Another important issue here is the social unconscious and "the Joneses" - others and their opinions are very important for us, according to studies of cultural anthropologist Daniel Miller (2001).

3. COMFORT FROM INTERACTION WITH "THE KNOWN" Shared cultural values and signs, archetypes, and stereotypes

The phenomena of "the known" is based in a culture, whereas a culture is defined as the shared patterns of behaviors and interactions, cognitive constructs, and affective understandings learned through the process of socialization. These shared patterns identify the members of a culture group while also distinguishing them from any other group.

Culture works like lens through which we perceive the world, in order to protect our nervous system from overloading from stimuli. That's why using and sharing patterns that enable orientation in the material and immaterial world serve to make life easier.

Archetypes expressed in psychoanalytical Jungian theories can be interpreted also in design and architecture forms. The collectively-inherited unconscious idea, pattern of thought, image, etc., that is universally present have reflection in human preferences in building and furnishings.

One example of architecture form archetype is a classical saddle roof structure, reminding us of living in

provisional shelters in prehistorical times.

That is why people feel so good in an attic space or in an inner space that has a visible wooden roof structure. We have lived 6 million years in the wilderness in some primitive shelters, and just some ten thousand years in buildings.

Contemporary human beings have inherited a preference for environments that are supportive for a survival that is independent from culture. Signs that are based on archetypal knowledge communicate safety and belonging as a tool of self-identification.

Human nervous systems relax when facing something "known", based in the genetic memory, the personal or collective unconscious or conscious. What makes us feel really relaxed is being in autopilot mode thanks to habituation, somatization - embodied habits through doing things regularly, practicing family rituals or community rituals, supported by storytelling.

Archetypes and stereotypes are also hidden in fairytales and folk stories (Pinkola Estes, 1996). Good example is also the story about the 3 little pigs teach us that a wooden structure is less durable than one made of bricks. Also stories from history tell us about great fires that have destroyed towns and villages because they were made of wood - it creates an unconscious fear of having wooden house, even though nowadays they have the same durability and safety as other building materials and technologies.

Sometimes it is necessary to directly show the way or to manipulate the public opinion through designs of public places that can serve as social constructs and social praxis. Bringing children and young people who are personally evolving into such public places has a consistent influence on their mind sets and later preferences in creating their own living and public places.

Being a "Vorbild" by showing respect and empathy to cultural values in everyday life is also a way of inspiring and teaching the next generation within strategy of copying authorities. Also institutional learning supported by courses about architecture and design, organized trips and excursions can support the increasing level of material and building culture. We can see such positive examples e.g. in Austria in the Vorarlberg region, in South Tirol in Italy or in North Sweden, in Kyoto, Japan etc. In Vorarlberg we can see the local or regional identity reflected in modern architecture and design in a way that deserves respect and admiration, even though it is also a kind of invented identity. In small villages we can see modern architecture coping with the traditional one in a great synergy, built from local materials, with local architects and craftsmen, matching perfectly to the local genius loci. This phenomenon was explored in many publications. Let's mention at least one of them. Architecture as a social Praxis from Prechter, 2013. During a number of excursions, we were amazed by public buildings like schools, kindergartens, community centers, factories, power houses. It is a part of the social transformation connected with architecture in the 90-ties (Figure 2).



Figure 2: Field research of transformation and interpretation of elements of regional traditional culture into modern architecture and design, Vorarlberg region in Austria. March 2018, Source: V. Kotradyová, 2018

For children and young adults, it is crucial to be surrounded and shaped by material and immaterial elements of regional and local identity. It is a natural way of sustaining the local culture. Even so, there can be a form of rebellion and resistance during the formation of Self-identity in the adolescent period. It is a process that can be misused, but at the same time it can be used for sustaining the local culture heritage.

4. HAVING AUTHENTIC EXPERIENCES

While working with abstracts values, plastic and glass devices, there is a contemporary desire for authentic experiences – for being surrounded by something real, something that can be relied on, verified over time. Tradition like a term is declined and questioned a lot.

Here belongs experiencing believable sensory stimuli that are also culturally accepted and whose context is understood.

4.1 Visual authenticity

A main sign of **visual authenticity** is aging, whereby colour changes on a surface may be accepted or diminished. One advantage of most traditional natural materials (such as wood, stone, or leather) is that they age with grace. For example, wood ages both indoors and outdoors as a result of UV rays and other outdoor conditions, including the usual physical obsolescence. Aging can either be accepted or denied by eternally exchanging worn-out parts.

4.2 Tactile authenticity

It is significant that this is more connected with our inner instincts than with our eyes. According to Hall (1969) the pleasure of touching a surface and enjoying the smoothness and balanced temperature is connected to tenderness and caressing. The intimate touch of textiles on human skin has already been thoroughly studied, and is a must in many fields of industrial design and interior design, in cars for example. Meyer (1999) provides a

profound survey on the measurement, design and impression of tactile effects.

During the research project Interaction of Man and Wood at IHF, BOKU in Vienna, we investigated the tactile interaction in depth and employed the term 'contact comfort' to express the state of body and mind during tactile interaction. When touching some object, feeling the contact comfort is a basic condition for being relaxed and avoiding irritation and stress. There is a direct linkage to tactile authenticity. From our past experience, we have certain expectations/ predictions about the tactile properties of materials and shapes. So when contact is about to happen, we approach the material with certain predictions and our nervous system is then irritated and stressed when the interaction is completely different. When the surface or shape provides certain features that we recognize by sight, and the contacted material turns out to be a fake, a stressing/frustrating reaction by our nervous system might occur. And on the reflective level we can be disappointed.

So we have to trust in the object with regard to its tactile properties if we want to avoid such situations. This relates to quality of surface, but also to shape and weight.

4.3 Acoustic authenticity

Juhani Pallasmaa in his book *Eyes of the Skin* (2012) writes that sight isolates, whereas sound incorporates; vision is directional, whereas sound is omni-directional. The sense of sight implies exteriority, but sound creates an experience of interiority. I regard an object, but sound approaches me; the eye reaches, the ear receives. Hearing structures and articulates the experience and understanding of space. We are not normally aware of the significance of hearing in the spatial experience, although sound often provides a temporal continuum in which the visual impressions are embedded.

Every building or space has its characteristic sound of intimacy or monumentality, invitation or rejection, hospitality or hostility. A space is understood and appreciated through its echo as much as through its

visual shape, but the acoustic precept usually remains as an unconscious background experience. Sight is the sense of the solitary observer, whereas hearing creates a sense of connection and solidarity. The acoustic properties of some materials and shapes are very important for creating acoustic balance - intimacy but not isolation. It is suitable to create a balance through the gentle mixing of softer and porous materials without finishing or echoing materials with hard and smooth surfaces that reflect sound waves.

4.4 Olfactory authenticity

Can you recall a specific odor or scent that has the 'spatiotemporal' ability to transport you back in time and space to a very specific place from your past? Most of us have experienced how the unexpected whiff of a Proustian, Remembrance of Things Past, type of odor can instantly evoke flashbacks to somewhere long ago or far away. Until recently, the underlying brain mechanisms that encode these vivid time-and-place smell memories has remained a mystery. But now, for the first time, a new study, "Hippocampal Projections to the Anterior Olfactory Nucleus Differentially Convey Spatiotemporal Information During Episodic Odour Memory," (Aqrabawi, A. J., Kim, J. Ch. 2018) helps to explain how 'what-when-and-where' smell memories are stored in the brain.

Something irregular, unique, original, made by hand, can be classified as an authentic experience - beauty in simple functionality and usability. A good example is the phenomenon of owning, rebuilding, refurbishing old traditional houses for purposes of second - weekend homes. This is a reflection of the contemporary lack of real authentic complex experience explains the popularity of free time common creative workshops, labs and trainings where participants can share their joy from flow.

Traditional local materials like wood or clay have a great potential in the "do it yourself" issue, as construction or decorative materials that are easily available, formable and workable, which can quickly bring positive feedback and satisfaction even on the hobby level. This process is enabled by the great availability on the market of different prefabricated products that ease the work. But the creating process is much therapeutic, complex and consequent if the whole process is really traditional, with less help from modern technologies.

To hold something properly in the hand and to have a real control over the tool and material is a matter of deep satisfaction that increases along with practicing and raising skills up to mastery. This principle differs for men and women, with man preferring to work with hard and heavy materials in repairing, building or rebuilding with tools something large and women enjoying fine hand work with direct contact of the fingers with a material, even though for both sexes the goal and the primary need - satisfaction and direct immediate feedback through creating and completing something - is the same.

Robust or fine hand work as well as fine art is also a form of meditation and also part of ergotherapy - a

part of rehabilitation or psychotherapy. In every hand work there exists a certain kind of transfer of ideas, energy and emotions among the creator, material and user. The human energy and emotions embedded and transmitted into a material are then later further perceived and felt by the users of the objects. This transmission works especially with crafted objects, which makes them unique.

Here another way of interaction exists between the objects of mastership and users. Professional craftsmanship is nowadays being endangered and widely substituted by the amateur enthusiast, whose work can later be transformed as well into professionalism. Being surrounded by crafted objects and enjoying an authentic experience from them, combined with amazement and fascination, also forms an element of wellbeing.

The handmade object does not charm us simply because of its usefulness, but lives in complicity with our senses, and that is why it is so hard to discard it - it is like throwing a friend out of the house (Paz, 1987).

Using your hands as a tool to communicate thoughts and ideas; building a relationship between hand, mind, thought, and object; feeling the satisfaction of making something that you can use in your life - these are the things that make craft education important in my opinion.

The Penland School of Crafts (2004) in its anniversary book stated that reformed-minded writers in England and United States focused on two main topics: sincerity and simplicity. The halcyon days of the crafts occurred at a time when every workman was an artist and every workman was a workman, when gain was of less importance than quality, and when things were made to endure. The spirit of commercialism changed this and resulted in large production at low cost. This placed low price wares within the range of the multitude, and luxury, in the sense of the ownership of many things, rapidly increased. Consequently, the value of workmanship was lowered and the purchaser was satisfied with machine-made ornaments. Naturally, then, excessive adornment became the rule, and art became divorced from industry.

According to Charles F. Binns, human happiness is encompassed not by a maximum of possession but by a minimum of desires... The need is simplicity, both in home and life, and it is the mission of the crafts to promote this. In the home and in life, it is the mission of the crafts to promote this. In the home... the simplification of surroundings does not necessarily mean a lessening of cost.... A few things, yes, but each one of the best, each one a masterpiece bringing and ever repeating the message of a master. These are works of which one does not tire. They become life-long friends and are fashioned so as to mellow but not to decay with age. In this way also daily life is affected ... the mission of the crafts is to teach these things.

In crafted design and the production process there is the dialogue of a creator- his mind and body - and the material. In this way there is a high chance that a product will be material conscious, but also human-centred, so that in this connection there are created



Figure 3 Doses “Povabnice”, 2010 and bowl from collection Závrtý a Erózie, 2018, Tibor Uhrin, Sources: www.uhrindesign.com, 2010

objects that respect the material and thus bring also more relaxation for the nervous system of those perceiving them.

Around the world there are professionals working on this interface between craft, design and art, and their works belong among masterpieces. As an example, we can mention the Slovak designer Tibor Uhrin, who has based his design work upon craftsmanship (Figure 3).

The exhibition Homo faber first organised in September 2018 in Venice showed a huge collection of this kind of work and gave hope that professional craftsmanship was not dead. This phenomenon works also in the “hobby” version, where the creating and building process becomes a tool for regeneration and recovery of every unprofessional creator, although a certain quality of result must be attained to bring a true feeling of satisfaction at the end.

5. INTERPRETATION OF THE LOCAL IDENTITY

Case studies

Last part of the study is dealing with questioning the

ways of working with the local identity, with “the known” and shows some examples from Europe and Slovakia.

How to preserve it, transform, interpret it, copy, refer to it? First of all it research about it, respect it, having a lot of respect and empathy by adding something new, use it with the context and telling stories, Not to embed in misinterpretation and be stranded in many form of kitsch.

How to define good taste and appropriate way of working with regional motives and features, how deal with it and not to copy literary? We can interpret it, refer to it, transform it and to question the process constantly and its result from the point of view of social sustainability and wellbeing.

It is possible to work with it also in a contextual way, in form of art acupuncture, as we did during the project BAETCH in the city, in Sandeleiten in Vienna, where there was built a temporary community center from waste brought by local inhabitants that were having many social problems in the area. This effort was to bring them together face to face by doing something hands-on (Figure 4).



Figure 4: BAETCH in the city, voluntary built temporary community center in Sandeleiten, Vienna, workshop with participants from Austria, New Zealand and Slovakia, 2012, Source: Veronika Kotradýová, 2012

In 2018, we decided to choose a different - comprehensive research and development methodology. This resulted in the organization of a series of experimental workshops entitled "Regional Product". The methodology consists in combining literary research, ethnographic field research (observation, mapping, interviews, case studies, oral history collections) with local stakeholders - representatives of different groups of citizens involved in regional development, participatory design and development

and prototyping regional products or products inspired by the region.

The combination of research and "in situ" creation was, in line with the project's ambition, to bring inspirational and exemplary solutions for consumer products, gift items, souvenirs, furniture, entire interiors, and building constructions, referring to folk material culture. Therefore, the project includes experimental workshops combined with field research in the regions (Figure 5).

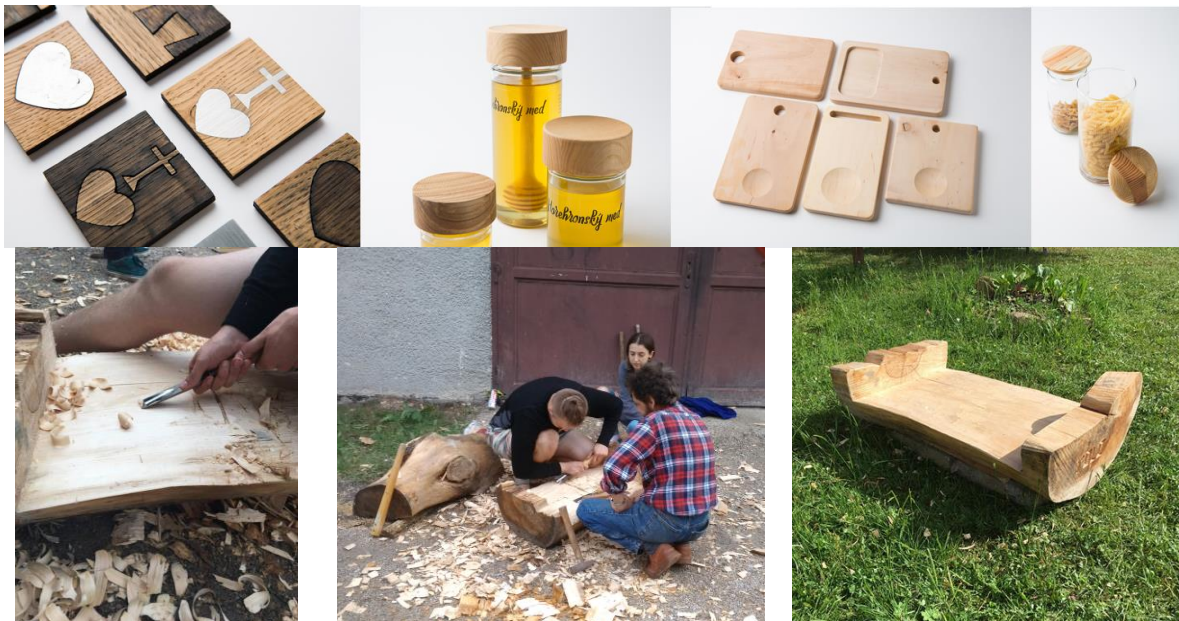


Figure 5 Field research, transformation and interpretation of elements of regional traditional culture of Horehronie into modern design, authors: P. Daniel, T. Lesajová, V. Kotradyová, L. Uhlárová, Source: N. Knap, K. Krajčovičová and V. Kotradyová, 2018

The first was a workshop in Pohorela, with the topic: "Regional product of Horehronie" with the participation of professionals and students from the field of ethnography, architecture and design.

During field research, products and services were designed within the philosophy of research by design, and conceived with the aim of developing the potential to develop regional micro-businesses linked to eco-agro and ecotourism, with the possibility of production in the region and distribution to and from local tourist information centres. The concepts were further developed after returning from the workshop. Figure 6 shows the prototypes of products inspired by the Horehronie traditional culture in conjunction

A second workshop was placed in southcentral Slovakia, in the Hont region, with a basecamp in the village of Hrušov. This had a very different climate and geomorphology from Horehronie and thus very different available materials.

While in Horehronie is prevailing the use of soft wood, of sheep breeding with milk products and wooden objects used for their processing and home textiles production, in Hont there is a dominance of stone works, hardwood processing, and basketry, fruit and wine culture. This difference was also reflected in the products that were developed. A third workshop

was established in Northeast Slovakia, in a region of north Šariš and Zemplín, with a basecamp in the small UNESCO protected town of Bardejov. The region was special due to its multi-ethnicity, where Slovaks, Jews and several tribes of Ruthenians have lived side by side for hundreds of years.

The culture has been influenced by a strong history of wars in the region, many heavy battles during the First and Second World Wars. A speciality of this region are also the wooden churches of the eastern rite.

For the effectiveness of such a workshop, it turned out to be very important to have right from the early beginning a link to local activists in order to maintain regional / local identity and to promote regional development. Meeting local stakeholders and bringing them together around one table to discuss and be involved in the creative process also played a crucial role.

The objects that are being developed in the workshop (Figure 5, 6) will be further explored and tested regarding the preferences of respondents. Also the topic of physiological reactions with EEG sensors of respondents while in a built environment that has marks of local identity will be further explored.

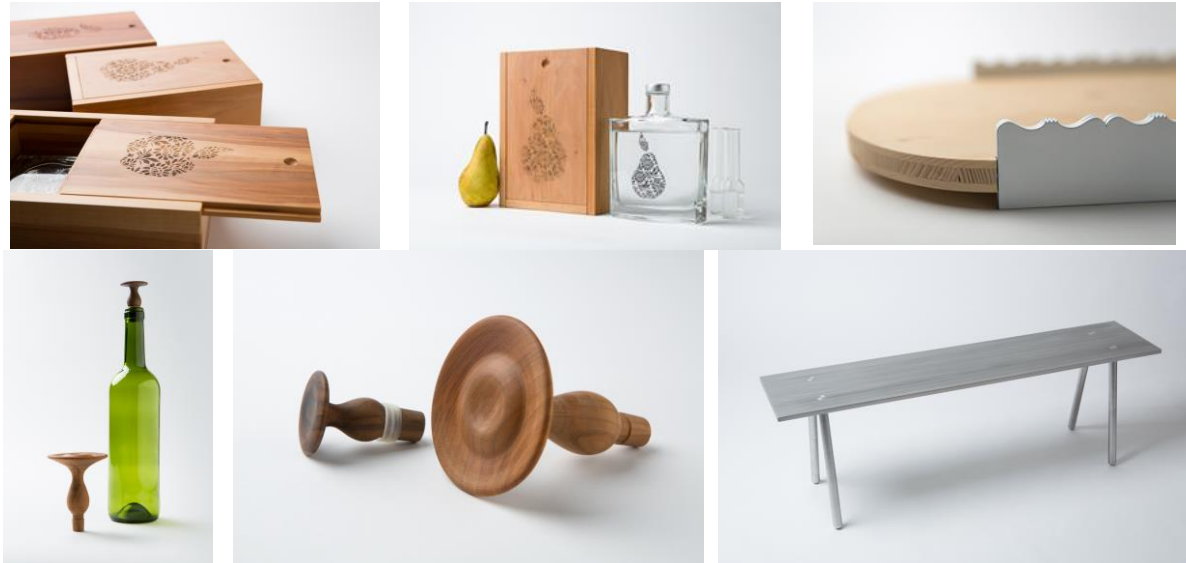


Figure 6 Examples of products inspired by regional elements of Hont, designed during workshop and field research in situ; design: A. Tóth, M. Kučerová, P. Daniel, T. Lesajová, Soruce: Noro Knap, 2019

CONCLUSION

Getting into contact with regional identity involves exploration, watching, listening, feeling, being amazed and coming back to one's roots and to the Self.

Being attached to the place where we live and taking care of it in common community interest, being aware of our origin, having a relationship with it, is an important part of wellbeing. Belonging to a community, having a rich relationship with that community massively contributes to public health and wellbeing.

Creating something with one's own hands while being in a state of flow is a further important part of wellbeing. Also being surrounded by crafted products and being amazed by master craftsmanship contributes to socio-cultural comfort.

What exactly supports wellbeing while being in interaction with issues having signs, referring to local signs, marks brimming over with local identity in a complex way is locally bounded and naturally very much culturally conditioned. But what is common for every culture is the need of the Self; all around the world people need to be connected with their roots and traditions to build a personal identity and integrity – to be healthy.

These issues will be further explored in the near future and tested through physiological responses.

During our first pilot workshops the entire team experienced fascination from the exploration of local identity and the flow from being involved in local craft techniques based on profound admiration and respect. This all is reflected in the designed product.

It also shows the meaning for designers to come closer, to listen and observe, to be directly in touch with the resource, by the root of the tradition, by its context in geomorphology, climate, mentality connected with local life style, rituals, stories, reflected in immaterial and material culture. Then it

gains the potential to match with the local identity, to be accepted by the local community and to be further transmitted to users of the products and spaces.

Case studies have shown great potential for regional development and possibility to contribute to the wellbeing during everyday life and experiencing the new forms of tourism. This issue is in progress and it will be further published.

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I care (my home)

Chiara Marchetti

AIPAA, Associazione Italiana Psicologia Ambientale e Architettonica

Abstract

There are various schools of thought in environmental psychology as to what may constitute the effect of pro-environmental actions on the wellbeing of the individual. This paper focuses on design choices aimed at wellbeing in terms of the home environment. Much attention has been given to "green" design choices, moving from Passive Houses to Zero Impact, from Biomorphic Design to Feng Shui, and more recently to Biophilic Design, an approach based on a comprehensive exploration of the innate human affinity for Nature. This paper proposes a perspective based on the principle of "I Care (My Home)" in which each design choice is dictated by a different meaning that the subject attributes to it. In this way, one's home acquires the potential to become regenerative and create wellbeing. A domestic environment without subjective meaning risks becoming merely a beautiful environment. In order to generate wellbeing, there must be a reciprocal empathetic relationship between the inhabitant who cares for the house and the house which cares for the inhabitant.

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Corresponding Author: Chiara Marchetti, chiamarchetti@libero.it

Introduction

This paper seeks to pose some questions and propose some hypotheses concerning the relationship between wellbeing and home, both of which can be considered in terms of a recent paradigm shift towards complexity. From this perspective, the *complexus*, the texture of complexity, “comes from different threads and becomes one. All the various complexities intertwine, therefore, and weave together, to form the unity of complexity; but the unity of the *complexus* is not eliminated by the variety and diversity of the complexities that have woven it” (Morin, 1995, p. 56). The eternal human search for wellbeing finds refuge in the home as a complex of physical elements: the architectural composition, the materials used, the forms and the shapes, the voids and

¹. This search for a dwelling may mean building your own home, choosing it, furnishing it, or customizing it and creates a personal dynamic in the quest for a place in which to shelter, rest and find wellbeing. This means that, within the perspective of complexity, architecture, psychology, sociology, biology and anthropology are all interrelated. Understanding complexity means reaching a synthesis of four dimensions – biological, cognitive, social and ecological – within a vision of life as a network of relationships (Capra, 2014).

From green housing to biophilic design

Since its advent, green housing has offered a number of ways of interpreting the relationship between places in which to live and wellbeing, with varying degrees of emphasis on the biological, cognitive, social and ecological dimensions. In the 1990s Passive Houses were developed in Sweden and became popular mainly in other Scandinavian countries, together with Germany, Austria, and the Netherlands, reaching other countries such as Northern Italy only to a limited extent. Passive Houses are designed to maximize energy efficiency and are built from airtight construction material that must be high performing in terms of energy requirements but are not necessarily natural. Air recirculation, necessary both for reasons of health and hygiene, is controlled by a ventilation system with a high-performance motor-driven heat recovery system. The sole aim is that of reducing the building’s ecological footprint and other dimensions that determine various possible choices in terms of type and style of housing are not considered (Berto and Barbiero, 2017). Further developments led to Zero Energy Buildings (ZNE) and subsequently Zero Net Energy Buildings (NZEB).

A different school of thought regarding green housing stems from the emergence of the criterion of the sustainability of the materials used. Priority is given to natural materials, such as wood, straw and clay, that are both kilometer zero and renewable. A further alternative approach is that of building houses made from recycled materials, with particular importance given to the scenic

the solids. Each one of these elements is dynamic and personal. At the same time, all the psychological elements - the sense of refuge as a space for body and soul, the status symbol, the expectations, the social relations, the wellbeing that can derive if certain conditions are satisfied – are equally dynamic and personal. Many of the positive emotions we seek in our house have a long evolutionary history and are formed in the early stages of a child’s life (Barbiero and Marconato, 2016). The same is also true of the macro-relations such as the house in its context and in relation to Nature.

Renzo Piano defines the work of the architect as “an ancient profession such as hunting, fishing, farming and exploring. After the search for food comes the search for the dwelling. At a certain point, man, dissatisfied with the shelters offered by nature, became an architect...”

qualities of the dwelling and less emphasis placed on its being high performing and eco-friendly. Examples include the building made from second-hand containers in the London Container City (Greater London Residential area) or in the Johannesburg Mill Junction Project (a colorful four-floor student residence, built on two former wheat silos).

Biomorphic Design has introduced a concern for following the rules that determine growth in Nature. In this approach, engineering is concerned with redefining space in order to create evocative sceneries. The emphasis is on the shape of the building rather than the materials used. The visual impact created has indeed at times led to difficulty in achieving a full enjoyment of the internal environment, probably because the human brain tends to favor maps and pathways following straight lines.

Architectural research on wellbeing has not been limited to materials and shape. In recent years there has been a rediscovery of *Feng Shui*, an ancient oriental discipline, and *Vastu*, Indian version of the same discipline. Both of them start from the idea that space has its own energy and that this feature must be harnessed in order to achieve wellbeing and prosperity for the inhabitants of dwellings. While in part recalling ancient oriental tradition, contemporary western fashion tends to offer customers a simplistic and commercial version of it, completely void of its original meaning (Bonaiuto, 2010; Chan, 2015; Keun, 2017).

Biophilic design emerges as an endeavor to go beyond previous approaches to green housing, with their varying emphases on environmental impact or personal wellbeing, in order to introduce a scientific approach to understanding the innate human affinity for Nature (Wilson, 1984) and incorporating this into a paradigm shift in design buildings and communities. In this respect, spaces conceived and realized according to Restorative Design ideas can be effective as promoters of health and wellbeing, in terms of enhancing sensory perception and promoting positive feelings, stress recovery and psychological regeneration. The approach to Biophilic Design proposed by Terrapin Bright Green (Browning, 2014) is based on fourteen patterns divided into 3 macro

¹ <https://www.tosilab.it/en/trendwatching-at-traverso-le-archistar/>

areas: Nature in the Space (visual connection with Nature, non-visual connection with Nature, non-rhythmic sensual stimuli, thermal/airflow variability, presence of water, dynamic and diffused light, connection to natural systems); Natural Analogues (biomorphic forms and patterns, material connection to Nature, complexity and order); Nature of the Space (prospect, refuge, mystery, risk/peril).

Based on combinations of such patterns, biophilic design can be adapted to both the surrounding environment and the intended users of that space. Models can be applied at different scales from a micro-space (a room), a medium space (a building) up to a macro-scale (a neighborhood or a city). A biophilic project can be seen as promoting a fractal growth as a form of natural geometry creating patterns of variety and similarity (Kellert and Calabrese, 2015).

Care and Restorativeness

As Biology, Psychology and Architecture have become influenced by an increasing attention to issues such as ecology, consciousness building, respect for Nature and wellbeing, a range of both scientific and non-scientific literature has come to deal with topics such as dwelling, decluttering and spare cleaning, in terms of Eastern Philosophy, such as Zen practice. Moreover, in Europe two more trends have emerged, defined by the Scandinavian words: *hygge* and *lagom*. *Hygge* expresses the mental and emotional wellbeing coming from small, daily things. It is a lifestyle based on a sense of comfort, security and welcoming, a familiar atmosphere that makes people feel more peaceful (Wiking, 2017). *Lagom*, which literally means the “right quantity”, is a lifestyle based on the key concepts of reduce, reuse and recycle.

Such ideas and trends can be seen as part of collective unconscious projections which are necessarily influencing the development of architecture. On one hand, the focus is on the house, considered as a refuge, an oasis where people can regenerate from external environmental stress. On the other hand, the focus is on Nature and Earth protection. Together these produce a sort of New Renaissance, centered not only on Man but rather on the interaction Man-Nature. In this respect, we could produce an image of Leonardo’s “Homo Vitruviano” circumscribed within the globe, where the relationship is bijective and interchanging but not hierarchical. The focus is now on the relationship between subjects and not on the subjects themselves. As Mallgrave puts it: “in the greater social and cultural context, design is the playful and tangible self modification (of our physical and emotional reactions)

through our environments” (2013, p. 151). If we care about our environment, we care about ourselves.

We have to feel emphatic with our home, in terms of what Gallese calls “embodied simulation” (Gallese, Sinigaglia, 2011). Living in a physical environment, we simulate shapes and materials by using our body, we “feel” the naturalness of wood or the softness of velvet. We become aware of what we like or don’t like and what creates wellbeing for us. In this sense, choosing the ideal living room has no objective answer, but only a subjective one, and wellbeing depends on an attitude of “I care”, both in terms of a physical and a phenomenal home environment.

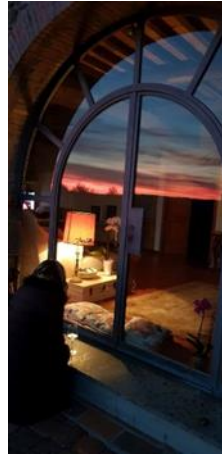
Care about and of the environment, both built and natural, is thus fundamental. Research has shown that if the urban green is well maintained and easily accessible then it represents an important component in residential satisfaction (Bonaiuto, 1999). In the same way, a house needs the same kind of care in order to achieve the same result of satisfaction and facilitate a process of regeneration. While certain kinds of specific design can provide a basis for restorative wellness, by themselves they are not enough. It is in the interaction Man-House that “something” actually happens, where the house welcomes, protects and defends because Man cares about House, a care that creates a reciprocal resonance effect. In this way, “I care” becomes the quid of Morin’s *complexus*. “I care” becomes personal and full of meaning, whereas a domestic environment with no personal meaning will simply be a nice place, perhaps even a sterile place.

Restorative Home Settings

What follows is a series of photographs I asked a number of people to send me of the place in their house they “use” for experiencing restoring and then the position they took the picture from. I also asked if they have some routine that enables them to be more relaxed. The photographs show how taking care of your environment is all about an order which is creative and lived in, but not maniacal. Personal objects and cultural references are clearly in evidence, not hidden. The relaxation routine is expressed through simple gestures: listening to one’s favorite music, reading a book, lighting a scented candle or incense, placing fresh flowers in a vase, each of which illustrates how taking care of your house is a part of the desire to take care of yourself.

Each photograph is considered first through a description of the physical environment and then through an analysis of correspondences with the 14 patterns of Biophilic Design proposed by Terrapin Bright Green, even though none of the examples used was originally designed according to biophilic premises².

² The photographs used have been authorized by the authors exclusively for this publication. For any other use, please contact: chiamarchetti@libero.it



1. Tuscany, Italy

Description. The restorative home spot is an armchair in natural fabric with footrest, from which can be seen a large window which opens towards the Tuscan hills. The ritual of relaxation is to put fresh flowers from the garden in a vase, sit in an armchair, light incense and read looking out the window.

Nature in the Space: visual connection with Nature is enhanced by virtue of a large French window overlooking the garden.

Natural Analogues: natural furnishings such as the wooden bookcase and elements of care such as flowers collected in the garden. The distribution of the furniture emphasizes the coexistence of complexity and order.

Nature of the Space: both prospect and refuge are clearly in evidence.



2. Udine, Italy

Description. The restorative home spot is a white sofa on which is placed a hand-painted linen sheet depicting leaves. The ritual of relaxation is to read a book, listen to music, light a scented candle.

Nature in the Space: non-visual connection with Nature.

Natural Analogues: material connection with Nature by materials and elements such a parquet and organic linens, that create a pleasurable sense of place. The emphasis is more on order than complexity.

Nature of the Space: the emphasis is more on prospect than on refuge.



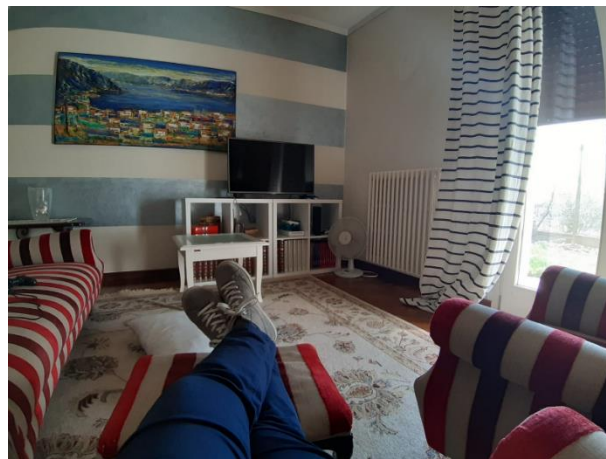
3. Friuli Venezia Giulia, Italy

Description. The restorative home spot is a large, dark, modular sofa, where all the family can sit together. The place is next to the fireplace. The ritual is to listen to good music, have a good glass of wine and chat.

Nature in the Space: non-visual connection with Nature.

Natural Analogues: material connection with Nature by materials and a toy monkey. The emphasis is more on order than complexity.

Nature of the Space: The emphasis is more on refuge, in the form of a dark-colored sofa, than on prospect.



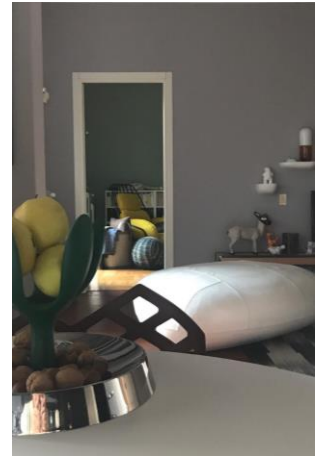
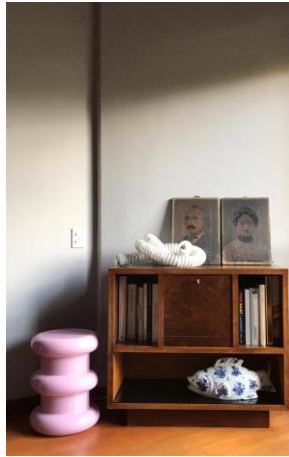
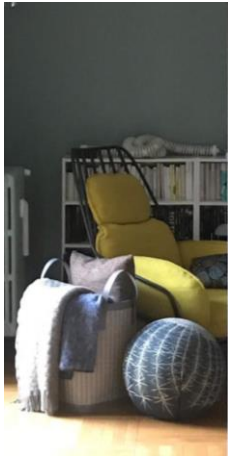
4. Iseo Lake, Lombardia, Italy.

Description. The restorative home spot is an armchair with a footrest. The ritual is to disconnect the phone, turn on a diffuser of essences and look out of the French window or at the picture that represents the lake.

Nature in the Space: visual connection with Nature is enhanced by a large French window overlooking the garden.

Natural Analogues: the choice and distribution of the furniture emphasize the coexistence of complexity and order.

Nature of the Space: both prospect and refuge are clearly in evidence.



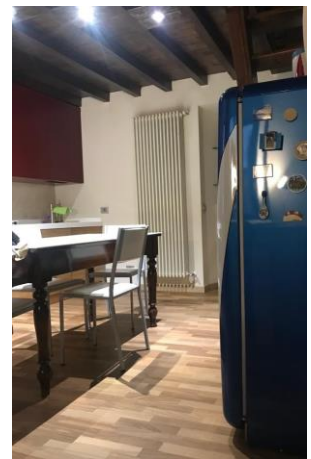
5. Milan, Italy.

Description. The restorative home spot is a yellow armchair together with a pouf made in the shape of a cactus. From this point can be seen the kitchen and a piece of furniture on which are placed souvenirs. The ritual of relaxation is to listen to music, light a scented candle and read design magazines.

Nature in the Space: non-visual Connection with Nature.

Natural Analogues: there is a balance between sophisticated design furniture and biomorphic design. The emphasis is more on order than complexity.

Nature of the Space: the emphasis is more on prospect - from a vibrant armchair - than on refuge.



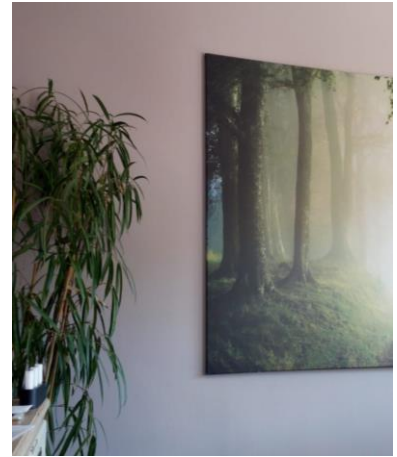
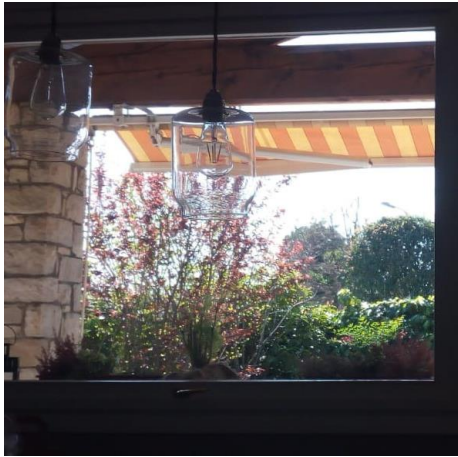
6. Cellatica (Gussago), Lombardia, Italy.

Description. The restorative home spot is a burgundy leather sofa from which can be seen the window overlooking the garden and the kitchen. The ritual of relaxation is drinking something, beer in summer and herbal tea in winter, silence the phone and sit silently reading a book.

Nature in the Space: visual connection with nature is enhanced by the window looking outside.

Natural Analogues: a large painting of a natural scene with a bridge is located behind the sofa. The parquet is made from material that connects with Nature. The emphasis is more on order than complexity.

Nature of the Space: Refuge and Prospect are balanced in the warm colors of the sofa.



7. Brescia, Italy.

Description. The restorative home spot is an armchair with a pattern of leaves from which you can see the large window overlooking the garden and a photograph of a forest. The ritual of relaxation is to take care of the plants at home, drink herbal tea and read a book.

Nature in the Space: visual connection with Nature is enhanced by a large window overlooking the garden and a real tree.

Natural Analogues: the choice and distribution of the furniture emphasize the coexistence of complexity and order. Nature is represented very clearly in a poster and in an armchair decoration as well as in natural wooden furniture and linen.

Nature of the Space: both prospect and refuge are clearly in evidence.



8. Castelmontecchio, Bergamo, Italy.

Description. The restorative home spot is an armchair in green leather, in front of a clearly visible private garden, with a sofa in purple leather opposite it. The ritual of relaxing is drinking herbal tea and listening to jazz music.

Nature in the Space: visual connection with Nature is enhanced by a large French window overlooking the garden.

Natural Analogues: natural furnishings such as the wooden cabinet. Complexity and order are balanced.

Nature of the Space: both prospect and refuge are clearly in evidence.



9. Franciacorta, Brescia, Italy.

Description. The restorative home place is the bedroom, from which there is a wide view of the landscape. The indoor ritual of relaxation is to play the piano and have a drink and, in the summer, to sit on the balcony and contemplate nature.

Nature in the Space: visual connection with Nature is enhanced by a large French window looking outside towards a natural hill.

Natural Analogues: the natural elements are white. Complexity and order are balanced.

Nature of the Space: both prospect and refuge are clearly in evidence.

CONCLUSIONS

Every design choice is driven by the different meaning that every person ascribes to a given Home-Space. This meaning then identifies the pathway to be taken. There is a current tendency to look towards a more conscious world, both in terms of life and architectural choices, a new empathetic way of living, largely made up of small connections to the real world. Within this perspective, house is not only a physical space but also an ancestral symbol, the place of personal identity. Taking care of one's house is taking care of oneself. In order to create a relationship of reciprocal empathy, the inhabitants of a dwelling must care for it so that it can care for them. Only in this way can a house be restorative and give rise to wellbeing.

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From the city of gaps to the city of wellness: The case study of DOT TO DOT© community garden in Maryhill, Glasgow

Laura Petruskeviciute

Studio Pop, United Kingdom

Abstract

The new urban question has been conveyed by the abrupt inequity of income distribution, environmental disasters, demographic shrinkage, social asymmetries and city voids (Brenner, Peck & Theodore, 2012). Brownfields, abandoned buildings and vacant lands are unresolved environmental and social problems in many European postindustrial cities. These ruins constitute the physical manifestation of our urban landscape heritage, which coincide with the location of deprived areas with vulnerable people that demand effective strategies with adaptive solutions. How should these gap sites become instruments of wellness whilst open to regenerative/restorative social innovations? This study reflects on theoretical and applied viewpoints of DOT TO DOT© [www.dots.scot], a multidisciplinary grass-root project that enables the participation of intergenerational groups -social entrepreneurs, researchers, architects, artists, educators and youth- in the co-development of a creative local community to refill and reuse empty sites on a temporary basis and to improve life of disadvantaged communities by applying participative design tools and establishing distinctive spaces: [a] the Community Garden (phase one, implemented); [b] the Remake Station and [c] the Woodland of the Senses. DOT TO DOT© project (phase one) addresses up-to-date urban regeneration and health issues from local agendas providing a vivid community-led and multicultural development. It proposes both a conceptual framework and applied experiment in situ by interconnecting key factors -so-called dots- in order to tackle health and wellbeing issues in selected deprived areas along the Forth and Clyde Canal in Maryhill North Kelvinside, Glasgow. Furthermore, it aims to transform polluted vacant lands into healthy and wellbeing outdoor environments based on integrated decision making and bottom-up governance by providing live demonstrations that are relevant to the empowerment of our local community and future replications in similar urban contexts. The DOT TO DOT© methodology employs community-based participatory research and somatic learning tools; community-led research by doing; and experimentation by reusing waste integrating spatial, visual, quantitative and qualitative data. It includes sensory learning activities, physical work and communication engagements with urban communities in the process of transferable creative knowledge.

Keywords: Urban reactivation; social innovation; regenerative public space; creative waste reuse; community-based participatory research; participative and somatic learning; experimental community garden

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Corresponding Author: Laura Petruskeviciute, laura@studiopop.net

Reanimating a Gap Site into Public Space

Glasgow as post-industrial city has the greatest amount of vacant sites than the rest of Scotland put together. In Glasgow's urban area, 98.1% of people live within 500m of vacant land or derelict buildings. The Forth and Clyde Canal flows through Maryhill North Kelvinside, forming a vital infrastructure of the local economy. It is for many years polluted and largely unused after the decline of heavy industry. Therefore, it is a post-industrial area with high social deprivation and historical heritage in risk.

Environmentally, people see vacant lands as valueless spaces, so lacking of visions and synergies to offset, reuse and repurpose urban waste creatively at local level

and to build ecologically sound communities. Local residents in Maryhill North Kelvinside still perceive abandoned buildings and gap sites as valueless assets, which lack of identity and have none or little utility. These spaces cause unpleasant discontinuity in the existing urban fabric. Derelict land intersecting residential urban areas dictates poor urban quality. Economically, the public budget for remediating brownfields (Beard, 1996) and gap sites is limited and especially tiny when applied to poor and disadvantaged areas. Industry is still far from being able to reuse or repurpose them creatively, and hence to build resilient and inclusive places for communities.

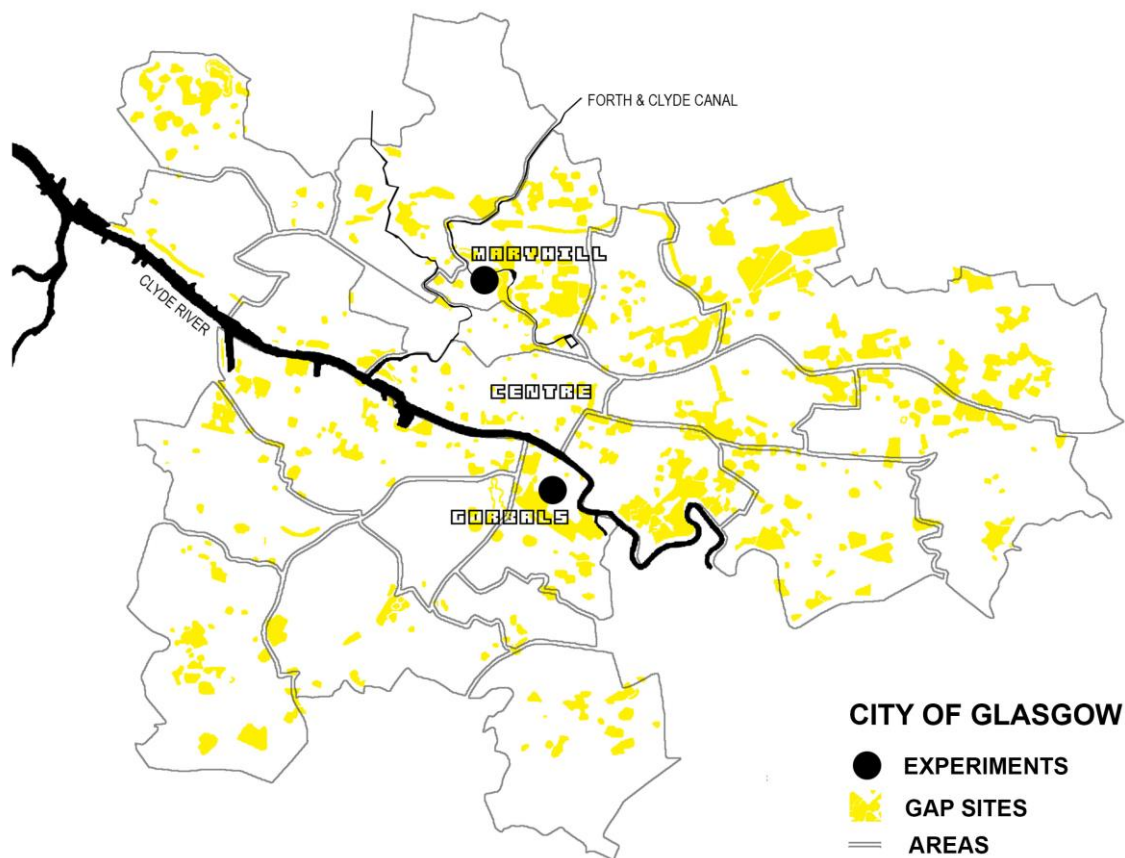


Figure 1. Map indicates derelict land proximity to residential areas in Glasgow city (highlighted in yellow). It also shows the position of two experimental community gardens: MOBILELAND© (2016) and DOT TO DOT© (2019). Source: Studio Pop archive, 2019.

People have the right to live in better and healthier public spaces by sharing capacities and contributing with the implementation of place-making and place-learning collaboratively. However, public space today is missing sense of appropriation becoming more as a space in transit rather than an "architecture of enjoyment" (Lefevre, 1973). On the other hand, the vitality of public space is dependent on personal choices and decisions to act publicly even if there is no obligation to do that. Essentially, the character and meaning of public spaces are formed and defined by how people occupy and use them throughout the empowerment of community to

take control over their environment (Andersson, 2016).

Nowadays there is an ethical need to rethink the notion of the "commons" in public spaces. To support this, Mitchell (2003) writes that "struggle is the only way that the right to public space can be maintained (...)" Public space is for people to be together, to interact, to exchange, to create, to learn, to trade and to collaborate. A sense of community always arises when people get involved in something. There is a naive way of perceiving the occupancy of public spaces in European culture, which assumes it is free and open to all by default. Nonetheless, public space is above all a social agreement.

In other words, without a social agreement there is no public space. According to recent statistics, UK citizens' behaviour in public spaces are recorded in nearly six million security cameras, which means one for every ten people. Such an invasive control over individual rights in public spaces shows the current impediments towards

the implementation of a democratic self-management of it. Being militarised, it provokes a culture of fear due to its intrusive nature, in which the celebration of urbanity seems exceptionally fragile, limited and ultimately sequestered.



Figure 2. Photography illustrates the first on-site community event, a clean-up day where school volunteers and community developers gathered to remove junk from plot in order to land-mark the future DOT TO DOT© garden (May, 2017). Source: Studio Pop archive, 2019.

DOT TO DOT© Case Study: Place-making with Creative Waste Reuse

DOT TO DOT© is a combination of social form (Maki, 1964) and loose space (Franck & Stevens, 2007). It proves to be successful because it is community-based participatory research initiative that is reinventing the way of what publicness actually is. How? Simply by reusing and repurposing waste as local resources creatively. The DOT TO DOT© project follows the principles of the New Urban Agenda Habitat III (Quito, 2016) and the Stalled Spaces Scotland (Toolkit, 2017) locally, offering a social framework to implement transformative actions to resolve urban challenges locally with temporary, portable and sensory structures. Its research objectives are:

[a] Connect waste, design and local communities to reactivate urban gaps through experimental sites.

[b] Boost social inclusion of vulnerable groups, mainly youth and children, locally.

[c] Enable social innovation between social enterprises, academia, eco-schools and local

communities through a community consortium.

[d] Test/pilot craft and social technologies through live projects, open demos and eco-fairs in the garden site.

The DOT TO DOT© consortium believes that communities are active designers rather than mere consumers. DOT TO DOT© is aligned with the socio-economic sectors prioritised by the EU/Scotland's Economic Strategy connecting Creative Industries (eco-design), Environment (waste reuse) and ITC (Information Technology and Communication). It was awarded and funded by the European Social Fund (ESF); Lottery; Creative Scotland; Stalled Spaces Glasgow; and the European Youth Award (EYA), category Sustainable Economics. Its aim is to reactivate cities connecting waste to design for society through social innovation, ecological design, waste reuse and outdoor learning by assisting communities to co-develop and deliver long-term local solutions that address local priorities and needs; increasing active inclusion; and building on the assets of local communities to reduce poverty, to give start-up resources and to enable inclusive participation in poor neighbourhoods.



Figure 3. DOT TO DOT© outdoor activities on remake with waste (2017-19). Source: Studio Pop archive, 2019.

DOT TO DOT© is an urban reactivator and predecessor of MOBILELAND© garden (Suau, 2016; Suau & Petruskeviciute, 2017). It takes place in an experimental site fully designed with temporary structures made entirely from reclaimed materials to create a distinctive place powered by gardening, art workshops, citizen science events and eco-design fairs. It is a process-based rather than outcome-driven research project. Every open and available space -such as the 636 Maryhill plot in Glasgow- should be treated as a living organism, both regenerative and restorative process. It is not something that simply culminates once we plant one or more trees. Instead it acts as a live innovator that adapts to the needs of our everyday life by caring about the place and building up trust and sense of placeness.

Indeed it is not a fast or homogeneous timeline process. It is a diverse community built upon different backgrounds, which work actively to share capacities and enjoy common interests. Weekly, community runs a series of onsite and offline activities, including practical place-based experiments, nature-based solutions (NBS), sensory learning, local policy making and grass-root research to support public decision-makers and other stakeholders to work more creatively with social and environmental innovators. As community developers, Studio Pop team co-leads and assists technically DOT TO DOT© community to initiate civic-responsive and locally-led projects in a bottom-up manner. For instance, the Maryhill experimental site is equipped with a portable remake station and community garden, which performs as “living remake lab” to enrich environmental perceptions and build somatic design capacities among

experimenters throughout the implementation of agile greenery, polyvalent architectures and adaptive uses.

This project offers the opportunity to unite ethnic minorities, various professionals, children, families and older generation not only offsetting social exclusion but increasing mental and environmental health and wellbeing. The balance between production and consumption through local sustainable sourcing cannot occur without changes in the living and working lifestyles of citizens who must be involved in these transformations through collaborative creative practices through local networks. Hence It also allows access to new community services where new relational flows, societal networks and circuits of production-consumption are formed.

The Radical (Re)Make Process of Ecopolis and its Circular Economy

Our habitats are being rapidly urbanised, renovated and restructured and, in this process, our cultural landscape is being radically altered. 60% of the urban areas that will exist in 2050 have not yet been built. Environmentally, about 75% of the consumption of natural resources occurs in cities. They produce around 50% of global waste and between 60 and 80% of CO2 emissions. Urban settlements are placed where most materials are used and wasted, and where buildings, land, and other infrastructure are constantly underutilised.

There are interlinks between local and global sustainability. Scalability rules. According to Bucky Fuller (1968), the Earth is a spaceship, with the sun as our

energy supplier. *"We are all astronauts"*, says Fuller. The idea of the earth is as a vehicle that requires maintenance, and that if you do not keep it in good order it will cease to function. Cities play also like spaceships. They are living laboratories. Tjallingii's thesis (1995) also deals with cities and sustainability bridges, linking general strategies to concrete practical tools and planning proposals, drawing lessons from years of pilot projects. His book introduces the Ecopolis strategy framework in the urban ecosystem and offers concrete guiding models with flows of energy, water, waste and traffic in the urban fringe and core areas and for organisation and participation (the market, co-operation, the learning organisation).

The challenge of managing and reducing urban waste is a growing sustainability problem for governments and local authorities. Recycling rates are increasing, but this is not enough to address the environmental challenges faced by our throwaway material culture. How? DOT TO DOT© investigates the scope, impact and potential of community-based waste-reduction initiatives, to address this problem firstly at local level (phase one) and then regional and global ones (phase two). It explores urban challenges and transformations through grassroots experiments and didactic research methods using waste creatively. Adaptability, Sensory and Temporariness are the key design components. Radical here means base, fundamental, taken from the fundamentals. Etymologically, this term comes from late-Latin radicalis, *"of or having roots"*; from Latin radix, *"root, going to the*

origin". The act of remake is restorative and regenerative, offering something to make again or anew with a special urban value.

At local level, DOT TO DOT© is a civic community in development that improves the perception of citizens about vacant lands through experimental gardens along the biological corridor of Forth and Clyde Canal. It represents an innovative socio-environmental model that enables creative people to connect gaps, design and local communities through real societal challenges like food and waste within the C2C framework (McDonough & Braungart, 2002). This regenerative model is not limited to recycling and the elimination of residual and toxic waste, but also focuses on the design of the cycles for biological and technical materials, the nutrients.

This case study is also part of a practice-led research forum *"Remaking the City"*, a social channel that connects practices with academic and research groups about eco-design, social technology and urban sustainability. In addition, the motto *"WASTE2DESIGN4SOCIETY"* enables the exchange of terminologies, frameworks, methods and experiments. However, how are perceptual experiences involved in the remaking of stalled spaces? Local communities, civic enablers and community developers contribute to co-produce live projects through experiential learning and active involvement of experimenters as remakers. All perceptual experiences connect systemically waste and society through user-centred and participatory design (Papanek, 1971) within the remake culture.



Figure 4. DOT TO DOT©, den building workshop (2018). Source: Studio Pop archive, 2019.

DOT TO DOT© runs a series of onsite and offline activities, including practical place-based experiments, sensory learning, local policy making and grass-root research to support public decision-makers and other stakeholders to work more creatively with social and environmental innovators. It can make a major contribution to understanding the potential of community-led grassroots innovations to offset waste locally and thus reconceptualise waste activities in order to help circular design and collaboratively implement more successful waste reduction and management schemes in other cities. Its outcomes drew on conceptual frameworks such as socio-technical systems, social practice theory and grassroots innovations (Seyfang &

Halextine, 2012; Seyfang and Smith, 2007; Shove & Surling, 2013).

By scaling up, DOT TO DOT© might contribute not only to the wellbeing of poor suburbs but also to the global sustainability by reducing waste, offsetting CO2 emissions and mitigating climate change in cities through community urban gardening, upcycling projects, free exchange networks, collaborative consumption, food-sharing apps, tool libraries (open source) and the sharing economy (time-banking), etc. These grassroots innovations implies social and technical arrangements, either by reducing material consumption and/or dealing with waste more creatively, in order to deliver lower-waste lifestyles. Community waste projects can

potentially offer new radical solutions for more sustainable waste systems and practices worldwide.

Research methods and tools

DOT TO DOT© employs a combination of research by design and didactic learning methods. It covers the fields of circular design (pop up architecture and eco-design), appropriate technologies (remake technologies and self-build); adaptive urban reactivation (open public space); and transformative landscape (sensory gardens and bioremediation of brownfield).

[a] *Community-based participatory research*: Eco-design methods based on remaking, place-making and place-learning; climatic and urban data collection, including clinics, design charrettes, group discussion and interviews on-site, and community consultations with members and volunteers from local communities, wards, municipality planners, housing associations, art collectives, social enterprises, students, researchers, remakers and local stakeholders. During the concept design phase, DOT TO DOT© Glasgow is driven by user-centred and participatory agenda. For instance, during phase one (6-month period), we have had weekly discussion groups (20 times), monthly interviews (six times) and three clinics. The total of participants consists of six leads, 19 regular members and between 8-12 volunteers on weekly basis. Members and volunteers are usually recruited via social media, promotional activities and festivals. All participants participate in the co-design process via design charrettes, clinics and public consultations. The experiments are also validated with national and international awards, art engagement activities and site-specific experiments –such as proof of concepts and live projects- in situ during eco-fairs. Participatory design includes legal lease agreements; feasibility study, preliminary and advanced design; urban mapping; satellite imagery analysis; geo-mapping; pictorial inventory of historical maps; photographic inventory; and factsheets made by Studio Pop team and research assistants. Design development covers from ideograms and sketches to CAD design modelling and visualisations. Regarding analogical trials, sensory gardens were tested in array of reclaimed tyres planters, with one-meter spacing between pots to allow users accessibility in all directions.

[b] Literature review: In order to develop a circular model, design took inspiration from significant books: *Spaceship Earth* by Fuller, B. (1968); *Ecopolis* by Tjallingii, Sybrand P. (1995); and *C2C* by McDonough, W. & Braungart, M. (2002). It also implies the implementation of the New Urban Agenda Habitat III (Quito, 2016) and the study of international precedents of structures made of reused waste ruled by the design principles of temporariness, portability and sensory.

[c] Learning methods and tools: The THINK2PLAY4MAKE© (TPM) framework is a pedagogic circular model developed by Studio Pop to be applied in community development and urban reactivation projects drawn on models of spatial perceptions (Bloomer & Moore, 1977). It activates the experimental site in a play-place, an evolutionary outdoor learning environment

that inspires our creative community to experience themselves as transformative agents of the built environment. TPM amalgams both senses and place-learning. Community leads employ both research-led teaching and experiential learning methods with activities coming from students, academics, artists, designers, urban activists and residents to experiment new concepts of perceived spaces and stimulate perception arguing for a return of the body to its proper place in the architectural equation. During live experiments, participants mainly learn from hands-on activities using conversations, games and self-build methods to interplay at personal and group levels. Learning activities offer a base structure with these components: [a] Attachment (perceptive learning tasks); [b] unfolding (activating pre-existing knowledge); [c] making (bodily-kinaesthetic experience); [d] sharing (sensory knowledge transfer); and [e] self-evaluation. TPM questions the professional reliance on visual or computational two-dimensional representational drawings in conventional education, which often understands design as a highly specialised model made with a set of prescribed technical tools and media rather than a multi-sensorial manifestation of the human body's perception (O'Neill, 2001).

[d] Experimental site: Plot is situated at 636 Maryhill Road in Glasgow, a former vacant land. The site is well-connected with a busy street, the Canal and close proximity to two primary schools. It obtained site permissions for trials from Glasgow City Council and Scottish Canals (Petruskeviciute & Suau, 2017). As part of the community-led regeneration programme led by the Scottish Government, DOT TO DOT© has been granted with the European Social Fund (ESF), Aspiring Communities Fund (ACF), stage one (six month) for piloting/testing a community garden with creative workshops and design charrettes. Stage two will implement a remake station, a workshop space fully focused on creative plastic reuse, including a eco-design shop and community hub. How is this experiment contributing to local sustainable development? During stage one, this trial contributed to: [a] define and map waste systems and practices in Maryhill; [b] study the scope, scale and character of the community waste sector; [c] evaluate the impacts of community-led waste reuse projects in gaps sites; [d] investigate the potential, and challenges faced by this sector at urban and regional scale; [e] design a remake station in future chosen sites; and [d] help design local community versus authority-led initiatives in order to improve waste reduction and tackle climate change locally.

Co-design of DOT TO DOT© Community Station

The community consortium is led by two social enterprises and one eco-school community. In terms of participants, DOT TO DOT consortium is both community of interest and geographic community. People from different backgrounds and professions is generously contributing to the enhancement of this project removing all inequalities and social boundaries whilst working for common good.

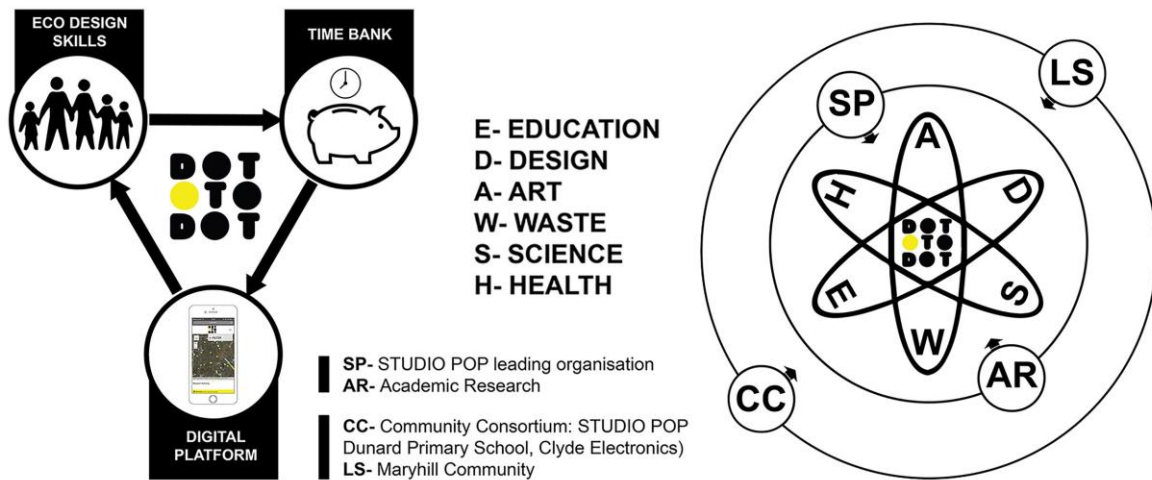


Figure 5. DOT TO DOT© Trash-to-Cash, social business model (right) and organisational structure (left). Source: Studio Pop archive, 2019.

DOT TO DOT© offers an agile spatial solution- on a temporary basis- to reanimate empty sites along the Canal through remaking with waste, public artistry and time-banking exchange. In order to change the negative perception of vacant lands and to plan a sustainable community-led regeneration, the community has approved a pragmatic proposal made in chunks. The community expects that all experiments inform new ways of developing DIY gardening and promoting environmental art locally and also in other brownfield sites. In doing so, the overall design is structured in four distinctive spaces: [a] The Community Garden, including a heritage food dome and sensory garden; [b] the Remake Station, a portable eco-design hub; and (c) the Woodland of the Senses, upwards the Canal side. After two consultations in 2018, design charrettes and site-specific activities, community partners and members agreed to co-develop the following spaces for learning:

[a] The Community Garden consists of two gardens, Heritage Food and Wild Green ones. During hot seasons, it is used to plant heritage vegetables and teach horticultural skills, primarily to School children and residents of Maryhill. They grow heritage vegetables and other varieties rarely found in supermarkets or groceries. Food is exchanged during community events. The Wild Green Garden is an outdoor sensory garden that grows diverse native flora in planters made by tyres. It will be focused only on growing medicinal and aromatic local plants within a selection of shrubs, small fruits and herbs. To avoid any potential toxicity from contaminated ground, portable planters are detached and elevated from ground and filled in with high-quality soil, which allow growing, picking and eating any native plants without getting toxics. This experiment demonstrates how certain plants prefer rich soils whilst others thrive off

poor soil. The reuse of organic nutrients such as domestic compost, tea bags or natural fertilizers could help specific plants like nuts and fruit shrubs to grow. Volunteers participate in all phases: soil preparation; planting; caring; picking; and eating.

[b] The Remake Station (phase two) will be the portable eco-design hub that provides remake and craft skills. It consists of modular units made of shipping containers (20-feet cabin hire type) to accommodate our community café, social club and remake workshops, including a tool storage. The central outdoor space is called Àite A Dhèanamh, Place for Making in Scot Gaelic. It is a communal place for gathering, sharing and exchanging ideas.

[c] The Woodland of the Senses (phase three), it is a slope situated close to the Canal side. It is a land concession given by the Scottish Canals to co-develop outdoor educational activities. The forest has the potential to become a natural laboratory for kids. Environmentally, it can be connected with the curricula of two primary eco-schools. This site is planned as experiential place-learning environment, where children, educators, researchers and wider community can get multi-sensorial experiences and test nature-based solutions as well. The community came with the concept of changing the perception of this man-made forest into a naturalised interactive touchpoint. Trees will be adopted and tagged, so everyone can identify and track them during excursions. For instance, kids can sample the mean temperature, amount of daylight, soil moisture, relative humidity with camera traps, insect and motion sensors. Due to the slope condition, this sensory forest will be connected through a zig-zag trail, starting from the Canal pathway.

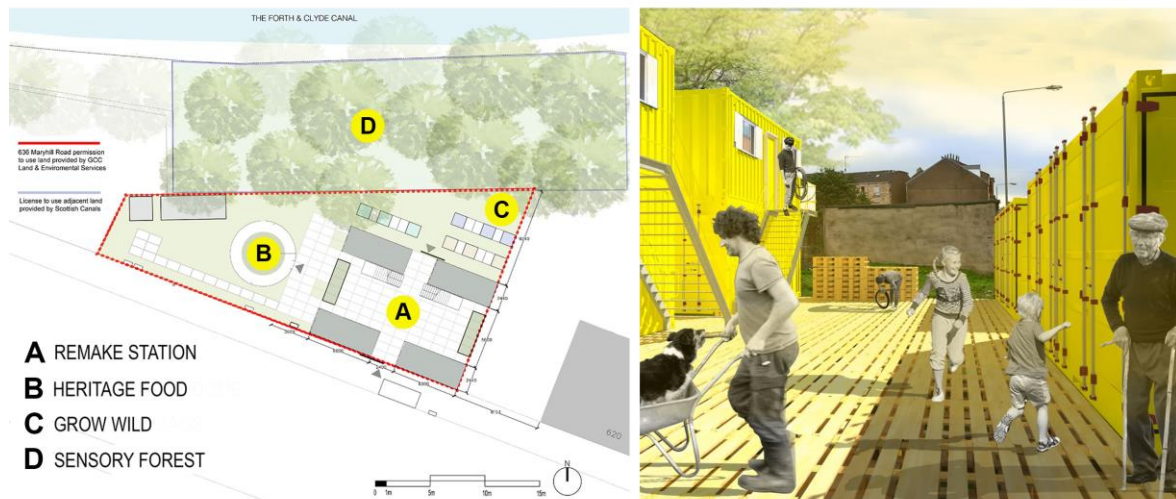


Figure 6. DOT TO DOT© Community Garden. Maryhill Remake Station. Source: Studio Pop archive, 2019

DOT TO DOT© is also a digital community, which is basically a social technology [mobile-friendly website: www.dots.scot] that maps and connects people and waste through design. The app is in Alpha development serving to retrieve relevant data and identify new functionalities and features for our community. This tool helps the implementation of temporarily land uses, live projects, clinics and site events. In phase two, we hope it will assist community with service design, remake workshops, online tutorials and a DIY library. As social technology, DOT TO DOT© will be self-financed with membership fees, crowdfunding and donations. Remakers are members, backers and volunteers that will contribute with materials in-kind or time to get free materials, services and reskills as rewards.

Finale

Cities require a widening focus from the city-products to material flows, production processes and conditions, as well as aspects of land use and waste reuse. It needs an extended systemic view as well as profound understanding of ecological principles. Pop up Architecture is the sensory, temporary and portable manifestation of the remake urban culture. It is an architecture of peripety, which uses the land without owning it. Pop up Architecture is the expression of a heterotopic space (Foucault, 1984), the “other space”. It is made from scratch. Paraphrasing Bernard Rudofsky (1964), these social forms are self-build structures of occupancy in transit. Self-build means animal architecture (Frisch, 1983), an instinctive way of making an habitat. Main design features are (a) people are natural self builders, (b) build with waste as reusable material, (c) make temporary structures, and (d) produce building with low-calories. Like any organism, co-

architecture is highly resilient. DOT TO DOT© is an architecture with the people, by the people and for the people.

DOT TO DOT© also means open source architecture using somatic learning experiences to co-create ecologically a place. This experiment has positively increased the number of local supporting organisations, including Scottish and European academic and research organisations, researchers and consultants. Experimenters are strengthening the sense of community cohesion, civic empowerment and urban reactivation. DOT TO DOT© is a unique combination of ecological design, social technology and community-led initiatives to transform waste into social value. Being an innovative urban management model, it offer the potential to be replicable as social licensing in other similar European cities (Suau; Petruskeviciute & Til, 2018). It is grass-root innovation that contributes to a lower-waste future locally and re-conceptualise waste reuse activities in public realms to help circular economy initiatives and collaboratively implement more successful waste reduction and management. The more senses people use, the richer the perceptual experience. Community gardens are dynamic learning spaces that represents the organic expression of evolutionary urban forms. They are often perceived as picturesque structures and rarely perceived as social forms. Sensory gardens are both restorative and regenerative spaces, mainly characterised by polyvalent, flexible and adaptive patterns, geometries and forms. They concentrate a wide range of sensory experiences and sensibilities, which many of them are unselfconsciously experienced. In DOT TO DOT©, learners live an multi-sensorial learning experience gaining perception-in-action, somatic, kinesthetic and constructional skills. By implementing sensory structures in cities, we reconnect design with

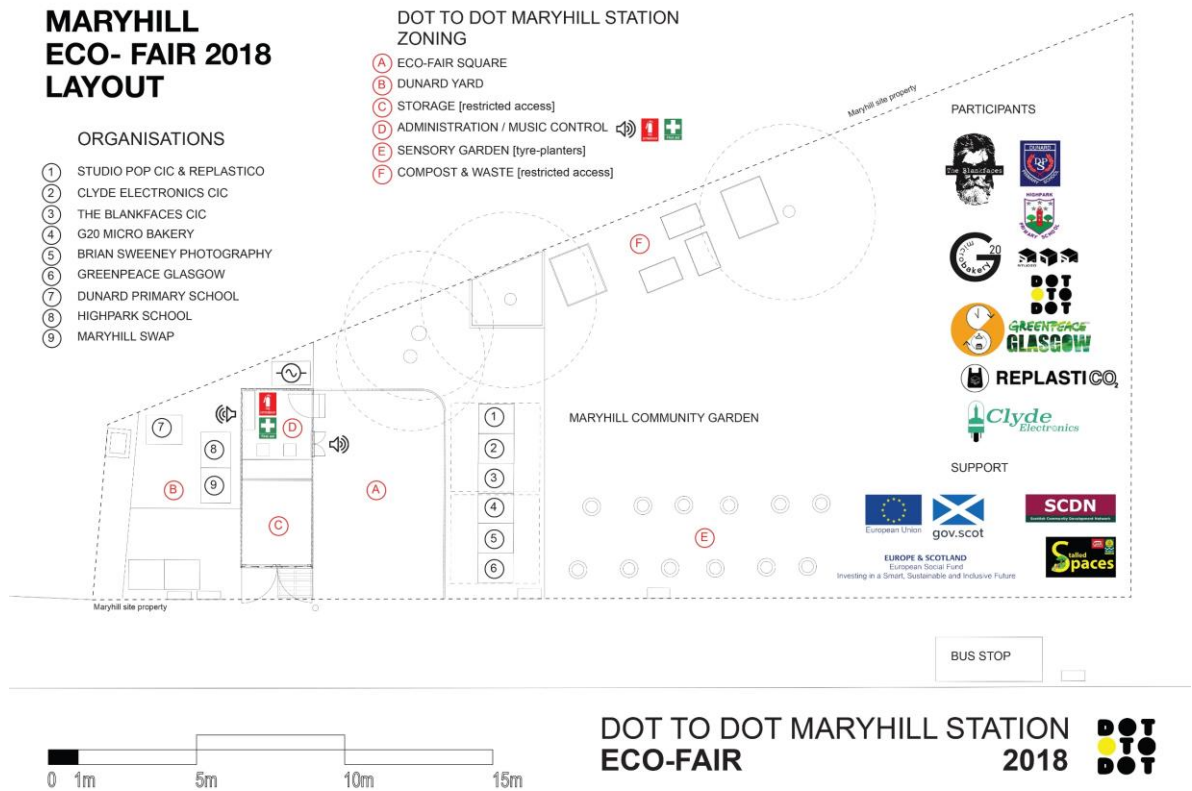


Figure 7. DOT TO DOT© pop up architecture validated by community consultations during eco-fair 2018. Source: Studio Pop archive, 2019

people and change their perceptions of everyday life in a transformative manner (Suau, 2017).

Within our material culture, what would happen if we creatively designed the reuse of waste, products and materials, promoting a long-term cyclical use and maintaining or improving its urban value within the neighbourhood? DOT TO DOT© translates the perceptions of vacant lands and waste into regenerative

landscapes transformed by creative experimenters. This chosen case orients young designers, architects, planners and environmentalists as local innovators to acquire a better understanding of what are the community needs; to perceive better connections with the immediate surrounding; and to build site-specific sensibilities. There is no more resource squandering, depletion and exploitation in cities, but resource use in cycles.



Figure 8. DOT TO DOT© Remake Station (phase 2), street view. Source Source: Studio Pop archive, 2019

Acknowledgments

DOT TO DOT© IP/copyright is owned by partners of Studio Pop C.I.C. It is a social licensing that enables smart communities, stakeholders, housing associations, local planners and governments to design and implement projects that transform vacant lands and rundown buildings in deprived areas throughout self-build, DIY, gardening, workshops and events. I would like to extend my gratitude to the DOT TO DOT© community consortium leads and Studio Pop C.I.C. team for their inspirations, artistic creativity and visionary ideas. Specially I do express thanks to distinguished personalities and groups, specially Dr Cristian Suau from Studio Pop and Dave Ball from Clyde Electronics; Viviana Checchia, engagement lead at the Centre for Contemporary Arts (CCA), Glasgow; Tanja Obradovic and the Urban Planning Cluster in Niš, Serbia; EU COST Action CA16229 European Network for Environmental Citizenship (ENEC), EU COST Action CA16114 RESTORE and EU COST Action TU1201 European Network Urban Allotment Gardens; ISAGS UNASUR Institute and HABITAT III (New Urban Agenda); and the Architecture Fringe Festival in Scotland. Finally, our gratitude to Zeba Aziz, DRS planning officer of Stalled Spaces Glasgow; Jim MacDonald, chief executive of Architecture & Design Scotland (ADS); and the European Social Fund (ESF), Aspiring Community Fund led by the Scottish Government.

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Surprise, arousal, and pleasantness in movement between spaces

Margherita Brondino¹, Jack Leon Nasar¹, Margherita Pasini¹, Saleheh Bokharaei²

1. University of Verona, Italy
2. Shahid Beheshti University, Tehran, Islamic Republic of Iran

Abstract

In one theory as perceived surprise increases, arousal increases and pleasantness increase up to a point, after which it levels off or decreases. However, studies indicate that for environmental response, arousal and pleasantness are independent of one another. Those studies did not examine movement through spaces. We sought to study response to surprise as experienced in moving between pairs of offices. We created three simulated offices (A, B, and C) and nine virtual walks between each possible pair, such that some walks had no physical differences (AA, BB, and CC), some had moderate physical differences (AB, BA, BC, CB), and some had larger physical differences (AC, CA). A test confirmed that the manipulations worked as planned. To measure arousal and pleasantness, we created two three-item scales (each in English and Italian). We assigned participants in the US (121 adults, 47 men, 84 women) and Italy (67 adults, 34 men, 33 women) at random to either a within-group condition or one of the three between-group conditions (Low Surprise, Medium Surprise, or High Surprise). We used the within group to test the Confirmatory factor Analysis model (CFA), and we used the between group conditions to test the effects of surprise. The CFA found the two three-item scales fit the multi-level model well. We combined the items into two three-item scales for the analysis of effects of surprise. Both arousal and pleasantness increased from low to moderate surprise, but decreased from moderate to high surprise. The results suggest value in studying dynamic environmental experience.

Key words: Aesthetics; dynamic perception; environmental preference; sequential experience; affective response.

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Corresponding Author: Jack L. Nasar, nasar.1@osu.edu

Physical properties of places or perceptions of them affect pleasantness (Kaplan & Kaplan, 1989; Nasar, 1994), but designers and researchers agree that some perceptions and pleasantness arise from movement between environments (Lozano, 1974; Berlyne, 1971; Heft & Nasar, 2010). Designers may use contrast between spaces (in such elements as size, lighting, texture, or shapes) to create interest. For example, Tadao Ando's Church in Water has people enter a large windowed nave facing nature through a narrow dimly lit, long corridor; and Frank Lloyd Wright's Falling Water has people enter a large well-lit library through a confined dark corridor. For researchers, these differences may evoke surprise, which they define as a mismatch between what one experiences in a place and what one anticipated for it (Berlyne, 1971). An environment can set up an expectation for the next. As the perceived discrepancy between two increases, surprise increases, and that surprise affects arousal and pleasantness (Berlyne, 1971;

Huron, 2006).

Two theories, one more perceptual and the other more perceptual-cognitive, predict similar effects of surprise on uncertainty, and arousal, but a different effect on pleasantness for high arousal. The perceptual theory predicts a decrease in pleasure for high arousal, while the perceptual-cognitive theory predicts a continued increase (in a safe condition).

In both theories, the stimulus conflict of surprise evokes uncertainty and has arousal potential that motivates the observer to try to reduce the uncertainty and make sense of the environment (Berlyne, 1972; Wohlwill, 1976). Theories of intrinsic motivation agree that surprise evokes uncertainty, arousal, and curiosity, that motivate exploratory or avoidance behavior (Deci & Ryan, 1985). Berlyne's (1972) more perceptual-based theory predicts that pleasantness increases with surprise up to a point (an optimal level) after which it levels out and decreases (Figure 1).

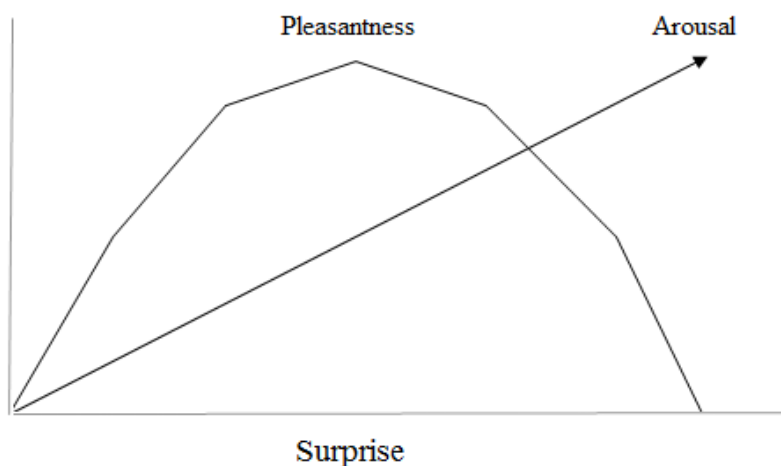


Figure 1. Theoretical relation of arousal and pleasantness to surprise (Berlyne, 1972; Wohlwill, 1976).

This occurs because a primary reward system generates positive affect as arousal potential starts to increase. However, a secondary system activates at a higher level of arousal, and it generates negative affect as arousal potential increases. In theory, the two systems together produce an increase in hedonic tone (pleasantness) from neutral to positive as surprise increases, but a leveling off and shift from positive to negative as surprise continues to increase beyond an optimal level. Studies of responses to the built environment support the theory (Akalin, Yildirim, Wilson, & Kilicoglu, 2009; Nasar, 1987; Wohlwill, 1968), but some studies have found a linear (Heath, Smith, & Lim, 2000) or U-shaped relation of pleasantness to arousal (Martindale, Moore, & Borkum, 1990), although the

Martindale et al. (1990) study examined responses only to polygons and art.

According to the perceptual-cognitive theory, evolution has favored the ability of humans to anticipate future information. However, because humans cannot know what will happen next, uncertainty accompanies anticipation. In this theory, surprise results from a failure to anticipate the future, and that failure creates a rapid reaction of uncertainty, arousal, and fear. That rapid reaction arouses a slower cognitive appraisal to make sense of the potential danger (Huron, 2006). Up to this point, the theory agrees with the perceptual theory. However, it then posits that the slower appraisal can replace the rapid negative reaction with a neutral or positive one. If it finds the fear unwarranted, it sends a

signal to the brain to stop the fear response. That subsequent appraisal relates both to the perceived harm or benefit of the outcome and to the contrast between the quick and slower reaction (Gaver & Mandler, 1987; Solomon, 1980). Pleasurable surprise mixes the initial fear of the unexpected features of the environment with the slower appraisal that the environment is safe. As the rapid uncertainty, arousal and fear increases, the contrast between the rapid reaction and the slower appraisal of the situation as non-threatening should increase, and with it, pleasantness should increase.

Humans have three kinds of responses to surprise, danger, and fear: *fight*, *flight*, or *freeze*, each of which can lead to a specific physically-based pleasurable response: *laughter*, *awe*, or *frisson* (Huron, 2006). A *fight* reaction occurs in response to a threat from another animal or something entailing a large expenditure of physical energy, such as a loud sound or an abrupt change. For example, the reaction includes *piloerection* (or goosebumps, like when the hair on the back of your arms goes up). If the slow appraisal judges the animal, sound or change as safe, the piloerection becomes the pleasurable chill of frisson. *Flight* and *laughter* (a kind of panting) occurs in response to a momentary fear, such as tripping but not falling. *Freeze* occurs in response to a sustained or fixed danger, such as encountering a cliff. If the danger appears manageable, the freeze (gasp) becomes *awe*. Regardless of the type of fear and response, as the surprise and rapid fear increases relative to the slower cognitive appraisal of safety, pleasure increases. In contrast to Berlyne's (1972) theory, pleasantness continues to increase for high arousal.

Of the three kinds of response, we believe the flight/laughter response may best fit responses to the physical environment. In movements through typical neighborhoods, homes, offices, commercial centers, or places of worship, if one encounters a surprise, the rapid fear reaction is small and short-lived, because the subsequent appraisal quickly recognizes the new environment as non-threatening.

The research and theory suggest three questions, one about the relationship between pleasantness and arousal, one about the relationship of arousal to environmental surprise, and one about the relationship of pleasantness to environmental surprise. For preference and arousal, the theories differ in their predictions. While Huron (2006) and Berlyne (1971) suggest a relation between pleasantness and arousal, Russell found them as independent of one another (Russell, 1980; Russell, Lewicka, & Nitt, 1989; Russell & Pratt, 1980). For arousal and surprise, both Berlyne (1971) and Huron (2006) suggest that arousal would increase linearly with surprise. Finally, for pleasantness and surprise, Huron (2006) predicts that pleasantness increases linearly with increases in surprise, but Berlyne (1971) predicts that pleasantness has an inverted U-shaped relation to increases in surprise, increasing up to a point, and then leveling off or decreasing.

Similarities and Differences in Response

Research has shown strong consistency in people's evaluations of the environment. A meta-analysis of responses to more than 3,200 scenes by almost 20,000

respondents found high correlations in response across cultures, genders, age, special interest groups, between students and others (Stamps, 1999). Van den Berg, Vlek, & Coeterier (1998) refer to the assumption that similarities in response outweigh differences across individuals, groups, and cultures as the "consensus assumption." Indeed, studies suggest differences across cultures or cultural groups in response to some kinds of environments (Hunziker, Felber, Gehring, Buchecker, Bauer, & Kienast, 2008; Herzog, Herbert, Kaplan, & Crooks, 2000). Through experience and socialization, people may develop similarities in attitudes, values and behaviors within a culture or subculture, and differences across them (Berry, Poortinga, Breugelmans, et al., 2011). Cultures may differ in their social representation of an environment such that judgments of pleasantness are socially mediated (Graumann & Kruse, 1990). Such cultural differences, however, need not conflict with an evolutionary or biological explanation of environmental preferences (Lyons, 1983; Van den Berg et al, 1998). Instead, they may reflect an effect of a shared mediating variable such as typicality or familiarity. Because both biological and cultural factors affect human responses to the environment (Bourassa, 1990; Hartig, 1993), it makes sense to consider the degree to which different groups have commonalities and differences in response.

Multi-Level Models

The social-ecological approach offers a complex but realistic perspective on the influence of the environment on humans (King, Stokols, Talen, Brassington, & Killingsworth, 2002). Among other things, it notes the importance of environmental and sociocultural variables. In discussing the consensus assumption, Van den Berg et al. (1998) acknowledge the importance of establishing the relative importance of biological and cultural factors in aesthetic response. For research to go beyond determination of the degree of consensus, and to find information on determinants of individual or socio-cultural differences in the characteristics of the environment, one can use multi-level models. These can estimate the effect of environmental variables while taking into account individual or group variations in the relationships, and they allow the estimation of cross-level interactions between the characteristics of the environment and the individuals responding to it. Thus, the present study used multi-level models to study group similarities or differences in response to the dynamic experience of surprise in the environment.

Taking into account the need to explore the relation among surprise, arousal, and pleasantness for dynamic experience, also in a cross cultural perspective, the present study used movements between simulated spaces to test the effects of environmental surprise on arousal and pleasantness. It did this across two groups, adults in the US and in Italy. We manipulated physical properties of spaces that would likely affect the perceived differences between the spaces, and thus might affect surprise. We did so with simulated movement through spaces. One test of environmental surprise, found that although pleasantness increased with surprise (Nasar & Cubukcu, 2011), it did not level off for high surprise. We wondered if the high surprise and

related arousal did not get high enough to reduce pleasantness, but also realized that most everyday environments would not reach such a high level of surprise. Nevertheless, the present research, centering on movement through three spaces, sought to create higher levels of surprise and test effects of surprise on arousal and pleasantness across two countries (U.S. and Italy). It had three research questions:

R1. Does perceived arousal increase with the level of the surprise experienced between pairs of spaces (Berlyne, 1971; Huron, 2006)?

R2a. If arousal does increase with surprise, does surprise affect pleasantness in an inverted U-shaped function (Berlyne, 1972), or in a linear way (Huron, 2006)?

R2b. If arousal does not increase with surprise, does pleasantness still relate to surprise?

METHOD

Preliminary steps

Before the main study, we did two steps to set up the study. First, we created and tested an environmental manipulation to generate different levels of surprise. Second, we tested the goodness of a measurement model for arousal and pleasantness. In the main study, as the manipulation and measurement model worked as expected, we conducted an experiment that examined

arousal and pleasantness in response to different levels of surprise.

Procedure and Data Analysis

We used 3D Max plug-in to create nine dynamic color desk-top virtual reality (VR) walks. The simulations paused in a start office (A, B, or C) and then walked the observer through it, turned right at a door, and walked into an end office (A, B, or C), where it stopped. We used a turn to the person would not see the end office until entering it. Table 1 shows the characteristics of each office, and Figures 2, 3, and 4, show the three offices.

Before creating the simulations, we tested surprise and preference in relation to features of a space that studies have found related to its perceived spaciousness and preference (Flynn, 1988; Kaplan, Kaplan, & Brown, 1989; Kaye & Murray, 1982; Im, 1984; Ozdemir, 2010): size, lighting, window size, amount of furniture, wall picture (natural or urban), or wall texture (vertical or horizontal). Using the dynamic color desk-top virtual reality, we moved two groups of respondents from a start-space to a destination space, and had them rate the destination space on scales from 0 to 10. One group of 30 (17 men, 13 women) rated surprise. Another group of 30 (16 men, 14 women) rated preferences. For surprise, the instructions stated that if the destination space has no difference from the start space it has no surprise, and if it has a huge difference from the start space, it has a big surprise. Participants rated the surprise on the following scale:

0	1	2	3	4	5	6	7	8	9	10
Very Small		Small			Not Small or Large		Large			Very Large

For preference participants rated each of the three bipolar items (order varied across respondents) shown below:

0	1	2	3	4	5	6	7	8	9	10
Very Small		Small			Not Small or Large		Large			Very Large
0	1	2	3	4	5	6	7	8	9	10
Very Unappealing		Unappealing			Not Unappealing or Appealing		Appealing			Very Appealing
0	1	2	3	4	5	6	7	8	9	10
Very Unattractive		Unattractive			Not Unattractive or Attractive		Attractive			Very Attractive

As the three items had high Cronbach alpha reliability, we combined them into a preference scale.

Based on the results of the two tests, we assigned properties to each office to make it more likely that offices would differ from one another at the desired level of surprise, but would elicit similar levels of preference. For surprise, the analyses found statistically significant differences between the start-and destination spaces for each of the six manipulations. For preference, the analyses found that participants preferred the larger size, brighter lighting, larger window, natural wall picture, and horizontal texture at a statistically significant level and the larger amount of furniture at a marginally

significant level. Previous studies (Kaplan & Kaplan, 1989) repeatedly show higher preferences for nature (the natural view, natural picture, or the plant). Thus, office A had the largest size, the dimmest lighting, the least amount of furniture, urban views, urban skylines and no plant. It had a larger window because its size required that. In contrast, office C had the smallest size, the brightest lighting, the most furniture, views of nature, a picture of nature, and a plant. The B office had a mix of the attributes rated favorably and unfavorably. Note also, that we chose attributes to create the largest contrast between the A and C office.

Attribute*	Office		
	A	B	C
Size	Smallest	Medium	Largest
Lighting	Brightest	Moderately bright	Dimmest
Window Size	Small	Medium	Largest
Amount of Furniture	Most	Moderate (hard)	Least
Wall Texture	Vertical	Grid (vertical & horizontal)	Horizontal
View	Nature	Nature	Urban
Wall Picture	Natural scene	Urban skyline	Urban skyline
Plant	Plant	None	None

Table 1. Characteristics of the Three Offices

*We kept all other attributes, such as entrance location into the second office, floor surface, and walking speed (4.99 kph) constant.

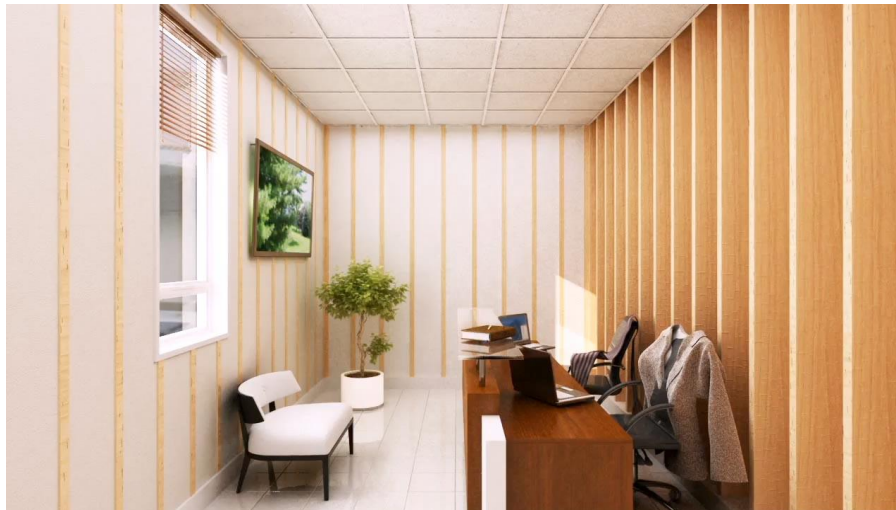


Figure 2. Office A.



Figure 3. Office B.



Figure 4. Office C.

We tested whether the perceived difference varied as we intended through the manipulation. For this, we had 46 adults in the U.S. (18 men, 26 women) judge each walk for degree of difference between the spaces (from 0 = No Difference to 10 = Completely Different). As planned, the low surprise walks (A-A, B-B, C-C) evoked the smallest judged difference ($M=2.42$, $SD=2.27$), the high surprise walks (A-C, C-A) evoked the largest judged difference ($M=8.25$, $SD=1.97$), and the medium surprise walks (A-B, B-A, B-C, C-B) was in between ($M=7.21$, $SD=1.76$). The effect of the type of walk achieved statistically significant ($F(2,86)=143.66$, $p<.000$), and it represented a large effect ($\eta_p^2=0.77$). Post-hoc pairwise comparisons with Bonferroni adjustments found significant differences in the expected direction between each pair (Low vs. Medium, $t(44)=-11.79$, $p<.001$; Low vs. High, $t(44)=-13.73$, $p<.001$; Medium vs. High, $t(44)=-5.29$, $p<.001$).

Measures

To test the effect of surprise, we developed and tested two three-item scales, one for arousal and one for pleasantness. We drew these items from studies on environmental descriptors and on emotional appraisals of the environment (Kasmar, 1972; Russell, 1980; Russell, Lewicka, & Nitt, 1989; Russell & Pratt, 1980).

For both the instrument check and main study, we used an on-line survey with one VR walk per page. Participants rated each destination office after the virtual walk on the six items in English or Italian from 0=Not at all (in Italian: per niente) to 10 = Very much (moltissimo).

For arousal, the study used three up to four items of the arousal dimension of the Mehrabian and Russell (1974) PAD (Pleasure, Arousal, and Dominance) scale:

arousing, stimulating, and activating (“attivante, stimolante, dinamizzante” for the Italian sample).

For pleasantness, the survey uses three items that Kasmar (1970) found valid for assessing interior spaces, and used in the pilot study to identify spaces that differed physically but elicited similar pleasantness scores: inviting, attractive, and pleasant (“invitante, attraente, piacevole” in the Italian version).

In the instrument check, we used responses from 120 participants (54 from US and 66 from Italy) to test the psychometric properties of the two measures. These participants took some virtual walks going to a first office

to a second one. Each virtual walk took around 10 seconds. At the end of each walk, the on-line survey had the participants rate the end space using arousal and pleasantness scales. After participants finished the ratings, the survey advanced to a new page with a new video. To lessen order effects, the survey randomized the order of walks across the participants.

We used Mplus version 6.11 (Muthén & Muthén, 1998–2011) to run multilevel confirmatory factor analyses (MCFA) and measurement invariance analyses (MI), controlling for a clustering effect of individual in the data.

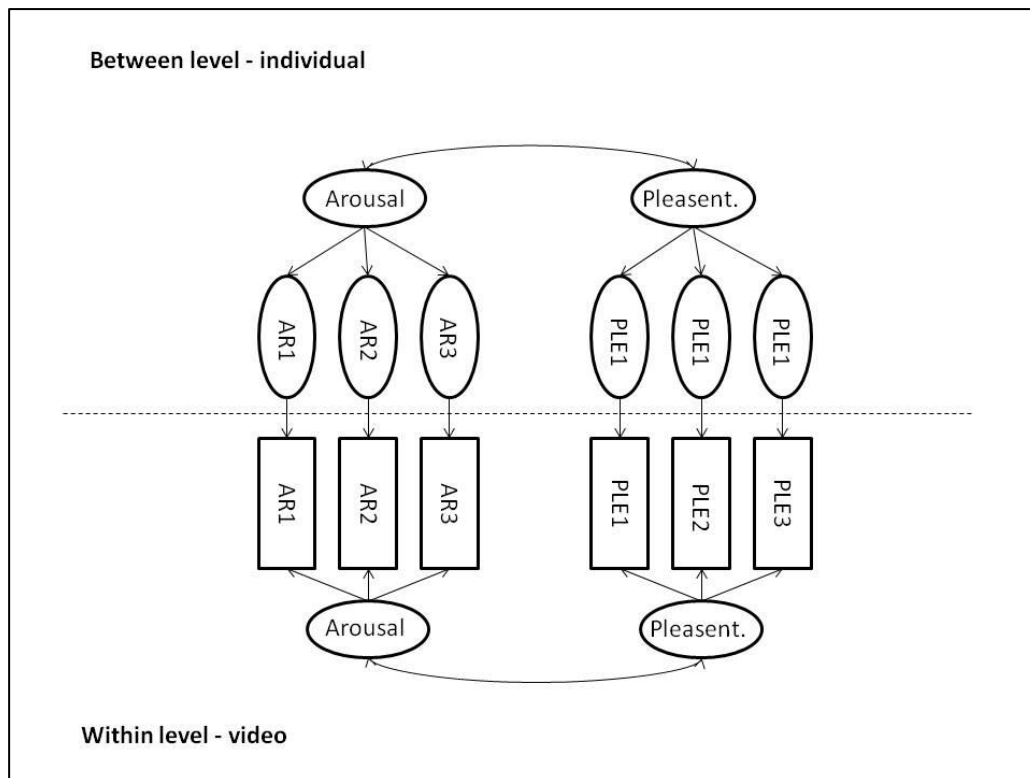


Figure 5. The Multilevel Model tested with Multilevel Confirmatory Factor Analysis

Note: Estimator: maximum likelihood estimation with robust standard errors; Fit indexes: Chi-square degree of freedom ratio ($\chi^2/df \leq 2$), comparative fit index ($CFI \geq .900$), root-mean-square error of approximation ($RMSEA \leq .080$), the standardized root mean square residual at within and between level ($SRMR_w, SRMR_b \leq .080$). Some preliminary assumptions were verified, before running the analyses; results are reported in note¹. Descriptive statistics were reported in Table 2.

¹ We checked the missing distribution on our database. Analyzing the distribution of missing values, the maximum value of missing data for item was below 2%. However, we conducted the Little’s test to check whether the missing data were ‘missing completely at random’ (MCAR) and the results confirmed this hypothesis ($\chi^2(5) = 1.686, p = .891$). Then for each item, means and standard deviations were computed, and items were also checked for normal distribution, computing skewness and kurtosis separately by country. The Skewness ranged from -.01 to .19 for the Italian sample and from -.01 to .16 for the US sample. The Kurtosis ranged from -.85 to -.59 for the Italian sample and from -.97 to -.59 for the US sample, confirming the normal distribution of the items.

		US		Italy	
Surprise	Start to End	Arousal <i>M (SD)</i>	Pleasantness <i>M (SD)</i>	Arousal <i>M (SD)</i>	Pleasantness <i>M (SD)</i>
Low	A to A	3.54 (2.26)	4.27(2.37)	4.47 (1.98)	4.73 (1.96)
	B to B	4.47 (2.56)	4.76 (2.68)	5.04 (2.07)	5.43 (1.82)
	C to C	4.38 (2.49)	4.50 (2.57)	5.33 (2.31)	5.63 (2.38)
Medium	A to B	4.47 (2.22)	4.40 (2.27)	6.41 (2.13)	6.56 (2.53)
	B to A	5.38 (1.80)	6.06 (1.94)	6.62 (2.10)	6.74 (2.09)
	B to C	4.50 (2.50)	5.09 (2.52)	5.08 (1.96)	5.18 (2.06)
	C to B	2.35 (1.84)	3.23 (1.78)	5.85 (2.50)	6.02 (2.58)
High	A to C	3.91 (2.00)	4.75 (2.13)	5.18 (2.36)	4.93 (2.29)
	C to A	4.59 (2.22)	6.20 (2.56)	5.35 (2.15)	5.43 (1.95)

Table 2. Means (Standard Deviations) for Each Scale in Each Country

In the next step we run two Multilevel Confirmatory Factor Analyses to separately test the goodness of the scales for the Italian and the US sample. To have the possibility to assess the measurement model of Arousal and Pleasantness scales composed by three items each one we decided to test a model which considered the two scales together taking in account of the covariation between the two latent factors Arousal and Pleasantness (see Figure 5). The MCFA were conducted separately on the Italian and the US sample. The models showed excellent fit indexes (see Table 3). Then we tested the measurement invariance across countries and different level of surprise². The results of the sequence of gradually more restrictive tests of measurement invariance (MI) supported for both the analyses configural, metric, and scalar invariance, but not uniqueness invariance (see Table 3).

For the main study, we averaged the three pleasantness items to create composite pleasantness scores, and we averaged the three arousing items to create composite arousing scores.

Because office B appeared only for two levels (Small

and Medium), we could not compare it with the other two offices. Thus, we analysed only responses to destinations (offices A and C). We ran two mixed ANOVA with two between subject factors (Surprise with three levels, Low, Medium, or High; and Country with two levels, US, Italy, one for Arousal and one for Pleasantness).

Participants

Participants in the US (121 adults, 47 men, 74 women) and Italy (67 adults, 34 men, 33 women) were randomly assigned to the within-group condition (for the CFA model test) or one of the three between-group conditions: Low Surprise, Medium Surprise, or High Surprise. Surprise is defined as the perceived mismatch between what one experiences in a place and what one anticipated for it (Berlyne, 1971). As the perceived discrepancy increases, surprise increases. We accomplished this through virtual walks through environments. The main study analyzed the data from the between group conditions.

² To test Measurement Invariance (MI) we considered four steps: configural invariance, allowing all the parameters to be freely estimated; (2) metric invariance, requiring invariant factor loadings; (3) scalar invariance, requiring also invariant intercepts; and (4) uniqueness invariance, requiring invariant item uniqueness. Comparisons among models were based on differences in CFI and RMSEA, sample size independent: Support for no changes in goodness of fit indexes requires a change in CFI and RMSEA less or equal than .010 and .015, respectively (Chen, 2007).

Groups	Model	χ^2/df	CFI	RMSEA	SRMR _w	SRMR _b	Δ CFI	Δ RMSEA
Country	Italy (n = 66)	5.59	.951	.088			-	-
	US (n =54)	1.15	.998	.018			-	-
	Configural invariance	10.20	.982	.092			-	-
	Metric invariance	8.98	.980	.086			-.002	-.006
	Scalar invariance	7.87	.978	.080			-.002	-.006
	Residual invariance	14.44	.942	.112			.112	.032
	Surprise	Low surprise	6.97	.924	.168	.032	.027	-
	Medium surprise	4.71	.959	.094	.025	.007	-	-
	High surprise	9,85	.921	.159	.041	.013	-	-
	Configural invariance	9.445	.976	.000			-	
	Metric invariance	7.39	.976	.000			.000	.000
	Scalar invariance	5.59	.976	.001			.000	.001
	Residual invariance	13.65	.908	.000			.000	-.068

Table 3. Results of Multilevel Confirmatory Factor Analysis and Measurement Invariance Analyses for the Model of Arousal and Pleasantness across Country (Italian, US) and Surprise (Low, Medium, High).

Note. Δ CFI = change in comparative fit index; Δ RSMEA = change in root-mean-square error of approximation.

RESULTS

Arousal

Because we found no statistically significant interactive effects for country, we combined the US and Italian scores. Destination arousal increased from the low to medium surprise conditions but decreased from the medium to high surprise conditions (Figure 5). The effect of surprise (differences from start to end space) achieved statistical significance ($F(2,185)=18.14, p<.001$) and a medium-sized effect ($\eta^2_p=.09$). The differences arose primarily from difference between low and medium surprise conditions. Post-hoc comparisons (with Bonferroni corrections) found medium surprise as more arousing ($d=-1.01$) than low surprise, but no difference in arousal between low and high surprise or between medium and high surprise. The only statistically significant difference was for medium versus low surprise ($t(125)=2.77, p=.02$).

Pleasantness

Because we found no statistically significant interactive effect of country, we combined the US and Italian pleasantness scores. As with arousal, pleasantness was lowest for low surprise, highest for medium surprise, and in between for high surprise (Figure 6). The effect of surprise (difference between start and end space) achieved statistical significance ($F(2,182)=4.34, p<.05$). It was a small effect ($\eta^2_p=.05$). The difference primarily reflects differences from medium surprise. Post-hoc comparisons (with Bonferroni correction) found higher pleasantness for medium than for low surprise ($d=1.38$) and for medium than for high surprise ($d=0.36$), but no difference between low and high surprise. The medium versus low achieved statistical significance ($t(120)=3.38, p=.02$), the medium versus high surprise achieved marginal significance ($t(120)=0.89, p=.060$), but the low versus high surprise did not achieve statistical significance.

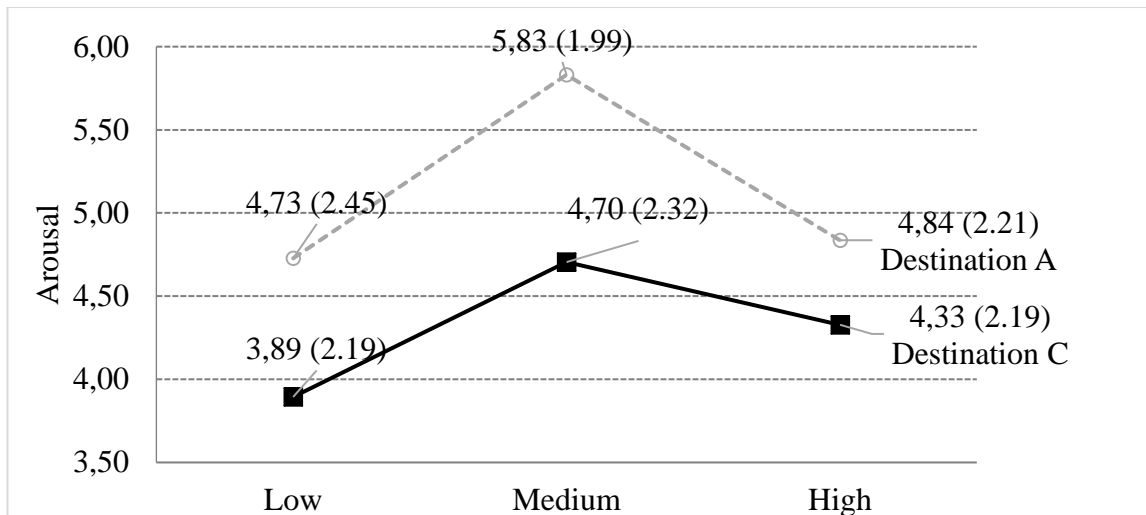


Figure 5. Arousal (from 0=not aroused at all to 10=very aroused) in destination offices A and C for low, medium and high surprise.

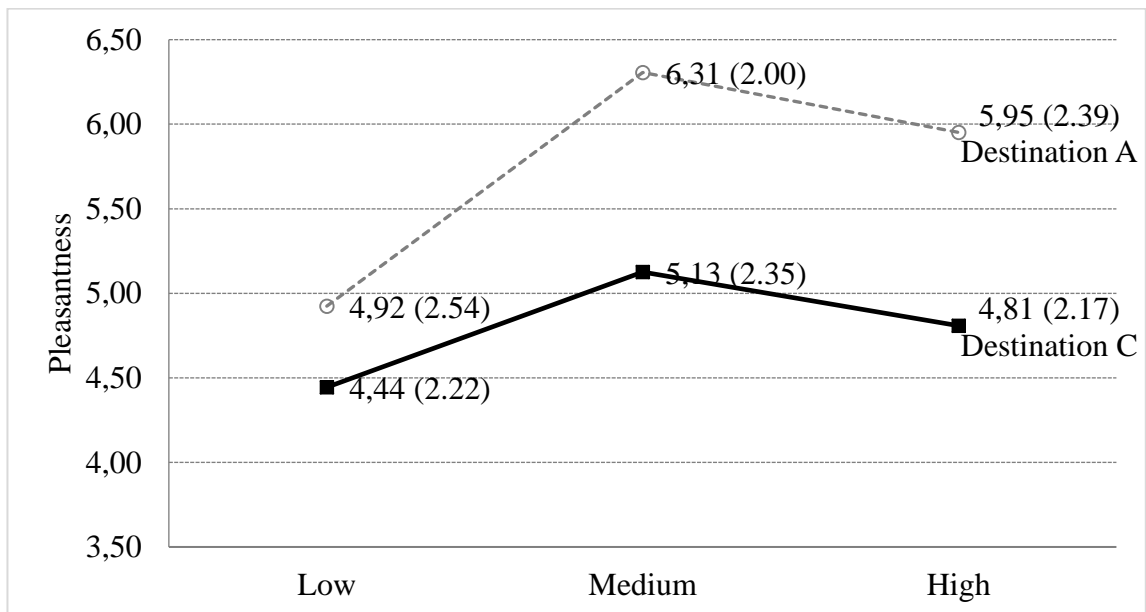


Figure 6. Pleasantness (from 0=not pleasant at all to 10=very pleasant) in destination offices A and C for low, medium and high surprise.

CONCLUSIONS

Every day, people move from place to place, indoors, outdoors, and between the two. The present study confirmed that such dynamic experience of movement between places affects people's perception and evaluation of places (Heft & Nasar, 2010). In particular, the surprise experienced from movement between spaces affected appraisals of arousal and pleasantness.

The study found consistency in response across

respondents from the U.S. and Italy. These findings agree with both the finding of strong consistencies in response to environments across people (Stamp, 1999) and the consensus assumption (Van den Berg, Vlek, & Coeterier, 1998). Even though experience and socialization may create differences in attitudes and evaluations of environments across groups (Berry, Poortinga, Breugelmans et al., 2011; Graumann & Cruse, 1990), the similarities in response to surprise outweighed the differences. Adults from the U.S. and from Italy had

similar appraisals of arousal and pleasantness. In addition, most respondents in each country had similar appraisals to one another.

For measurement, the three items for arousal emerged as reliable measures of arousal, and the three items for pleasantness emerged as reliable measures of pleasantness. In addition, the finding of no main or interactive effects for group means that each scale worked the same way for the U.S. and Italian respondents. Research might explore the generalizability of the scales to respondents from non-western or less developed countries.

Contrary to studies finding pleasantness and arousal orthogonal to one another in response to environmental stimuli (Posner, Russell, & Peterson, 2005; Russell, 1980; Russell, Lewicka, & Nitt, 1989; Russell & Pratt, 1980), the present study found them correlated with each other. Perhaps, the difference in results stems from a difference in response to static stimuli (such as slides and photos) and dynamic stimuli, such as the ones tested here. This suggests a need for additional research on the dimensions of affective response to the dynamic experience of places.

Regarding effects of surprise, some effects fit theory, and others did not. As predicted by theory (Berlyne, 1971; Huron, 2006), arousal increased from low to moderate surprise, but contrary to theory, it did not continue to increase with surprise. It levelled off for the high surprise condition. As predicted by Berlyne (1972), pleasantness had the inverted U-shaped function in relation to surprise, but contrary to that theory, the drop in pleasantness for high surprise did not relate to higher arousal. These findings study may not necessarily explain the relationship between pleasantness, arousal, and surprise.

The study used between-group comparisons, in which each respondent evaluated only one of the nine walks, but across all respondents all nine walks were assessed. This makes it unlikely that reactivity biased the ratings of any walk. Because each participant saw only one walk, he or she did not see the other manipulations and thus would have no basis for guessing the experimental manipulations or changing responses accordingly. Also, their response to their one walk would not be affected by their responses to other walks or multiple walks. Finally, our test of the manipulation for surprise found that that it worked as we intended. However, other aspects of the study may account for the unexpected similarity between pleasantness and arousal and for the levelling off of arousal for high surprise.

For the levelling off of arousal, perhaps participants experiencing one walk differed from those experiencing other walks in ways that affected their ratings. Such differences appear unlikely for three reasons. First, participants in each country were assigned at random to each of the nine walks. Second, participants in each country had the same pattern of response to each level of surprise. Third, research suggests commonalities in response across people (Stamps, 1999), such that differences in groups across the walks should not have biased their responses. Within group data would eliminate the threat of group differences across the conditions, because each person's responses would be

compared across the walks. However, within group data would contaminate the independent variable, surprise. In a within-group design, people would see a destination space for high surprise up to five times before rating it, and that repeated experience might well lessen its surprise. This leaves the second possibility. The study had each participant rate both arousal and pleasantness. We did this, because if arousal affected pleasantness, we needed to have each person's arousal level, not some average of arousal for a walk. However, the ratings on each scale could have affected the ratings on the other. Perhaps a study which either measured arousal through psychophysiological measures or obtained independent ratings of arousal and pleasantness would find the linear relationship of arousal to surprise and a decrease in pleasantness for the high surprise and arousal condition.

The present study used simulated walks between one environmental category (offices) and it did so for one set of modern-looking offices and a one set of manipulations to create surprise. Research could test environmental surprise for different kinds of spaces, both indoors and outdoors. It could test different manipulations to create surprise. To better approximate the real environmental experience of walking through spaces, it could do so with full-scale virtual reality walk-throughs. It could also test different populations, such as children, older people, or people from other cultures.

If the findings hold, they would suggest that arousal and pleasantness increase from low to moderate surprise, and that designers seeking such arousal or pleasantness might include such moderate arousal in their designs. If people see moderate surprise as pleasant, such surprise might make places attractive for them to walk. Many environmental design firms use virtual reality simulations to create walk-through experiences of their designs. We have developed and tested reliable measures that they and others can use to gauge the arousal and pleasantness in such dynamic simulations. Through understanding likely effects of such dynamic experience before implementing a design, designers can create places that have the desired effect on humans.

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A review of the limitations of Attention Restoration Theory and the importance of its future research for the improvement of well-being in urban living

Brittany N. Neilson¹, Curtis M. Craig², Alexandra T. Travis¹, Martina I. Klein¹

1. Department of Psychological Sciences, Texas Tech University, Lubbock, TX, USA

2. Department of Mechanical Engineering, University of Minnesota Minneapolis, MN, USA

Abstract

Attention Restoration Theory (ART; Kaplan, 1995) is the predominant theory identifying characteristics of nature that are thought to make it restorative. Albeit, these characteristics lack operational definitions, thus generating several methodological challenges in critically assessing ART. For example, a major component of restoration within the ART framework is soft fascination, which is an involuntary capturing of attention, but not in a dramatic fashion. However, there is no empirical support of nature's ability to innately hold attention, and this poor understanding contributes to the challenges in developing an operational definition of soft fascination. We describe attributes of stimuli that are known to capture visual attention (e.g., salience; Ruz & Lupiáñez, 2002) and consider whether such attributes are consistent with the notion of soft fascination. Since ART evolved from literature on aesthetics and environmental preferences (e.g., Kaplan, 1987), a review of this literature may inspire new ways to define restorative characteristics of nature, and thereby, promote the implementation of these characteristics into built environments. Thus, the purpose of this paper is to review and integrate relevant literature from multiple subfields of psychology to inspire research that can employ new methodology and ultimately better our understanding of the mechanisms underlying restorative environments.

Keywords: Attention Restoration Theory, aesthetics, directed attention, attention capture, visual perception

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Corresponding Author: Brittany N. Neilson, brittany.n.neilson@gmail.com

Introduction

Throughout most of history, humans lived a more rural lifestyle, often referred to as “living off the land,” supported by hunting, fishing, and farming. The industrial revolution seemed to have instigated the move from rural to urban areas. Now, about half our world population (4.128 billion people) lives in urban environments, and 68% of our population is expected to live in urban environments by 2050 (United Nations, 2018). In theory, urbanization can be beneficial for several reasons. Urbanization results in people living closely together, which has the potential to be more energy efficient, provide greater access to resources, and increase social cohesion. In reality, urban areas have not necessarily been an asset to human psychological well-being. Urban living is associated with additional stressors, like noise, crowding, and crime.

Importantly, urban environments are thought to be less emotionally and cognitively restorative compared to natural environments (van den Berg, Hartig, & Staats, 2007). Further, urban expansion reduces the amount of natural environments available. In turn, this can reduce the opportunity for interaction with nature and the recovery from fatigue and stress that is associated with nature interaction. Overall, urbanization poses an issue for human psychological well-being. Given these concerns, the question arises: How can we implement components of nature that are restorative into urban environments?

The purpose of this paper is not to be an exhaustive resource on literature citing the benefits of nature interaction, but rather, to integrate literature from different subfields that we believe may inspire new empirical research regarding the mechanisms underlying emotional and cognitive restoration and the implementation of restorative aspects of environments into urban areas. Towards that end, a review is needed of the major theory of cognitive restoration associated with nature, Attention Restoration Theory (ART; Kaplan, 1995). Further, this paper will highlight some gaps and methodological challenges in the literature supporting ART and attempt to integrate literature from information processing theory, resource theory, aesthetics, visual perception, and environmental psychology to inspire future research that may address shortcomings in the literature associated with ART. It was our aim to cite others fairly and appropriately and maintain an unbiased view in the literature that we included in this paper, but the reader should note that this paper is ultimately our interpretation of the relevant literature. We encourage readers to review original works and develop their own critical analyses of them.

Attention Restoration Theory (ART)

Attention Restoration Theory (ART) argues that exposure to nature after performing a demanding task that requires and depletes directed attention capacity (i.e., attention that is required to focus and inhibit distractions in support of difficult mental activity) will subsequently

facilitate the replenishment of directed attention capacity (Kaplan, 1995). Further, ART postulates that *certain characteristics* of nature effortlessly grab bottom-up attention, which frees up the capacity for top-down, directed attention and leads to recuperation of directed attention fatigue. Therefore, in order for an environment to be considered restorative, it must contain certain characteristics, which are as follows:

- Soft fascination: An environment that promotes effortless attention distributed across aesthetically pleasing features of the environment (e.g., clouds, tree branching moving in the wind).
- Extent: An environment that is conceptually vast, such that one could get lost in it.
- Being away: An environment that allows one to engage in cognitive content outside of the current situation or need (i.e., day dreaming).
- Compatibility with one’s goal: An environment that aligns with one’s goal, and nature is thought to have an evolved compatibility with the human basic needs because it has contained the basic needs for survival throughout history.

A significant amount of empirical research on ART has been conducted. This research has presented a compelling case for the benefits associated with nature exposure, specifically improvements in cognitive (Kaplan, 1995), emotional (Hartig, Evans, Jamner, Davis, & Garling, 2003), and stress (Ulrich et al., 1991) outcomes. However, there remains a need to address some of the limitations of ART from how it has been previously assessed. We hope that this paper presents several unanswered research questions that others can pursue in addressing the challenges that research on ART presents. The next sections aim to address the following: (1) the lack of operational definitions of the characteristics purported to be important for restorative environments, (2) no empirical evidence that the soft fascination characteristic captures bottom-up attention and the mechanism underlying this attention capture, and (3) the inconsistent measurements of directed attention and an unclear explanation on how it is being depleted and subsequently replenished by nature interventions. Importantly, these sections present research and methodology from other subdisciplines that could be applied to help fill these gaps.

Measuring Characteristics of Restorative Environments

While ART proposes four characteristics thought to be necessary for an environment to be restorative, the measurement of these characteristics in a scene could be improved. Currently, researchers use self-report ratings of each of these characteristics in order to gauge if an environment is restorative (e.g., Perceived Restorativeness Scale; Hartig, Korpela, Evans, & Garling, 1997). While self-reports in research are valuable and informative metrics (see Muckler & Seven, 1992), the issue with this technique is that the perceived strength of these characteristics in a scene is being used to define the

restorative quality of the scene without ever validating the need of these characteristics for restoration. Further, this methodology presents the potential for demand characteristics, or confounds in which participants may anticipate that researchers are predicting a greater positive response to nature compared to urban environments and therefore respond in a more positive way to nature. The current methodology for measuring the characteristics that are assumed to be important for restoration by ART needs to be further developed.

ART was originally inspired by the environmental preference literature that merged aesthetics and affective responses to environments. Thus, a review of this literature may provide inspiration for new ways to operationally define and then assess the four

characteristics of restorative environments proposed by ART. According to ART, humans have an evolved preference for nature due to the survivability of natural environments. Kaplan postulated that environments that provide a good mental map or understanding of the physical environment enhance survivability and are preferred. Further, he assumed that humans are attracted to environments that inspire exploration. He proposed four aesthetic variables that are thought to be important for either understanding the environment or the ability to explore the environment crossed with the availability of information in the environment (immediate or inferred); these variables are presented in Table 1, and a brief explanation of each is provided below.

	Understanding	Exploration
Immediate	Coherence	Complexity
Inferred	Legibility	Mystery

Table 1. Kaplan’s (1987) Aesthetic Variables Related to Environmental Preference.

Understanding the Environment: Coherence and Legibility

The proposed aspects of preferred scenes are coherence, or organization of the information in the scene, and legibility, which involves the ability to predict what is to follow in the scene if one were to explore it further. Coherence and legibility are assumed to be related to understanding of the scene, meaning there won’t be a threat or unexpected event that would occur in the scene.

With regard to measuring these variables, structural coherence is thought to involve the configuration of the visual array. Coherence is thought to increase preference, which can also be explained by evolutionary psychology as an adaptive trait because it would afford a large number of elements to be chunked together as opposed to a several, smaller chunks. Structure can be achieved by an environment having redundant elements, properties that provide continuity, focality and by the grouping of elements, all akin to Gestalt principles. An application of Gestalt principles may afford a method of measurement for coherence and structure, but this would likely need to be self-reported as well. Legibility would be difficult to operationally define without asking people if they can predict what the environment would provide if it were to be explored more.

Exploring the Environment: Complexity and Mystery

Complexity and mystery are both thought to be important for exploration. Complexity involves the number of independently perceived elements in a scene, such that a highly complex environment has a large number of elements that are dissimilar and not easily grouped together. Complexity can be difficult to

operationally define because it is unknown how people group items in unique environments together. Thus, it would be too simplistic to count the number of items in an environment to define complexity, as the grouping of items would not be accounted for. The relationship between complexity and aesthetic preference has an inverted-U shape, such that a moderate level of complexity results in the highest preference ratings. Ulrich (1983), who also studied the association between aesthetic variables and environmental preferences, cited the importance of complexity for preference as well.

On the other hand, mystery involves the notion that a scene appears to promise more information if an observer were to explore the scene further (e.g., a hill that one cannot see beyond). This, too, is an abstract variable that is difficult to measure. We think that depth/spaciousness and ground surface texture may be related to mystery and could be indicators of mystery. Specifically, depth and spaciousness are proposed to be important from an evolutionary perspective because a moving, exploring person would need depth to identify dangers and have opportunities to escape, whereas low depth may result in hidden dangers and fewer opportunities to escape the environment in the presence of danger. Thus, the relationship between depth and aesthetic preference is linear, such that greater depth is associated with greater preference (Ulrich, 1983). Furthermore, ground surface texture is important for depth perception, such that uniform, smooth textures can make depth perception easier and thus increase preference compared to rough, uneven textures (Ulrich, 1983).

Measuring Visual Attributes of Scenes

The aforementioned aesthetic variables proposed by Kaplan in 1987 are not much easier to measure than the

four restorative characteristics proposed by him in 1995. Additionally, to our knowledge, it is presently unclear how the aesthetic variables of interest are related to his four restorative environment characteristics. Because of this, aesthetic and visual perception research may offer new characteristics of restorative environments that were not proposed by Kaplan.

Indeed, recent research efforts have focused on identifying quantitative low-level visual features (i.e., computed from decomposing images, more bottom-up driven) and high-level visual features (i.e., semantic, more top-down driven) related to people’s aesthetic preference for certain environments and perceived naturalness of environments. Importantly, preference and naturalness are thought to underlie the restorative effect (Kaplan, 1995; Ulrich et al., 1991), thus research identifying attributes related to preference and naturalness may be the same attributes related to restoration.

Specifically, the low-level visual properties, composed of color and spatial properties, that were significantly related to aesthetic preference and perceived naturalness were as follows: (1) the average hue across all image pixels, (2) the average standard deviation of saturation across all image pixels, (3) the density of straight lines in the image, and (4) the density of non-straight lines in an image (Berman et al., 2014; Kardan et al., 2015). Specifically, participants preferred

less average hue (i.e., more yellow-green content rather than blue-purple), more diversity in saturation (i.e., images containing both low and highly saturated colors), less straight edges, and more disorganized (i.e., non-straight) edges, all of which are more common in natural environments (Kardan et al., 2015).

Further, Hunter and Askarnejad (2015) identified 10 different theories used to explain the human preference for nature and benefits of being in natural environments and used these theories to select physical attributes of a scene or image that may influence preference and/or restoration. The physical attributes that Hunter and Askarnejad (2015) identified are higher-level visual features that hold semantic information and were divided into three categories: (1) structure attributes, (2) content attributes, and (3) landscape attributes. They identified 62 attributes in total (for explanation of these attributes, see Hunter and Askarnejad, 2015). Of these 62 attributes, Ibarra and colleagues (2017) identified 10 high-level attributes that were significantly related to preference and perceived naturalness (see Table 2). Interestingly, these significant attributes were all structure or landscape attributes; none of them were content attributes, indicating that the types of nature, water, or even focal points may not be as important as other visual attributes related to structure and landscape.

Attribute	Type of Attribute	Definition
Horizon Line Position	Structure Attribute	The horizon line is “where earth meets sky (seen or inferred position)” (pp.7, Hunter & Askarnejad, 2015). Further, horizon line position is thought to be important for understanding proprioception and visual balance.
Skyline Maximum Undulation	Structure Attribute	“Relates to the maximum amount of vertical shift in the skyline. It is measured as the distance between the highest and lowest points of the skyline and reported as a percentage of the vertical frame height” (pp.12, Hunter & Askarnejad, 2015).
Skyline Vibrancy - Proportion	Structure Attribute	“The proportion of frame width occupied by the canopy-sky interface, the place where foliage vibrancy is most easily measured” (pp.12, Hunter & Askarnejad, 2015).
Skyline Vibrancy -Length	Structure Attribute	“The length of the canopy-sky interface along its path (i.e., includes all vertical shifts). The length is reported as a percent of the frame width and can range from 0% to infinity” (pp.12, Hunter & Askarnejad, 2015).
Vegetation Groundcover	Landscape Attribute	The height of the plants were estimated and compared; vegetation groundcover was defined as “herbaceous plants or low shrubs up to 3 feet tall” (pp.14, Hunter & Askarnejad, 2015).
Non-Veiling Vegetation	Landscape Attribute	“Non-veiling attributes are not covered by any intervening foliage” (pp.14, Hunter & Askarnejad, 2015). Therefore, non-veiling vegetation is the presence of vegetation but in a non-veiling form.
Built Ground Open	Landscape attribute	Built ground involves “any ground surface who materiality has been adjusted by construction such as paved roads or wooden boardwalks” (pp.14, Hunter & Askarnejad, 2015). The open aspect is related to it not being veiled.

Table 2. High-Level Attributes Significantly Related to Preference and Perceived Naturalness (Ibarra et al., 2017)

Importantly, these high-level features mediated the relationship between low-level features and preference and the relationship between low-level features and perceived naturalness (Ibarra et al., 2017). This finding suggests that semantic information in image scenes was

highly associated with aesthetic preference and perceived naturalness, and more specifically, the semantic information related to design features. This is important to note as “water” may be significantly associated with preference and naturalness, but

according to Ibarra and colleagues (2017), the form of the water and its landscape layout and/or design accounted for more of the variance in the model. Further, understanding design preferences is important for implementing natural elements in urban environments.

However, the aforementioned research is not without limitations. Ibarra et al.'s (2017) model selection strategy for determining which of the 72 low- and high-level features to include in the model has the potential to inflate Type I error significantly. Specifically, Ibarra and colleagues (2017) used stepwise regression with p -values of $< .05$ as their selection criteria. There are several issues with their approach. First, p -values as a selection criterion will inflate Type I error. Second, stepwise regression was used to identify potential variables associated with aesthetic preference and naturalness, but then the utilization of these variables in regression and mediation models resulted in biased tests since they are based on the same data. This is also likely to inflate Type I error as the significance of these values should be confirmed using cross-validation methods or with a new sample. Therefore, additional research is necessary to confirm that these low- and high-level variables identified in Ibarra et al. (2017) are of statistical significance.

As such, prior research attempting to identify significant attributes related to aesthetic preference and naturalness should be relevant for identifying attributes related to restorative environments, but this research may have been contaminated with Type I error inflation. Thus, research is needed to determine if these suggested attributes are relevant for designing effective restorative settings, especially as we attempt to make our urban environments more restorative.

Soft Fascination and its Relation to Bottom-Up, Involuntary Attention Capture

If one assumes that some attention resource (e.g., directed attention resource) is being depleted and restored via the light capturing of attention described by soft fascination, how are the features of nature environments facilitating this process? One way to approach this question is to describe what is known to capture attention from work in experimental psychology and determine if there is a plausible correspondence.

The first potential avenue to consider, if one adopts an attention or information-processing focused approach, is the voluntary (directed) versus involuntary attention dissociation as described by Kaplan and Berman (2010). In this perspective, restorative environments work by (1) not requiring voluntary attention in order to navigate, and (2) capturing involuntary attention, while (3) not monopolizing attentional capacity. These three characteristics capture the construct of *soft fascination*. While voluntary or directed attention is primarily not required during more automatic tasks or situations in which multiple tasks must be coordinated, what captures involuntary attention is not as obvious.

The research literature on involuntary attention capture has focused on orienting tasks and visual search tasks, looking at the unique features of a stimulus that affect detection time. The features known to affect

search time and arguably capture involuntary attention are visual salience, unique basic features or singletons, abrupt onsets, motion, luminance change, novel objects, and color (Irwin, Colcombe, Kramer, & Hahn, 2000; Ruz & Kupianez, 2002; Yantis & Hillstrom, 1994). However, these paradigms are tested in the context of disrupting or facilitating reaction time performance in orienting attention and performing visual search and may not fit the context of restoration. Most of these attention capturing features may better fit with the concept of *hard fascination*, during which involuntary attention is captured, but attentional capacity is monopolized, requiring directed attention to disengage from the stimuli at hand (Kaplan & Berman, 2010). The exception may be novel stimuli, as the construct of scope has been important in characterizing which environments capture attention long enough for restoration to occur (Kaplan, 1995; 2001).

One interesting and more recent line of research has observed that a task irrelevant stimulus that has been previously paired with a reward was distracting, suggesting that the associated value of a stimulus matters in attention capture (Anderson, Laurent, & Yantis, 2011). Furthermore, stimulus meaning in the form of a happy face has been shown to be more rapidly detected in a rapid attentional detection task (Mack, Pappas, Silverman, & Gay, 2002). Taken together, one could hypothesize that higher value, meaningful stimuli associated with positive affect may be more attention capturing than at least neutral stimuli. When there are no threatening stimuli present, which would otherwise capture attention powerfully (Mathews, Mackintosh, & Fulcher, 1997), the presence of higher value, positive, and meaningful stimuli may play a role in attention capture, less directed attention, and provide a correspondence with the features of nature environments. Indeed, recent research focusing on gaze behavior found longer gaze times for nature stimuli compared to artificial stimuli when presented at the same time (Masuch, Einkenel, Weninger, Schwarzl, Girsovcis, & Oberzaucher, 2018), and high fascination scenes engender more fixations and eye movements relative to low fascination environments (Berto, Massaccesi, & Pasini, 2008), suggesting less effort and more attention capture.

An alternative and potentially complementary set of features that may be associated with fascinating environments are visual complexity and fractal geometry (Aks & Sprott, 1996; Van den Berg, Joye, & Koole, 2016). Environments and scenes with a high number of visual elements are thought to be visually complex. Furthermore, if the visual elements and their interrelationships can be characterized by significant recurrence or repetition of these visual elements over different scales, the scene is said to be relatively high in fractal geometry. Aks and Sprott (1996) demonstrated that their sample of participants preferred generated objects with a fractal dimension averaged 1.26 and a Lyapunov exponent averaged 0.37 bits per iteration, which is consistent with natural scenes. Van der Berg and colleagues (2016) demonstrated that nature scenes have higher levels of fascination, perceived restorativeness, and visual complexity than built scenes, and that this effect was statistically mediated by the higher

subjectively reported visual complexity of the scenes when magnified at different scales. This means the reported fascination and length of viewing time (a behavioral measure of fascination) is at least partially governed by visual complexity. Therefore, it would be reasonable to not only consider singular features (e.g., novelty, value, positive affect) but also how the elements of a scene are interrelated (e.g., complexity and fractal geometry) when considering how to design built environments with high potential for soft fascination. However, this does not necessarily imply that even higher levels of visual complexity would lead to more soft fascination. There may be a fine distinction between scenes that are either too simple, just complex enough, or incomprehensible.

Finally, we should note that the previous discussion on visual components that elicit soft fascination focuses on soft fascination as *content*, which is initiated by a stimulus or set of stimuli that does not monopolize attentional capacity, and this engagement initiated by soft fascination content is sustained over time. Other approaches to operationalize or more carefully define soft fascination may emphasize soft fascination as a *process*, such as story-telling or some other mode of mental approach that acts to sustain engagement or interest (Berto, 2011). Resolving the overlap between these alternative interpretations of soft fascination is an interesting problem for those intending to best make use of restorative environments.

Directed Attention Depletion: An Information Processing Framework

In addition to unclear operational definitions of the characteristics thought to make an environment restorative, particularly the fundamental characteristic of soft fascination, more empirical evidence is needed to support the mechanism proposed by ART; that is, that nature innately grabs bottom-up attention, and this allows top-down attention to recuperate or replenish. This has practical implications for establishing the types of mental fatigue that is best suited for an intervention with restorative elements. The previous section addressed the aspect of this mechanism that assumes involuntary attention is being facilitated by a soft fascination characteristic in an environment. Literature on information processing and resource theory may provide an updated perspective to the proposed underlying mechanism of ART, which is heavily centered on the concepts of voluntary and involuntary attention that were defined by William James (1892) over a century ago. While we acknowledge that William James' contribution to psychology is unparalleled, we decided to link these concepts to current tenants of cognitive and human factors psychology to address more recent conceptualizations.

Directed Attention in ART: Unitary or Multiple Information Processing Resources?

Information processing theory and cognitive psychology

more broadly can be characterized by a few general principles or assumptions insofar as the question of nature is concerned: limited mental capacity, a required control or executive mechanism for the processing of information (e.g., storage and retrieval), a two-way flow of information from the senses (bottom-up) and memory (top-down) that guides behavior, and a genetic predisposition to process certain types of information in specific fashions (e.g., perception of faces, local language learning; Anderson, 2005). These information processing assumptions also apply specifically to attentional processes (Schiffrin & Schneider, 1977). One theory of cognition that has been specifically linked to nature and attentional processes, is resource theory (Berto, 2005). Resource theory focuses on the assumption of limited mental capacity in cognitive processing and posits a resource pool as an organizing metaphor for thinking about attention and mental effort (Warm, Parasuraman, & Matthews, 2008). Attentional tasks requiring mental effort will deplete this resource pool, and when there is no more availability of the resource, task performance will worsen, and fatigue will occur (Warm et al., 2008). Originally, attentional capacity was construed as a single mental resource pool (Kahneman, 1973), but more recent research has conceptualized attention as comprising multiple resources (Wickens, 2002), such as separate pools for visual and auditory processing.

Directed attention, representing the aforementioned assumption that there is a control mechanism that directs the processing of information (in this context, attention), has also been thought to have its own separate resource pool (Just, Carpenter, & Miyake, 2003). When individuals exert continuous effort to direct attention to activities in daily life and the workplace, this directed attention resource pool will deplete, resulting in fatigue and diminished performance on directed attention tasks. Nature then presents an environment in which this directed attention resource pool can more rapidly replenish (Berto, 2005; Kaplan & Berman, 2010).

Taking a more information processing approach, Kaplan (1995; 2001) proposed that when navigating complex situations involving more than one domain of knowledge, individuals must manage multiple mental structures and perception/action relationships that conflict with each other. This management requires intervention by the directed attention mechanism to inhibit certain mental structures in order to behave or perform appropriately over the course of a complex task. Furthermore, even performance in a well-learned single domain with an associated mental structure, which is initially fairly automatic, will eventually fatigue and require intervention by directed attention (Kaplan, 2001). Nature provides an environmental intervention by avoiding the activation of fatigued mental structures (being away), and avoiding any allocation of effort by directed attention over an extended period of time (soft fascination, extent, and goal compatibility).

While ART has assumed to encompass many domains that rely on executive attention (Kaplan & Berman, 2010), the unity of a single directed or executive attention construct has been challenged. Brain imaging research looking at attention networks has noted significant support for at least two separate directed attention

networks, a frontoparietal system which corresponds to task-switching and task initiation, and a cingulo-opercular system that performs error monitoring and task maintenance over time (Petersen & Posner, 2012). As a side note, Kaplan and Berman (2010) has suggested the cingulo-opercular system as a candidate for the neural substrate for directed attention in ART. Secondly, factor analytic research has disassociated executive functioning performance into (1) a shared or common executive functioning ability, (2) an updating component (e.g., working memory), and (3) a task set shifting component (Miyake & Friedman, 2012).

Measuring the Construct of Directed Attention

A related gap in ART is the lack of specificity in defining depletion of directed attention resources. As can be expected, if there is uncertainty if directed attention is a unitary or multiple resource, then these different perspectives of directed attention will impact how it is being measured. ART claims that directed attention resources are being depleted and subsequently recovered, but a broad scope of cognitive tasks have been used to demonstrate this effect, such as tasks typically used to measure selective attention, sustained attention, working memory, and higher-order executive functioning (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Hartig, Evans, Jamner, Davis, & Gärling, 2003; Kaplan, 1995; Kaplan & Berman, 2010; Laumann, Gärling, & Stormark, 2003; Ohly et al., 2016; Shin, Shin, Yeoun, & Kim, 2011).

Further, meta-analytic research by Ohly and colleagues (2016), which reviewed attention restoration across a great variety of cognitive tasks domains, only observed nature benefits for three tasks: Digit Span Forward, Digit Span Backward, and Trail Making Test B. These tasks were interpreted as posing demands onto working memory. More recent meta-analyses have implicated certain working memory and cognitive flexibility tasks in restorative environments (Stevenson, Schilhab, & Bentsen, 2018). While working memory is closely related to attentional processes, including directed attention, the linkage between them in the context of ART is unclear. Further, it is too simplistic to attribute the restorative effect to the replenishment of working memory resources, specifically. Other tasks that also pose high working memory loads, like the Symbol Digits Modality Test, did not benefit from nature interventions (Ohly et al., 2016). Further, among those tasks that were identified to benefit from nature interventions, the effectiveness of the restorative effect was not directly linked to working memory load. For example, the Digit Span Forward and Digit Span Backward tasks showed comparable effectiveness of nature interventions, even though the Digits Span Backward tests places greater demands onto working memory (Ohly et al., 2016). Thus, it is presently unclear if directed attention or a type of directed attention is the actual cognitive resource being depleted and subsequently recovered in the restorative effect, as ART suggests, or if the restorative effect is more complex and impacting several cognitive processes that are interrelated.

Beyond the issue that it is not known which specific directed attention resources recuperate under nature exposure, ART's underlying assumption that nature interventions result in recuperation of fatigued attentional resources has received limited testing (Joye & Dewitte, 2018). Specifically, most ART studies follow a pre-post experimental design. In such a design, participants perform a cognitively demanding task or set of tasks (pre-nature exposure). Then, they are exposed to nature or urban (serving as a control) environments either directly (e.g., walking on a nature trail or city sidewalk) or indirectly (e.g., viewing digital nature or urban images). Finally, participants perform the same cognitively demanding task or set of tasks (post-nature exposure). While the pre-nature exposure task or set of tasks is intended to deplete participants of their directed attention resources, to our knowledge, prior research has not tested if restoration can occur at varying levels of depletion due to different task loads. As Kaplan and Berman (2010) argued, tasks of attention rarely require only involuntary attention or only voluntary/directed attention. Instead, attention tasks likely require varying amounts of effort. Thus, it is presently unknown if people can profit from the restorative effect in states of higher directed attention capacity (i.e., a lower effort/depletion state). If performance improvement occurs in individuals whose attentional resources have not been taxed, the beneficial performance effects associated with nature may not be caused by attention restoration as proposed by ART.

Future Directions

The purpose of this paper is to integrate literature from multiple subdisciplines with the hopes of inspiring future research that can aid in filling the gaps presented by prior literature on ART. We believe this paper presents opportunity for the following future directions:

- *What are the characteristics of an environment that make it restorative?* This is an imperative research question for those wanting to apply ART to design and operational settings. The four characteristics presented by Kaplan (1995) are not operationally defined well, easy to measure, and thus, implement. Further, the aesthetics and environmental preference literature that seemed to inspire ART is equally vague in terms of defining and measuring variables of interest. However, more recent research has integrated perceptual and landscape design variables to aid in better understanding aspects of nature that are associated with preference. Since preference for an environment is related to restoration, these variables may be informative for promoting cognitive and emotional restoration. However, there are limitations to this recent research, as it was correlational in nature. Therefore, future research could experimentally manipulate these visual variables thought to be correlated with environmental preference to determine if they impact restoration.

- *What is soft fascination, and how does it operate?* This research question may be of most interest to an audience who focuses on theoretical implications. If soft fascination has the three characteristics described

(1) does not require voluntary attention, (2) captures involuntary attention, (3) does not monopolize attentional capacity, how does this relate to observable behavior? One type of proposed behavior thought to be linked with soft fascination is gaze behavior, such as more fixations and eye movements for scenes with higher fascination (Berto, Massaccesi, & Pasini, 2008). Why does this occur, and what is/are the mechanism(s)? If these are known, then we could explain and predict more about what scenes and features engender soft fascination.

- *What stimuli elicit soft fascination?* This research question may be of most interest to an audience who focuses on applied research, specifically the application of ART to rapidly relieve mental fatigue. There are two potential methods to better understanding soft fascination and the attributes in an environment that elicit soft fascination: (1) A brute force approach; that is, develop object/scene/feature inventories that have been sorted with scales that measure soft fascination (e.g., Perceived Restorativeness Scale; Hartig, Korpela, Evans, & Garling, 1997), and (2) Besides nature, consider candidate features proposed here based on the information processing literature review, specifically positive stimuli with relatively higher value/meaning and fractal geometries. Further, certain aesthetic variables described in this paper may aid in promoting soft fascination and other aspects of restorativeness and should be considered.

- *What is directed attention, and does directed attention capacity need to be full depleted for restoration via nature to occur?* This research question has important theoretical and practical implications. Theoretically, if restoration can improve other cognitive processes beyond directed attention or occur after varying levels of directed attention depletion, then ART may need to be modified or expanded to encompass modern empirical findings. Researchers should operationally define directed attention and use this definition to better inform the tasks being used to measure restoration. Further, validating that directed attention is being depleted by the task(s) and a control condition in which directed attention is being less depleted or not depleted is needed. This would then allow for better scoping tools for designers, so that they can consider whether people within the environment would benefit from implementing restorative components, given their prior degree and type of directed attention depletion.

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The Cumulative Risk Model to encompass perceived urban safety and well-being

Elena Bilotta¹, Silvia Ariccio², Luigi Leone², Marino Bonaiuto^{2,3}

1. Third Center of Cognitive Psychotherapy, Rome, Italy

2. Department of Psychology of Development and Socialization Processes, Sapienza University of Rome, Rome, Italy

3. Inter-University Centre for Research in Environmental Psychology (CIRPA), Rome, Italy

Abstract

The Cumulative Risk Model (CRM) has usually been applied to developmental and quality of life psychology; however, the CRM could also be applied to the urban safety and personal well-being of people living in urban environments, since cities are complex, multi-risk scenarios. This paper presents two studies meant to provide evidence in support of this hypothesis. The first study (N=287) was aimed to create and validate a set of scales to measure the cumulative risk index and to pilot study two. Study two (N = 540), instead, aimed at showing how a higher number of risk factors is associated to a higher level of perception of insecurity/fear of crime and a smaller level of wellbeing/satisfaction with life and provided consistent correlational evidence, controlling for the neighborhood effect. These studies showed that the CRM can be used to study urban safety issues, since perception of personal safety, fear of crime and well-being are multidimensional constructs, and are affected by a large series of environmental and psychosocial risk factors. The CRM could have significant applications for policymaking and urban renovation.

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Corresponding Author: Elena Bilotta, bilotta.elena@gmail.com

1. Safety and well-being in the urban environment: cities as multi-risk contexts

Guaranteeing safety for urban residents has become one of the most critical problems of our time (Amerio, 1999; Ferguson & Mindel, 2007). Personal safety has been studied mostly in terms of psychological reactions to crime and in particular fear of crime (Amerio & Roccato, 2007), that can be defined as an apprehension of attacks and of their psychological and (or) physiological consequences (Brantingham & Brantingham, 1997). According to psychological research on the subject, perceived urban insecurity, and the consequent fear of crime, can have negative psychological consequences (anxiety, distrust, dissatisfaction, etc.). Perceived urban insecurity is also associated with specific coping strategies that may have further negative personal and social consequences (reduction of social activities, moving to other areas of the city considered safer, etc.; Amerio & Roccato, 2007; Skogan & Maxfield, 1981). Safety is often one of the most desired attribute of a neighborhood and it is considered to contribute to quality of life (Conde & Pina, 2014). Safety is also one of the features inhabitants always consider when assessing their own residential neighborhood, a preference that is consistently displayed across different cultures and languages (Bonaiuto *et al.*, 2015; Mao *et al.*, 2015).

The key to reduce perceived insecurity is to understand its antecedents, i.e., the factors affecting it. Previous research has consistently identified two major types of perceived urban insecurity antecedents: *environmental factors* and *community factors* (Gifford, 2007). Several *environmental factors* have been found to affect the perception of safety, with people reporting more crime in old neighborhoods, with denser housing designs, with high traffic and commercial or industrial land uses mixed amongst the residences (Taylor, 2002). Moreover, visibility usually associated to public lightning and open spaces, seems a key feature for perceived safety since it enables individuals to supervise and control the situation, and adapt to it (Hall, 1966; Appleton, 1975). Consistently, the availability of shelter and way outs favoring protection or escape routes from dangerous situations is also associated to perceived safety (Loewen, Steel & Suedfeld, 1993; Nasar & Fisher, 1993).

Some aspects of urban space design can also affect and increase perceived safety, particularly easing or preventing behaviors that affect the safety perception. According to the Defensible Space Theory (Newman, 1972), for instance, certain design features such as real or symbolic barriers separating public from private territory, and designs that allow owners to observe suspicious activities around their property, increase residents' sense of security and decrease crime in the area (see also Sommer, 1987; Casteel & Peek-Asa, 2000).

However, these places and neighborhoods are also settings for the social relations and the interactions of people and communities that share these physical spaces. Unsurprisingly, residents show less fear of crime when they have a strong sense of community (Riger, LeBailly & Gordon, 1981; Skogan & Maxfield, 1981). Thus, higher social capital is found to be associated not only to

lower rates of homicide, assault, robbery, and burglary but also to increased participation in formal local organizations, and to decreasing perceptions of personal insecurity and fear of crime (Kawaki, Kennedy & Wilkinson, 1999; Sampson & Groves, 1989). In fact, social capital seems to mediate the association between crime and neighborhood conditions of disadvantage (Kruger, Reischl, & Gee, 2007). Overall, both environmental and community related factors contribute to people's perceived safety/insecurity and thus ultimately to their well-being. Indeed, perceived security and fear of crime ultimately affect residents' well-being, quality of life and satisfaction with life (Garofalo & Laub, 1978; Motl *et al.*, 2006). On the one hand, features usually associated to perceived insecurity and fear of crime are often associated to loss of well-being and negative physical health consequences (Ross & Mirowsky, 2001); on the other hand, positive social and environmental features (e.g., presence of nature) are found to increase people's well-being and life satisfaction (Venhoeven *et al.*, 2018). Some studies also found a relationship between socio-physical neighborhoods features and residential neighborhood attachment (Bonaiuto *et al.*, 1999; Fornara *et al.*, 2018).

2. The Cumulative Risk Model: from developmental psychology to the environmental psychology domain

Forty years ago, studying the risk factors of children development, Rutter was the first researcher to apply a cumulative risk model. Studying the factors affecting childhood psychiatric disorders, he found significant increased effects as risk factors accumulated. While no single risk factor by itself increased risk for mental disorder, the presence of two to six risk factors contributed to fourfold and tenfold increases in mental disorder, respectively (Rutter, 1979).

In the CRM, a dichotomous classification of risk exposure is determined for each personal or environmental construct, typically by a statistical cutoff (greater than one standard deviation above the mean) or based on a conceptual categorization (e.g., gender, age, poverty, etc.). A cumulative risk index is then calculated by simply adding the dichotomized risks categories (Evans, 2003). Since its conceptualization, the CRM has been mainly applied to developmental issues and suggests that the effect of multiple risk factors is often cumulative: as the number of risk factors experienced by an individual (a child, in Rutter's case) rises, the likelihood of negative outcomes increase (Evans, 2003; Evans & Marcynyszyn, 2004; Greenberg *et al.*, 1999). Compared to the traditional risk models that tend to isolate the effects of singular risk factors (Covington & Taylor, 1991; Hale, 1996; Hunter, 1978; Merry, 1981; Lewis & Salem, 1986; Skogan & Maxfield, 1981), the CRM allows accounting for the exponential consequences of experiencing a large number of risk factors; such effects are undetectable when considering risk factors individually. Since cities are multi-place complex environments (Bonnes & Secchiaroli, 1992; Bonnes & Secchiaroli, 1995; Zani, Cicognani & Albanesi, 2001), and

the perception of urban security is influenced by a large series of factors, the CRM appears an appropriate framework, with its associated array of methodological tools, to study perceptions of insecurity and well-being in the urban context

However, most urban safety models tend to isolate the effects of different factors (Covington & Taylor, 1991). Models traditionally employed to analyze urban risk factors (e.g., *indirect victimization model*, Skogan & Maxfield, 1981; *community concern model*, Conklin, 1975, *incivilities model*, Hunter, 1978; Lewis & Salem, 1986; *subcultural diversities model*, Merry, 1981) tend to isolate the effects of specific factors (Covington & Taylor, 1991). Instead, the CRM allows a more “ecological” approach to risk (Bronfenbrenner, 1979), taking into account a larger series of factors (of different nature). This would be consistent with the complexity and dynamic nature of the urban context, where it is unlikely to be confronted to only one specific risk at a time or to a specific and stable pattern of risks. Instead, it is more common to face changing, unstable and dynamic configurations of risks, mixing in line with broader contemporary VUCA (Volatility, Uncertainty, Complexity, Ambiguity) scenarios. Given the multidimensional characteristic of the safety issue (Amerio & Roccatò, 2007) and the large number of factors that may influence it (Skogan & Maxfield, 1981), it is plausible to apply a cumulative risk model to the analysis of its negative consequences on city inhabitants.

The application of a cumulative risk model (Evans, 2003; Evans, 2004; Evans & Marcynyszyn, 2004) would allow analyzing the effects of the multiple risk factors involved in the perception of safety and fear of crime and well-being within the residential neighborhood urban scenarios.

3. Assessing the CRM in urban scenarios

An ecological approach (Becker, 1995; Bronfenbrenner, 1979) could help to clarify how complex dynamics featuring risk factors co-occurrence may impact the perception of personal safety, fear of crime, and well-being. Therefore, the present studies aim to apply the cumulative risk model to assess the effects of multiple risk exposure on urban residential perception of safety, fear of crime and well-being/satisfaction with life. The first study aims to create and validate the research tool and to provide preliminary evidence of the expected relationships between the variables; while the second study is fully devoted to the test of two main substantial hypotheses via the adoption of two independent samples procedure to measure predictors and criteria.

4. Study 1

4.1. Aims

Integrating the literature about cumulative risk model (Evans, 2003; Evans, 2004; Evans & Marcynyszyn, 2004; Greenberg *et al.*, 1999; Lengua, 2002) with the one about perception of safety and fear of crime (Amerio & Roccatò, 2007; Ferraro & LaGrange, 1992; Sampson &

Raudenbush, 1999), this first study aims at validating the necessary research tools, as well as to offer a preliminary test of the cumulative effects of multiple risk factors on resident’s perception of insecurity/fear of crime, and as an ultimate variable, on resident’s well-being/satisfaction with life.

In order to be able to compare residents living in neighborhoods affected by different levels of urban risks, data were collected in three different Roman neighborhoods, which are representative of different levels of perceived safety. A pilot study allowed choosing three Roman neighborhoods – i.e., Parioli, Tiburtino and Centocelle - as representative, at the time of data gathering, of a “safe” (Parioli), an “intermediate” (Tiburtino) and an “unsafe” (Centocelle) neighborhood of Rome. Collecting data in these three different neighborhoods was expected to provide a wide range of experienced risks across contexts, allowing testing the cumulative risk model.

The independent variables (the so-called risk factors) of the present study are the following:

1. Gender (being a woman is considered as a risk factor)
2. Age (being older is considered as a risk factor)
3. Monthly salary (a lower salary is considered as a risk factor)
4. Perceived physical disorder (higher score is considered as a risk factor)
5. Perceived social disorder (higher score is considered as a risk factor)
6. Perceived neighborhood violence (higher score is considered as a risk factor)
7. Victimization (higher score is considered as a risk factor)
8. Police presence (lower score is considered as a risk factor)
9. Sense of community (lower score is considered as a risk factor)
10. Neighbors ties (lower score is considered as a risk factor)
11. Informal social control (lower score is considered as a risk factor)
12. Psychological health (lower score is considered as a risk factor)
13. Perceived stress (higher score is considered as a risk factor)
14. Negative affect (higher score is considered as a risk factor)

The dependent variables (criteria) are the following:

1. Perceived insecurity/fear of crime
2. Well-being/satisfaction with life.

Specifically, study 1 aimed at:

1) developing a reliable measurement tool for each of the following CRM *predictors*: Perceived physical disorder, perceived social disorder, perceived neighborhood violence, victimization, police presence, sense of community, neighbors’ ties, informal social control, psychological health, perceived stress, negative affect;

2) developing a reliable measurement tool for each of the following CRM *criteria*: perceived safety, fear of

crime, well-being, satisfaction with life;

3) exploring if, in the same sample, the number of risk factors is both associated to insecurity/fear of crime (positively) and to wellbeing/satisfaction with life (negatively).

4.2. Method

4.2.1. Sample

Data were collected in Rome, Italy; 287 residents of the neighborhoods of Parioli (n = 89), Tiburtino (n = 97) and Centocelle (n= 101) participated in the study (mean age = 41.6, SD = 18.5; years of residence in the neighborhood M = 43.5, SD = 17.5; 95.5% Italians, 52.5% female, 30.7% earning 1000 Euros per month or less, 40.1% earning between 1000 and 2000 Euros per month, 22.6% earning

2000 Euros or more per month).

4.2.2. Instrument

The instrument consisted of a self-administered questionnaire composed by two main sections. A map of the specific inhabitants' residential neighborhood was also provided in the second page of the questionnaire, with a list of the streets corresponding to the borders of the neighborhood, in order to make sure that all interviewees from the same neighborhood were referring exactly to the same urban area.

Section 1 contained 13 assessment scales measuring the predictors (see table 1), while section 2 contained 4 assessment scales measuring the criteria (see table 2) and the socio-demographic information.

Scale	Authors	Number of items	Rating scale
Sense of community	Prezza, Costantini, Chiarolanza & di Marco (1999)	13 items; Example of item: "I feel I belong to this neighborhood"	from 1 = <i>completely disagree</i> , to 5 = <i>completely agree</i>
Whole neighborhood satisfaction scale	Bonaiuto, Fornara & Bonnes (2006)	3 items; Example of item: "Would you recommend this neighborhood to some friend of yours who is looking for an apartment for renting/sale?"	from 1 = <i>not at all</i> to 5 = <i>completely</i>
Informal social control	Sampson, Raudenbush & Earls, 1997	4 items; Example of item: "Would you say that your neighbors could be counted on to take action if children were spray painting graffiti on a local building?"	from 1 = <i>very likely</i> to 5 = <i>very unlikely</i>
Neighbourhood ties	Sampson & Raudenbush, 2004	4 items; Example of item: "In your neighborhood, how often do you loan things to one another?"	from 1 = <i>never</i> to 5 = <i>frequently</i>
Perceived neighbourhood violence	Sampson, Raudenbush & Earls, 1997	6 Item; Example of item: "During the past 6 months, how often a sexual assault had occurred in your neighborhood?"	from 1 = <i>never</i> to 5 = <i>frequently</i>
Victimization	Austin, Furr & Spine, 2002	2 items; Example of item: "Have you or anyone you know in this neighborhood ever had their home broken into and/or something stolen?"	from 1 = <i>never</i> to 5 = <i>frequently</i>
Police presence	Ferguson & Mindel, 2007	2 items; Example of item: "How often have you seen in your neighborhood a police officer searching or frisking anyone or breaking up groups or arresting anyone?"	from 1 = <i>never</i> to 5 = <i>frequently</i>
Perceived physical disorder	adapted from Sampson & Raudenbush, 1999	8 items from the original version + 6 new items ¹ ; Example of item: How much each of the following items (e.g., gang graffiti) is present in your neighborhood.	from 1 = <i>not at all</i> to 5 = <i>very much</i>

¹ 6 items were added to the original scale on the basis of a qualitative piloting results about neighborhood features that affect perceived physical and social disorder in Rome:

- a) Home appliance and furniture abandoned by the street;
- b) Barracks /caravans (like those owned by the gypsies);
- c) Lack of illumination at night;
- d) Good maintenance of the buildings;
- e) Good maintenance of the streets;
- f) Good maintenance of the green areas.

Perceived social disorder	Sampson & Raudenbush (1999)	5 items from the original version + 5 new items ² ; Example of item: How much each of the following items (e.g., adults fighting or hostilely arguing) is present in your neighborhood.	from 1 = <i>not at all</i> to 5 = <i>very much</i>
Perceived Safety	Austin, Furr & Spine, 2002; Ferraro & LaGrange, 1987)	9 items Example of item: "People who live in this neighborhood have to worry about someone breaking into their home to steal things"	from 1 = <i>completely disagree</i> to 5 = <i>completely agree</i>

Table 1: assessment measures included in section 1 (CRM predictors).

Scale	Authors	Number of items	Rating scale
Well-being/satisfaction with life	adapted from Pavot & Diener, 1993	5 items; Example of item: "In most ways my life is close to my ideal"	from 1 = <i>completely disagree</i> to 5 = <i>completely agree</i>
Perceived stress	Cohen, Kamarck, & Mermelstein 1983	4 items; Example of item: "How often, in the last month, have you felt that you were unable to control the important things in your life?"	from 1 = <i>never</i> to 5 = <i>very often</i>
Psychological health	Berwick, Murphy, Goldman, Ware, Barsky & Weinstein, 1991	5 items; Example of item: "How often, in the last month, you felt so down in the dumps that nothing could cheer you up?"	from 1 = <i>never</i> to 5 = <i>very often</i>
Negative affect scale	Watson, Clark & Tellegen, 1988	10 items; Example of item: "Indicate to what extent you generally feel this way (e.g., upset), that is, how you feel on average"	from 1 = <i>not at all</i> to 5 = <i>very much</i>

Table 2: assessment measures included in section 2 (CRM criteria).

4.2.3. Procedure

Data were collected between the months of November 2008 and March 2009 in the Roman neighborhoods of Parioli, Tiburtino and Centocelle. Data collection was suspended during December 2008, in order to avoid the peculiarity of the city during Christmas time (e.g., brighter lights in the streets and enhanced illumination in the shops' windows), which could have affected people's responses to the survey.

Participants were recruited on the streets or in main informal areas of the neighborhoods and asked to participate in a research project about their neighborhood.

4.3. Results

4.3.1. Aim 1

In order to fulfill Aim 1, a Principal Component Analysis (PCA) was conducted for each CRM predictors' scales, and Chronbach's *alpha* were computed, with the exception of the victimization (Austin *et al.*, 2002), and police presence³ scales (Ferguson & Mindel, 2007) that counted less than 4 items (it is commonly accepted that a small number of items can deflate the alpha value). The sense of community scale (Prezza *et al.*, 1999) was merged to the whole neighborhood satisfaction scale (Bonaiuto *et al.*, 2006) because of the high correlation

² 5 items were added to the original scale on the basis of a qualitative piloting results about neighborhood features that affect perceived physical and social disorder in Rome:

- a) Beggars by the streets;
- b) Car-windows cleaners and/or sellers at the traffic lights;
- c) Homeless people;
- d) Illegal peddler by the streets/squares;
- e) Immigrants.

³ Police presence scale (Ferguson & Mindel, 2007) was reduced to one item; the item "How often have you seen in your neighborhood a police officer searching or frisking anyone in your neighborhood or breaking up groups or arresting anyone?" was taken out from the subsequent analyses because it was negatively correlated with the second item of the scale.

between the two scales ($r = .83, p < .001$). Analyses showed a mono-factorial structure for all the scales. Table 3 presents the final range of saturations,

eigenvalues, and Chronbach's alpha of the CRM predictors' scales.

<i>Scales</i>	<i>Range of saturations</i>	<i>Eigenvalues 1; 2; 3</i>	<i>Cronbach's Alpha (N of items)</i>
Sense of community ⁴	.82 - .24	5.50; 1.95; 1.18	.86 (15)
Informal social control	.86 - .64	2.45; .76; .42	.79 (4)
Neighbor ties	.84 - .75	2.57; .60; .53	.81 (4)
Perceived neighborhood violence	.77 - .74	3.48; .87; .55	.85 (6)
Victimization			.61 (2)*
Perceived physical disorder	.79 - .40	4.76; 2.36; 1.38	.85 (13)
Perceived social disorder	.82 - .46	3.97; 1.43; 1.21	.82 (10)

*since Victimization was composed of two items, reliability was calculated as Pearson's r .

Table 3. Range of saturations, eigenvalues, and Chronbach's alpha of the CRM predictors' scale

4.3.2. Aim 2

Principal Component Analyses (PCA) were performed on CRM criteria's scales, and Chronbach's alpha were subsequently computed. Perceived safety scale (reversed into "perceived insecurity"; Austin, et al. 2002), perceived risk scale (Ferguson & Mindel, 2007), concern about crime scale (Amerio & Roccato, 2005),

and fear of crime scale (Ferraro & LaGrange, 1992) were merged into one scale, named perception of insecurity/fear of crime, because of their high inter-correlation (see table 4). Table 5 summarizes the results of the final factor analyses, and each scale's reliability scores.

	<i>Perceived insecurity</i>	<i>Perceived risk</i>	<i>Concern about crime</i>	<i>Fear of crime</i>
<i>Perceived insecurity</i>	1	.70**	.70**	.58**
<i>Perceived risk</i>		1	.48**	.47**
<i>Concern about crime</i>			1	.36**
<i>Fear of crime</i>				1

** $p < .001$ (one tailed test)

Table 4. Pearson's correlations for perceived insecurity, perceived risk, concern about crime, and fear of crime (N= 287)

<i>Scales</i>	<i>Range of saturations</i>	<i>Eigenvalues 1; 2; 3</i>	<i>Cronbach's Alpha (N of items)</i>
Perception of safety/fear of crime	.81 - .35	7.68; 1.98; 1.73	.90 (22)
Well-being/satisfaction with life	.86 - .72	3.20; .64; .45	.85 (5)
Perceived stress	.78 - .68	2.17; .80; .54	.72 (4)
Psychological health	.78 - .66	2.57; .80; .69	.75 (5)
Negative affect	.78 - .49	4.70; 1.04; .97	.87 (10)

Table 5. Range of saturations, eigenvalues, and Chronbach's alpha of the CRM criteria scales

⁴ The item "In this neighborhood there are some feasts or recurrences that involve the majority of the residents" from Prezza et al. (1999) was taken out from the subsequent analyses because of its lower saturation (.27).

4.3.3. Aim 3

For each of the environmental, psychosocial and individual risk factors, risk was defined as scores larger than one standard deviation above the mean for the entire sample (Evans, 2003). Only for psychosocial characteristics “positively oriented” (the higher the score, the lesser the perceived discomfort) such as police presence, sense of community, neighbors’ ties and informal social control, risk was defined for scores lower than minus one standard deviation below the mean for the entire sample. Each risk factor was defined dichotomously (0 = absence of risk; 1 = presence of risk): cumulative risk was defined as the simple, un-weighted sum of fourteen risk factors (Evans 2003), named the Cumulative Risk Index (CRI).

Table 6 provides descriptive information on each of the fourteen risk factors composing the CRI and on the two outcome variables. For the analyses of perception of personal safety, fear of crime and well-being/satisfaction with life, cumulative risks of seven or more risks were

combined into one category given the small sample sizes from eight to fourteen risk factors. As a result, 9.3% of the sample had no risk factor, 22.4% had one risk factor, 22.8% had two risk factors, 20.5% had three risk factors, 9% had four risk factors, 6.3% had five risk factors, 4.1% had six risk factors, and 5.6% had seven or more risk factors.

Table 7 and figure 1 illustrate the effects of CRI exposure on perception of insecurity/fear of crime and well-being/satisfaction with life. Consistently with Aim 3, data showed that as the numbers of risk factors rises, perception of insecurity and fear of crime increase ($\beta = .37, t = 6.60, p < .001; R^2 = .14; F(1, 266) = 43.44$), while well-being/satisfaction with life decreases ($\beta = -.41, t = -7.35, p < .001; R^2 = .17; F(1, 266) = 54.08$). Particularly, having three or four risk factors seems to lead significantly higher Insecurity/fear of crime than having indiscriminately zero, one, or two. Having five or six risk factors is associated to even higher Insecurity/fear of crime, and having seven or more risks further increases

<i>Measure</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Proportion of the sample with risk factor</i>
<i>Risk factors</i>			
Gender (M/F)			.52
Age	43.5	17.5	.17
Monthly salary (0/4)	2.03	.96	.33
Perceived physical disorder	3.00	.63	.14
Perceived social disorder	3.12	.69	.15
Perceived neighborhood violence	2.02	.74	.16
Victimization	2.18	.96	.12
Police presence	3.00	1.16	.11
Sense of community	3.37	.55	.17
Neighbors ties	2.49	.89	.19
Informal social control	2.64	.84	.19
Psychological health	2.60	.67	.15
Perceived stress	2.58	.67	.21
Negative affect	2.10	.65	.15
Cumulative risk (0/14)	2.66	2.02	
<i>Outcome variables</i>			
Perceived insecurity/Fear of crime	2.92	.64	
Well-being/satisfaction with life	3.38	.70	

Table 6. Descriptive statistics on cumulative risk factors and outcome variables (N = 287)

<i>Variable</i>	<i>Number of cumulative risks</i>							
	0	1	2	3	4	5	6	7 and more
<i>Insecurity/ fear of crime</i>	2.57 ^a	2.70 ^a	2.83 ^a	2.96 ^b	3.09 ^b	3.22 ^c	3.35 ^c	3.48 ^d
<i>Well-being/satisfaction with life</i>	3.78 ^a	3.63 ^b	3.48 ^b	3.33 ^c	3.18 ^c	3.03 ^c	2.88 ^d	2.73 ^d

Note: numbers correspond to means; different letters indicate significant differences among the means ($p < .001$).

Table 7. Relation of cumulative risk to perception of safety/fear of crime and well-being/satisfaction with life (N = 287)

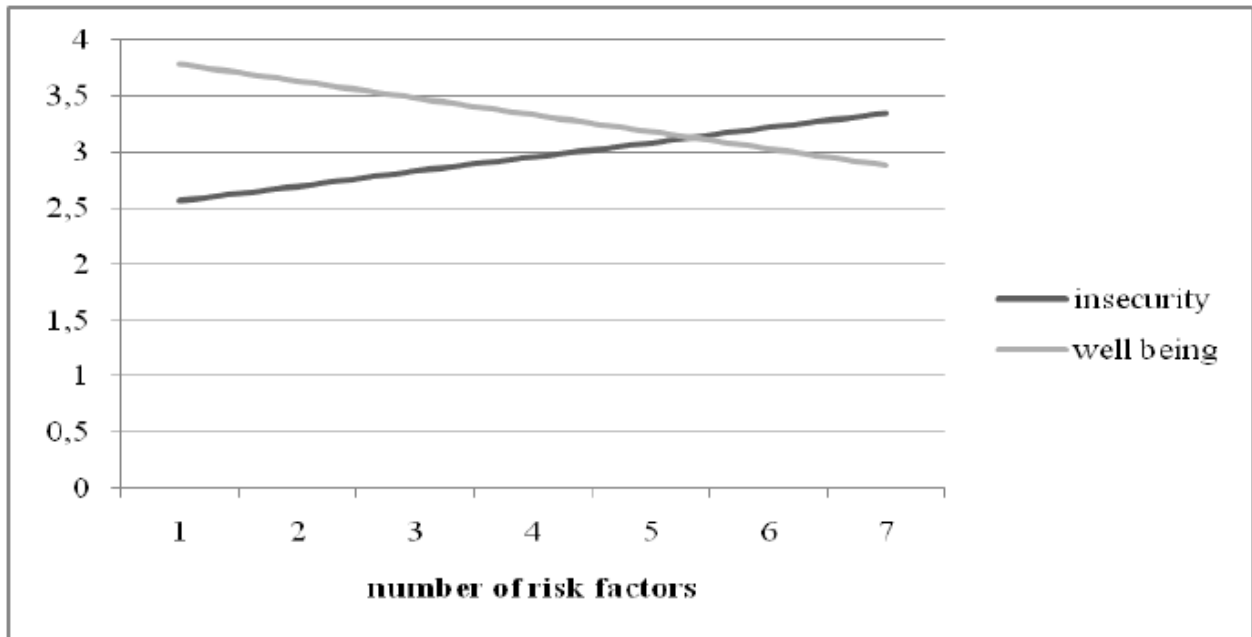


Figure 1. Regression of Perceived Insecurity and Well-being on the number of risk factors (N = 287)

it. On the other hand, having one or two risk factors already decreases well-being/satisfaction with life compared to having zero risk factors. Having three, four or five risk factors is associated to even lower scores of well-being/satisfaction with life; having six or more risk factors further decreases this score.

4.4. Discussion

Principal component analyses and internal consistency indicators have shown that predictors and criteria were adequately measured with the scales at hand.

Regression analyses show a positive association between the number of risks and insecurity/fear of crime, and a negative association between number of risks and well-being/satisfaction with life. As the number of factors rises, insecurity and fear of crime increase, while well-being and satisfaction with life decrease, in line with the tradition of studies of cumulative risk effects on developmental outcomes (Evans, 2003; Evans, 2004; Evans & Marcynyszyn, 2004).

This preliminary study thus provided some reliable scales for measuring both CRM predictors and CRM criteria for the urban safety issue, and it gave preliminary evidence of the association between number of risks, wellbeing and fear of crime.

Study 2 employed these scales in order to test the CRM in the urban safety issue context.

5. Study 2

5.1. Aims and hypotheses

Aiming to test the CRM in the urban safety context, this study chose to employ two different samples in order to separately measure CRM predictors and CRM criteria. As

suggested by the literature about neighborhood effects (Leventhal & Brooks-Gunn, 2000) and environmental psychology methods (Winkel, Saegert, & Evans, 2009), the sample used for the community survey and the observation of the neighborhood (i.e., the risk predictors level) should be independent from the sample of residents providing broader evaluations about general perception of insecurity/fear of crime and well-being/satisfaction with life (i.e., the criteria level).

For instance, asking the same subject about perceived neighborhood violence or police presence and then about the levels of fear of crime s/he experiences, could probably hint to the participant that a link is expected between these variables, thus inflating estimates of main effects of environmental factors (e.g., physical disorder) on safety/fear of crime and well-being/satisfaction with life (Winkel *et al.*, 2009). Thus, in the present study, one smaller sample (named “the observers”) provides an observational report of the neighborhood characteristics answering to items about: sense of community, whole neighborhood satisfaction, informal social control, neighbors ties, perceived neighborhood violence, victimization, police presence, perceived social and physical disorder; in addition to that, negative affect and socio-demographic questions were included. A separate, bigger sample (named “the criteria”) was recruited for more general measures of perception of insecurity/fear of crime, well-being/satisfaction with life, psychological measures of health, stress and affect; socio-demographic variables were included too. The same variables described for Study 1 were assessed in Study 2 (see section 4.1).

The hypotheses to verify in study 2 are thus as follows:

H1: A higher number of risk factors in the “observers” sample is expected to be associated to a higher level of perception of insecurity/fear of crime in the “criteria” sample.

H2: A higher number of risk factors in the “observers” sample is expected to be associated to a lower level of perception of well-being/satisfaction with life in the “criteria” sample.

5.2. Method

5.2.1. Sample

Five hundred-fifty residents of three neighborhoods of Rome (i.e., Parioli, Tiburtino, Centocelle) participated in the study. One hundred eighty-two participants (61 in Parioli, 60 in Tiburtino, 61 in Centocelle) filled in the “observers” questionnaire (age $M=46.5$, $SD=16.9$; years of residence in the neighborhood $M=25.8$, $SD=16.7$; 97.3% Italians, 52.2% women; 33% had a salary of 1000 Euros per month at most, 49.5% had a salary between 1000 and 2000 Euros per month, 13.7% had a salary of more than 2000 Euros per month).

Three hundred fifty-eight participants (119 in Parioli, 118 in Tiburtino, 121 in Centocelle) filled in the “criteria” questionnaire (age $M=47.8$, $SD=17.9$; years of residence in the neighborhood $M=26.4$, $SD=21.3$; 93.6% Italians, 51.7% women; 29.1% had a salary of 1000 euro per month at most, 44.7% had a salary between 1000 and 2000 Euros per month, 15.7% had a salary of more than 2000 Euros per month)⁵.

5.2.2. Instruments

The “observers” questionnaire contained the CRM predictors described for Study 1 (see Table 1). The questionnaire included also the Negative affect scale (Waston, Clark & Tellegen, 1987), and measures for Socio-demographic indicators.

The “criteria” questionnaire contained the CRM criteria measures, already employed in study 1 (see Table 2), and the socio-demographic information.

5.2.3. Procedure

The same data collection procedure employed for study 1 was applied for study 2. Participants were told about the anonymity of the questionnaire and about the length of filling in the questionnaire (about 15 minutes for the “observers” questionnaire, and about 10 minutes for the “criteria” one).

5.3. Results

Since data were collected on two different samples, before calculating the cumulative risk index on the “criteria” sample, a direct discriminant function analysis was computed on the “observers” sample using the

neighbourhood of residence as the grouping variable. The perceived *environmental risk* factors (i.e., perceived physical disorder, perceived social disorder) and the *psychosocial risk* factors (i.e., sense of community, neighbor ties, informal social control, and perceived neighborhood violence) were considered as predictor variables.

In order to determine which variables discriminate between the neighborhoods, two discriminant functions were calculated with a combined $\chi^2(12) = 103.84$, $p < .001$; after removal of the first function: $\chi^2(5) = 26.58$, $p < .001$. The two functions could therefore be retained. The two discriminant functions accounted for 76.8% and 23.2%, respectively, of the between group variability⁶. The loading matrix of correlations between predictors and discriminant functions, as seen in Table 8, shows that the first function is composed by perceived social disorder, perceived physical disorder and perceived neighborhood violence. The first function was named “disorder and violence”. Centocelle’s residents have higher perceptions of social disorder (mean = 3.59) than Tiburtino’s (mean = 3.63) and Parioli’s (mean = 2.67); they also have higher perceptions of physical disorder (mean = 3.38) than Tiburtino’s (mean = 3.10) and Parioli’s (mean = 2.61) residents, and higher perceptions of perceived neighborhood violence (mean = 2.51) than Tiburtino’s (mean = 1.92) and Parioli’s residents (mean = 1.76).

The second function is composed by neighborhood ties, informal social control and sense of community; the second function was called “social capital”. Tiburtino’s residents have lower neighbors ties (mean = 2.11) than Parioli’s (mean = 2.74) and Centocelle’s (mean = 2.79); they have lower informal social control (mean = 2.17) than Parioli’s (mean = 2.81) and Centocelle’s (mean = 2.28), and also lower sense of community (mean = 3.08) than Parioli’s (mean = 3.49) and Centocelle’s residents (mean = 3.13). The plots of the three group centroids on function 1 and function 2 are shown in Figure 2. The Bonferroni contrasts performed showed there are significant differences among the three neighborhoods on the function “disorder and violence”. The three neighborhoods differ one from another; $F(2, 179) = 38.95$, $p < .05$. For “social capital”, Tiburtino neighborhood differed from Parioli and Centocelle ($F(2, 179) = 9.59$, $p < .05$).

Concerning the first function “disorder and violence”, the value 0 (no risk) is assigned to Parioli; the value 1 (presence of risk) is assigned to Tiburtino and the value 2 (presence of higher risk) is assigned to Centocelle. This is the only case here where the risk factor was not dichotomized, since data demonstrated there is a significant difference among the three neighborhoods. Concerning the second function “social capital”, the value 0 (absence of risk) was assigned to Parioli and Centocelle, and the value 1 (presence of risk) to Tiburtino. Through this strategy, it is possible to add these two new risk factors to the cumulative risk index of the “criteria”

⁵ No significant difference was detected across the two samples on the distributions of gender, education, occupation, monthly salary, marital status and nationality (χ^2 's ps all $> .23$). Similarly, mean levels of age and years of residence in the neighborhood did not differ across samples ($ps > .49$).

⁶ The variable “victimization” was kept out of the analyses because of its similar correlation with the two functions (.26 on function 1, .34 on function 2), and in order to achieve a simple structure of the two functions.

sample.

Predictor variable	Correlations of predictor variable with discriminant functions		Univariate F (2,179)	Pooled within group correlations Among predictors					
	1	2		Perceived social disorder	Perceived physical disorder	Perceived neighborhood violence	Neighborhood ties	Informal social control	Sense of community
Perceived social disorder	.77	-.46	32.58	1	.67	.34	-.25	-.19	-.38
Perceived physical disorder	.75	-.24	28.20		1	.34	-.26	-.24	-.40
Perceived neighborhood violence	.60	-.33	19.29			1	-.05	-.02	-.45
Neighborhood ties	.04	.83	10.01				1	.52	.62
Informal social control	-.32	.51	8.85					1	.52
Sense of community	-.28	.39	6.14						1

Table 8. Discriminant function analysis of perceived environmental and psychosocial risk factors

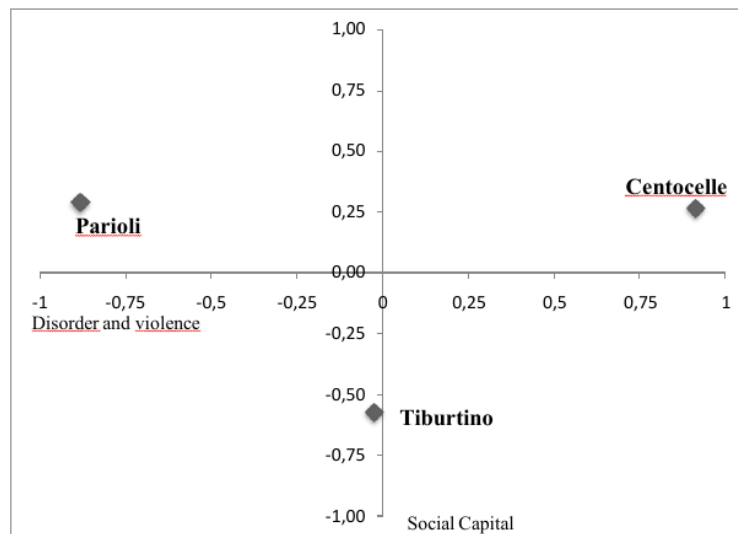


Figure 2. Plots of the three group centroids on “Disorder and Violence” (function 1) and “Social Capital” (function 2)

Table 9 provides descriptive information on each of the risk factors composing the CRI; 13.8% of the sample had one risk factor, 30.3% had two risk factors, 25.3% had three risk factors, 16.9% had four risk factors, 9.4% had five risk factors, and 4.4% had six or more risk factors.

For the analyses of perception of insecurity/fear of crime and well-being/satisfaction with life, cumulative risks of six or more risks were combined into one category given the small sample sizes from seven to eight risk factors.

<i>Measure</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Proportion of the sample with risk factor</i>
<i>Risk factors</i>			
Gender (M/F)			.52
Age	47.8	17.8	.24
Monthly salary (0/4)	1.91	.83	.32
Disorder and violence (0/2)	1.00	.47	.34
Social capital (0/1)	.33	.82	.33
Psychological health	2.80	.74	.17
Perceived stress	2.71	.69	.18
Negative affect	2.48	.71	.18
Cumulative risk (0/8)	2.92	1.37	
<i>Outcome variables</i>			
Insecurity/Fear of crime	3.19	.83	
Well-being/satisfaction with life	3.15	.80	

Table 9. Descriptive statistics on cumulative risk factors and outcome variables (N = 358)

In order to test H1 and H2, each risk factor was defined dichotomously (0 = absence of risk; 1 = presence of risk) on the basis of statistical or theoretical criteria. Cumulative risk was defined as the simple, un-weighted sum of the risk factors, including the new ones emerged by the discriminant analysis (Evans 2003). A Cumulative Risk Index (CRI) was obtained by adding each single risk factor one to the other to test all the hypotheses of the present study.

Table 10 and Figure 3 illustrate the effects of CRI exposure on insecurity/fear of crime and well-being/satisfaction with life. Coherently with the initial hypotheses, data showed that as the numbers of risk

factors rises, insecurity/fear of crime increases ($\beta = .41$, $t = 7.93$, $p < .001$; $R^2 = .16$; $F(1, 318) = 62.4$) (H1), while well-being/satisfaction with life decreases ($\beta = -.29$, $t = -7.35$, $p < .001$; $R^2 = .09$; $F(1, 318) = 29.91$, $p < .001$) (H2). Particularly, having two, three or four risk factors seems to lead to significantly higher Insecurity/fear of crime than having indiscriminately zero or one; having five or more risk factors is associated to even higher Insecurity/fear of crime. On the other hand, having two or more risk factors indiscriminately decreases well-being/satisfaction with life compared to having zero or one risk factors.

<i>Number of cumulative risks</i>							
<i>Variable</i>	0	1	2	3	4	5	6 and more
<i>Insecurity/ Fear of crime</i>	2.55 ^a	2.76 ^a	2.97 ^b	3.18 ^b	3.39 ^b	3.60 ^c	3.81 ^c
<i>Well-being/satisfaction with life</i>	3.60 ^a	3.44 ^a	3.28 ^b	3.12 ^b	2.96 ^b	2.80 ^b	2.64 ^b

Note: numbers correspond to means; different letters indicate significant differences among the means ($p < .001$).

Table 10. Relation of cumulative risk to insecurity/fear of crime and well-being/satisfaction with life (N = 358)

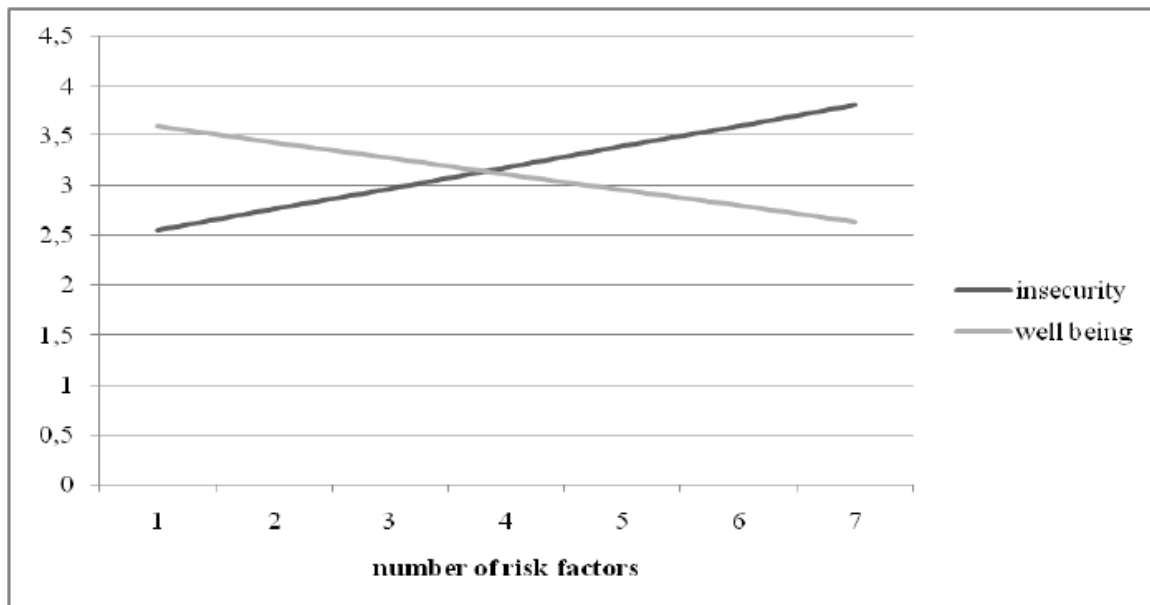


Figure 3. Regression of Perceived Insecurity and Well-being on the number of risk factors

5.4. Discussion

A cumulative risk model was applied in order to assess its effects on perception of insecurity/fear of crime and well-being/satisfaction with life via two independent samples of residents in three Rome neighborhoods: Parioli, Tiburtino, and Centocelle. One sample reported the physical and psychosocial characteristics of their neighborhood (predictor variables), while a different sample reported perception of insecurity/fear of crime and of well-being/satisfaction with life (criterion variables).

The direct discriminant function analysis computed on the “observers” sample showed the presence of two functions for distinguishing among Centocelle, Parioli and Tiburtino neighborhoods. The first function, named “disorder and violence”, was composed by perceived social disorder, perceived physical disorder and perceived neighborhood violence. The second function was named “social capital”, and it was composed by neighbors’ ties, informal social control and sense of community. The two functions “disorder and violence” and “social capital” were added to the risk factors of the criteria sample in order to calculate the cumulative risk index. This was possible because the two separate “observers” and “criteria” samples had the variable “neighborhood of residence” in common.

Concerning the test of the hypotheses, results showed a significant effect of cumulative risk both on perception of insecurity/fear of crime (H1) and well-being/satisfaction with life (H2). As anticipated, as the number of risk factors rises, insecurity and fear of crime increase, while well-being and satisfaction with life decrease. These results suggest the presence of a linear model of cumulative risk (Sameroff *et al.*, 1998; Appleyard *et al.*, 2005) in line with the tradition of studies of cumulative risk effects on developmental outcomes (Evans, 2003; Evans, 2004; Evans & Marcynyszyn, 2004).

From an applied and policy-oriented perspective, the CRM could inform local municipal administrators and decision-makers involved in the issue of urban safety and well-being. CRM would help to know the amount of risk perception people experience and the most common risk factors in a given area. The CRM could be employed to compare different urban areas or to test the efficacy of urban interventions, easily showing if the number of risk factors has decreased after the intervention.

6. General discussion

A Cumulative Risk Model (Evans, 2003; Evans, 2004; Evans & Marcynyszyn, 2004), traditionally applied to developmental issues, was proposed here for assessing perception of safety and fear of crime (and well-being/satisfaction with life as an ultimate variable) within a large metropolitan urban environment, namely the city of Rome. Both results of Study 1 (conducted on a single sample of residents) and Study 2 (conducted on two separate samples of residents in order to independently measure predictors and criteria variables) confirmed the cumulative effects of multiple risk factors on perception of insecurity/fear of crime (positively) and well-being/satisfaction with life (negatively). Data showed that as the number of risk factors rise, perception of insecurity/fear of crime increases, while well-being/satisfaction with life decreases. The direction of such effects is conceptually in line with the theoretical model and with previous empirical results.

Results of the present research evidenced the presence of a linear model of cumulative risk exposure (Appleyard *et al.*, 2005), i.e., the growth of the negative consequences of risk exposure (insecurity perception, loss of wellbeing) is proportional to the number of present risk factors, and follows a monotonic linear

progression as cumulative risk increases. Traditional approaches, focusing on the role of singular risk factors may thus lead to underestimate the level of risk exposure that people face, especially in complex urban contexts, where many different risks may co-occur (Appleyard *et al.*, 2005). Beside the possibility of considering the complex variety of coexisting risks, another strength of the CRM in this context is that, for risks measured by metric scales an individual's cumulative risk index includes only risks which intensity goes beyond one standard deviation from the general mean. Therefore, the cumulative risk index does not include every single risk the individual perceives or feels, but it reflects exposure to the most severe levels of risk, highlighting the risks that are significantly more relevant for the individual.

It should also be acknowledged that dichotomization and summation of risk exposure can be considered arbitrary and minimalist, consisting in a loss of information about variables and their associations (Greenberg *et al.*, 1999; Szatmari, Shannon & Offord, 1994), and therefore a potential limitation of the approach described herein. Focusing on the *number* of risks rather than the *types* of risks implies that all the risk factors are considered as having the same impact on the outcome, while research reports how some variables might be more relevant than others for perception of safety/fear of crime and well-being/satisfaction with life (e.g., Pantazis, 2000). Some methodological solutions, such as testing the separate role of some risk factors - especially social and socio-demographic risk factors- as moderators of the relationship between the cumulative risk index and fear of crime and/or wellbeing, could try to couple the ecological approach of the CRM with indicators of the specific importance of a given risk factor.

As a further limitation of this study, one could point to concerns related to reliance on self-report data of risk factors. In contrast with some previous research, (e.g., Sampson & Raudenbush, 1999) no census data, systematic observation, or police data were used herein. More objective data would be suitable for further studies on the issue. A possible development regards therefore the use of behavioural measures as criteria variables, both overt behaviors and neurophysiological indexes. Along the same line of reasoning, a welcome development would consist in setting up laboratory experiments where risk factors can be manipulated and behavioural modifications measured in order to investigate in a more controlled setting the possible cause-effect relationships implied by the CRM. This could be achieved by designing standard urban layouts on which single risk factors can be presented according to a cumulative logic, i.e., in terms of increasing or decreasing elements added to or subtracted from a standard urban layout, and then by presenting the different scenarios to measure a number of behavioural and neurophysiological indexes in the target subject. However, unlike to our studies, such an approach would risk reducing external and ecological validity of results.

From an applied perspective, the present studies suggest that politics and local (neighborhood) communities should consider insecurity perception and residents' well-being as the result of the combination of

multiple factors, encompassing social (both at an individual and community level) and physical neighborhood features. Their intervention should try to deal with all these different factors, since focusing on isolated risk factors may fall short in significantly improve people's neighborhood and life experience. It is clear that intervention to tackle one risk factor or the other may be very different, ranging from social policies to urban design. Thus, for example, solely enhancing police presence in an unsafe neighborhood most probably will not affect the perception of insecurity among the residents, because the many other risk factors that characterize their neighborhood, e.g. like physical and social decay, lack of social support, etc. would be still intact. Rather a more systemic approach should target several of the major risk factors, after a diagnosis has been carried out in order to identify priorities. Under this respect, of course, the CRM can be useful to assign priorities in terms of vulnerability by comparing exposure to multiple risk factors across targets, e.g., across inhabitants groups or neighborhoods, etc.. The possibility of applying CRM in both ecological settings and laboratory procedures opens the possibility to monitor inhabitants reactions to contemporary urban scenarios with varying degree of risk factors: this kind of knowledge could greatly help the design of new urban environments as well as the management of the existing ones, in order to increase the social sustainability of contemporary urban life.

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Self-reported nature exposure and its association with well-being as measured with affect and cognition

Curtis M. Craig, Brittany N. Neilson, Martina I. Klein, Randy W. Overbeek

Utilizing the publicly available MIDUS II Refresher datasets (Ryff et al., 2017) with hundreds of respondents across the United States, the authors attempted to (1) replicate and (2) extend their previous findings with the original MIDUS II data on the relationship between self-reported frequency of nature exposure and well-being, the latter holistically measured by emotional, physiological and cognitive variables (Craig, Menon, & Klein, 2015; Craig, Neilson, & Overbeek, 2016).

In the original published research, Craig and colleagues (2015) first observed an association between a 3-pt scale in which middle-aged participants reported the frequency that they appreciated nature and other reported questionnaire measures. These measures included subscales of the Mood Affective Symptoms Questionnaire (MASQ), the Perceived Stress Scale, and scales measuring well-being constructs such as life satisfaction and gratitude. This was followed up with a second study, which found an observed relationship between reported nature exposure with a 7-pt scale and measured physiological variables relevant to emotion and cognition, specifically asymmetrical EEG and eye-blink startle response (Craig et al., 2016). However, the prior research was exploratory and correlational in nature, which many would argue necessitates replication.

The original MIDUS II datasets used in the previous investigations (Ryff & Davidson, 2010; Ryff, Seeman, & Weinstein, 2010) were recollected by the original team with a new cohort (Ryff et al., 2017), allowing for a nearly direct replication of the previous analyses (Craig et al., 2015; 2016). Because positive effects associated with nature exposure may be a function of both exposure frequency and degree of appreciation, the first set of analyses replicating and extending the results of Craig and colleagues (2015) used an averaged composite score of two 3-pt scale questions measuring both frequency and degree of nature appreciation, instead of only frequency of nature appreciation as conducted in the original analysis. The second set of analyses that attempted to replicate Craig and colleagues (2016) used the original 7-pt nature exposure scale.

For the replication (goal 1), controlling for factors such as age, gender, exercise, and education, multiple regression analyses with the new datasets replicated the association between nature exposure and positive emotions, perceived stress, and metrics such as gratitude

and perception of work value. However, there were mixed results for depressive affect, and the previously observed correspondence between nature exposure and emotional reactivity measures, such as eyeblink startle response and epinephrine, did not replicate.

For extending the original research (goal 2), exploratory analyses were conducted to explore (1) previously unanalyzed variables related to well-being, and (2) previously unanalyzed cognitive variables. There was an observed and potentially beneficial relationship between self-reported nature exposure, sleep quality, self-control, and low-frequency (.04 - .15 Hz) heart-rate variability. A follow-up analysis focusing on cognitive test batteries including the CANTAB and BTACT mostly did not observe any associations between self-reported frequency of nature exposure and cognitive performance. However, a tentative relationship was noted between nature exposure and category fluency, which should be tested with future research.

To clearly demonstrate the effects of nature on general well-being, an exploratory principle components analysis was conducted on 18 measures presently observed to be significantly associated with nature exposure, with a varimax rotation and the extraction based on the Kaiser criterion. Of five identified factors, one appeared to capture a construct akin to well-being (e.g., positive affect, reduced stress, gratitude, cognitive control, anger management, sleep score, work value). Therefore, a single well-being composite variable was computed (regression-weighted) based on the observed factor loadings after standardizing the component variables. A regression of the well-being composite score on the standardized nature exposure composite score ($n = 788$) was found to be significant, $R^2 = .095$, $F(1,786) = 82.81$, $p < .001$.

One of the limitations of this study is nature exposure was measured with a single variable, and the type of exposure (nature trails, window scenery) and type of nature (green vs. blue nature) was not explored. Also, the current analysis looked at a large set of survey data and produced relatively small effect sizes, which is understandable given the large number of potentially intervening variables and the imprecision of the survey measurements. Further, the findings here are correlational and precise design recommendations are not warranted, but there may be several avenues to implement nature in and around built spaces. With

careful design, even urban scenery designed with components akin to nature could be helpful in improving well-being. Future research could assess whether the

amount of time in nature may lead to greater improvement.

Variables and questionnaires

Variables	Related to Nature Exposure	Significant Subscales
<i>Replication Goal</i>		
Mood Affective Symptoms Questionnaire	Partial	Positive Affect and Loss of Interest subscales
Perceived Stress Scale	Yes	
Satisfaction with Life Scale	Yes	
Gratitude Scale	Yes	
Work Value Composite	Yes	
Epinephrine	No	
Eye Blink Startle Response Magnitude	No	
<i>Extension Goal</i>		
Spielberger Anger Expression Inventory	Partial	Anger Control and Adjustment subscales
Center for Epidemiologic Studies Depression Scale	Partial	Positive Affect subscale
Singelis Self-Construal Scale	Partial	Interdependence subscale
Self-Control Scale	Partial	Cognition and Emotion Control subscales
Minimalist Well-Being	Partial	Gratitude subscale
Pittsburgh Sleep Quality	Partial	Global sleep score and sleep quality
High Frequency HRV	No	
Low Frequency HRV	Yes	
Brief Test of Adult Cognition by Telephone (BTACT)	Partial	Category Fluency measure
CANTAB Cognitive Assessment	No	

Table 1.

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