

A Meta-Method Overview of Restorative Urban Environment Approach*

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ABSTRACT

Today, the rapid expansion of cities and urban lifestyles has led to increasing problems such as urbanites' undermined mental health. Although reviewing studies on the "restorative environment" approach indicates a wide variety of studies on how natural environments influence human mental health, how urban built environments affect urbanites' mental health has been investigated only in recent decades and without a specific framework. This is while even in Iran, only a few studies have been carried out on this issue in natural and therapeutic environment frameworks. The present study aims to identify and introduce the methodological framework used in the studies on restorative urban environments to provide a suitable ground for domestic research by reviewing their results. To this end, using a meta-method approach, out of 136 English articles published in the period 1999-2019, 30 articles are selected. Next, they are coded and analyzed separately based on Saunders's research onion using content analysis. The results show that like natural environments, urban environments can have restorative quality if they observe certain conditions. The main course of methodology is based on quantitative Multiple -method studies relying on experimental and survey strategies. These studies are carried out using various types of environmental and individual self-response questionnaires and comparative and relational parametric statistical analyzes.

Keywords: Restorative Quality, Urban Environment, Meta-Method.

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1. INTRODUCTION

For the first time in human history, urban areas with more than half of the world's population, have become new habitats for humans. This new urban lifestyle has caused a wide variety of psychological, economic, and social changes (Turan & Besirli, 2008), leading to the formation of a stressful lifestyle (Weber & Trojan, 2018, p. 1) and undermining citizens' mental health (Fleury-Bahi, Enric, & Navarro, 2017, p. 127). Due to this phenomenon, various concepts and theories have been raised in the field of environmental psychology. The "restorative environment" approach is one of the most important theoretical-applied approaches to the improvement and promotion of mental health, which has been developed in various forms and fields since the 1970s (Mittelmark, Sagy, Eriksson, Bauer, Pelikan, Lindstrom, & Espnes, 2017). The results of many studies¹ on the concepts of "healing gardens" and "therapeutic landscapes" have proved that natural environments and elements significantly play a positive role in improving and promoting individuals' mental and physical health. In recent years, the lack of access to pristine natural environments and the difficulty of creating such environments in terms of financial and operational facilities, have led to researchers' more attention to the restorative quality of urban areas (Subiza-Pérez, Vozmediano, & San Juan, 2019). Despite the complex (objective-subjective) nature of the formation of restorative quality in urban areas as well as the wide variety of content and methodology in the studies in this field, there is no certain framework of used methods, techniques, or research achievements in this field. On the one hand, the findings of mental health studies in Iran indicate the high prevalence and increasing trend of mental disorders in recent years (Sharifi et al., 2015; Aghayari Hir, Abbas zadeh, & Garavand, 2016) and on the other hand, few domestic studies² on this issue have been carried out based on the "healing gardens" concept and with emphasis on therapeutic environments. Thus, to help solve citizens' mental health problems, it is necessary to conduct similar research, especially in different forms of urban environments in Iran.

Therefore, in the present study, it is attempted to perform a meta-method study of the abovementioned research on restorative urban environment to provide a certain and accurate picture of their methodological frameworks and scientific achievements to pave the way for conducting similar domestic research while providing the ground for discussion about this new approach. Thus, the main question of this research is based on the research methodology process and applied methods in the two parts of data collection and statistical analysis in studies in this field.

2. THEORETICAL FOUNDATIONS

To know the concepts, definitions, and basic principles of the "restorative environment" approach, two key and important "stress reduction" and "attention restoration"

theories and the indicators in each of them, are described.

2.1. The "Restoration" Concept and Restorative Environments

The word "restoration" is a multidimensional term in psychology that refers to the process of physiological and psychological improvement that occurs by specific environments called "restoration environments" (Joy & Vanden Berg, 2019, p. 97). For the first time, Hartig defined the concepts of "restoration" and "restorative environment" in 2004 and introduced them to the field of environmental psychology.

The term "restoration" means the process of renovating, restoring or reproducing physical, psychological, social resources, or impaired capabilities through continuous effort to meet everyday demands and needs (Hartig, 2007, p. 164).

2.2. Theories on Restorative Environments

Studies on restorative environments are mainly based on Ulrich's "Stress Reduction Theory (SRT)"³ and Kaplan's "Attention Restoration Theory (ART)"⁴ each of which provides an interpretation of the structure and concept of "restoration" (Fleury-Bahi et al., 2017, p. 129; San Jua, Subiza-Perez, & Vozmediano, 2017, p. 2; Fornara & Troffa, 2009, p. 1).

2.2.1. Stress Reduction Theory (SRT)

Roger Ulrich suggested Stress Reduction Theory (SRT) in 1983 by focusing on emotional and aesthetic reactions to the visual stimuli of an environment and directly under the influence of evolutionary psychology theories (Joy & Vanden Berg, 2019, p. 98; Hartig, 2004, p. 276).

According to this theory, the response or reaction to the environment is called at the first level effectively and spontaneously by the visual features of an environment/landscape (Fleury-Bahi et al., 2017, p. 129). These features include the presence of natural elements (vegetation and water) as well as structural features such as complexity, symmetry, depth and even the ground surface texture, invisible landscapes (such as a path that its direction suddenly changes and the continuation of the path is not visible) and the absence of threats (Joy & Vanden mountain, 2019, pp. 59-60).

2.2.2. Attention Restoration Theory (ART)

The Attention Restoration Theory (ART) was proposed in "The Experience of Nature" in 1989 by Rachel and Stephen Kaplan, and many studies have been carried out based on this theory (Joy & Van denberg, 2019, p. 98; Hoyle, Hitchmough, & Jorgensen, 2017, p. 110).

The core hypothesis of this theory is based on the "Directed Attention Fatigue" concept (Roe & Aspinall, 2011, p. 103; Staats, Jahncke, Herzog, & Hartig, 2016, p. 5). Directed attention refers to a mechanism that a person directly uses to focus on a particular task, situation, or behavior and to avoid other distractions to be able to perform the task (Staats et al., 2016, p.

5; Scopelliti & Giuliani, 2004, p. 424). Since "directed attention" is inherently difficult and toilsome, using it for a long time can severely reduce attention (Kaplan, 1995; Hoyle, Hitchmough, & Jorgensen, 2017, p. 110), and thereby increasing human error in performing tasks and the occurrence of different forms of abnormal behaviors (Staats et al., 2016, p. 5). According to this theory, a "restorative experience" can improve this situation. According to Kaplans, an environment including four qualities of "being away", "extent", "fascination", and "compatibility" can form such an experience (Kaplan & Kaplan, 1989; Kaplan, 1995). The quality of "being away" refers to the creation of a physical or psychological distance from daily commitments and tasks requiring directed attention (Nordh, Evensen, & Skarb, 2017, p. 109). This quality is based more on the possibility of forming a perceptual-psychological distance than on a physical-geographical distance (Kaplan, 1995, p. 173; Scopelliti & Giuliani, 2004, p. 424). The quality of "extent" refers to the order

and continuity in the environment as well as sufficient space for exploration (Nordh et al., 2017, p. 109). The quality of "fascination" is the core and essential component of any restorative experience. This quality occurs when an environment can draw one's passion and attention through the patterns and features implicit in it, and without effort or with very little effort, and does not lead to mental fatigue (Kaplan, 1995, p. 173; Cooper, 2017, p. 119). The quality of "compatibility" refers to the degree of fit between the characteristics of the environment and the individuals' goals, inclinations, and demands to perform a particular action (Scopelliti & Giuliani, 2004, p. 424).

In general, it can be said that although the two theories differ in conditions under which a need for restoration is created, the process and time required for the emergence of the results of the restoration, and the components of restoration (Fig. 1), they are known as two complementary perspectives that focus on different aspects of the restoration process (Staat, 2012, p. 452).

Key components and indicators	Process and time required for restoration	Effective mechanisms in the formation of restoration	Conditions create the need for restoration
Presence of natural elements, pleasant structural features, depth and texture of the ground, lack of visual vision, security, fascination, water, savanna vegetation, focal point, visual richness, complexity	Stopping negative feelings and thoughts through pleasurable experiences, reducing stress and achieving restoration Fast and concentrated emotional, affective process	Emotional-affective mechanisms	Stress and negative emotional states and the need for restoration Stress Reduction Theory (SRT)
Being away, extent, compatibility, and fascination	Utilizing indirect attention and providing the ground for restoring cognitive resources and achieving restoration Slower cognitive process	Cognitive mechanisms	The use of directed attention leads to mental fatigue and the need for Attention Restoration Theory (ART)

Fig. 1. Differences between Attention Restoration Theory and Stress Reduction Theory

3. METHODOLOGY

The lack of a coherent and certain framework representing the appropriate process, methods, and techniques applied in restorative environment studies, along with the difficult and complex nature of the human-environment relationship, makes the researcher encounter a wide variety of research with different research strategies. In recent decades, the development of research and knowledge production in various fields

of science has led the scientific community to believe that it is greatly not possible to know and master all aspects of a subject and also be up-to-date in that field. Therefore, it is necessary to use a mixed research method such as meta-method, which provides the extract of studies on a particular subject to researchers systematically and scientifically (Alvandi por & dadash por, 2019, p. 73; Noghani dokht Bahmani & Mir mohammad tabar, 2017, pp. 16-17).

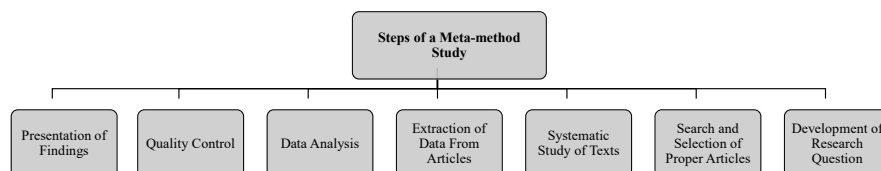


Fig. 2. Steps of a Meta-Method Study
(Mohammadpour, 2010, p. 72)

According to the steps of a meta-method study (Fig. 2), After developing the research questions, the keywords of "Urban Restorative, Environmental Restorative, Restoration, Restorative, Urban Space, Built Environment, Perceived Restorativeness" were applied to search electronic articles published in journals indexed in Science Direct, Proquest, Taylor & Francis, Wiley databases to collect initial data.

To validate the data, several priorities were considered in the initial selection of sources: 1. Thematic relevance: It means that those articles whose keywords included restorative quality, city, and its components were selected. Since few studies have examined the relationship between the restorative quality and the characteristics of the urban built environment, natural man-made elements in cities were introduced to the

field of research; 2. Those articles published during the years 1999-2019 were selected because the studies carried out in the last two decades have better coherence in terms of methodological and theoretical structures and the need to improve the restorative quality in cities has been paid attention in this period more than ever; 3. Both quantitative and qualitative studies were used; and 4. Just English articles were included. In the next step, after a qualitative review of the articles, 30 articles

were selected based on the research objectives to reduce the data and according to the process shown in Figure 3. Then, the content of the articles was analyzed using content analysis and open coding. To achieve a suitable tool for coding based on Saunders's research onion model (Fig. 4) and research objectives, a checklist has been developed. This checklist included two main axes of "methodology" and "research achievements" and its face validity was confirmed by experts.

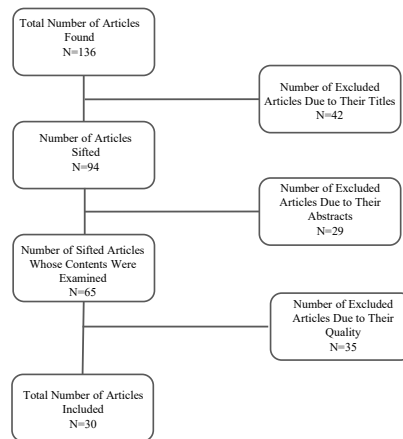


Fig. 3. Article Selection Process

4. FINDINGS

To purposefully analyze the findings, Onion's Layers of Saunders was used. This model considers each research to consist of seven layers or stages each of which is influenced by its surrounding layer (Saunders, Lewis, & Thonhill, 2007). It should be noted that to maintain the coherence of the text, the abovementioned articles are referred to by (a) and their specifications are presented in Table 2. In the first step, the philosophical paradigms of the research are presented. Each of these perspectives has important different characteristics that affect the way of thinking about the research process, in other words, it shows the researcher's attitude towards the phenomenon (Mohammadpour, 2010, p. 10; Saunders, Lewis, & Thonhill, 2007, p. 102). The review of the articles showed that none of them have directly mentioned philosophical paradigms, just as "research

approaches" have not been considered by researchers. Although none of the selected articles have directly mentioned the approach used, the content analysis showed that 18 articles (60%) have been started with the hypothesis and according to Saunders, it can be said that they have applied deductive approaches. Moreover, 9 articles (30%) have been started with questions and 3 articles (10%) with no specific question or hypothesis (Herzog, Colleen, Maguire, & Nebel, 2003; Hidalgo, Berto, Galindo, & Getrevi, 2006; Martínez-Soto, Gonzales-Santos, & Barrios, 2014). In the third layer, the "research strategy" or research plan is presented as a general program directing how to answer research questions. This model classifies research strategies into six classes: experiment, survey, case study, action research, grounded theory, ethnography, and archival-historical research are (Fig. 4).

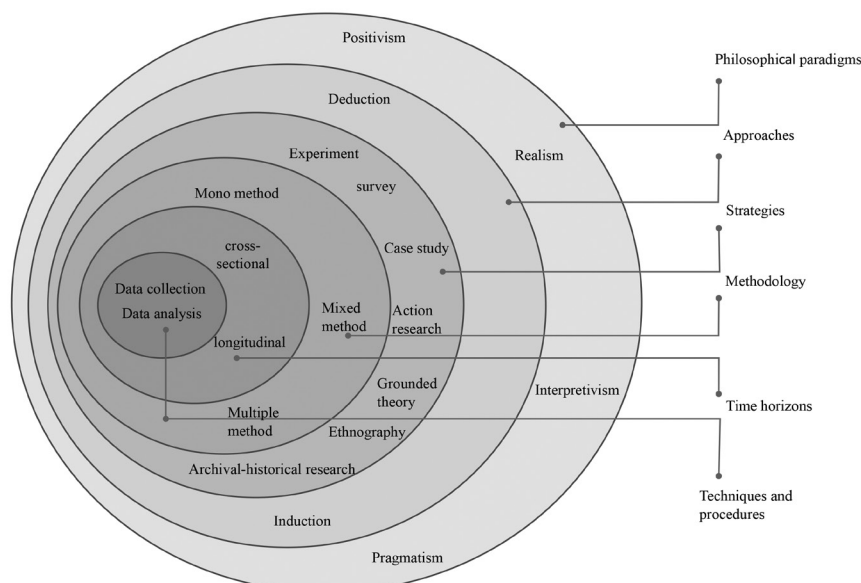


Fig. 4. Saunders's Research Onion Layers (Saunders et al., 2007, p. 102)

Analysis of the coded data showed that 15 articles (50%) have used the experimental strategy, followed by the survey strategy (11 articles (37%)), the grounded-

theory (10%), and the descriptive strategy (3%) (Fig. 5).

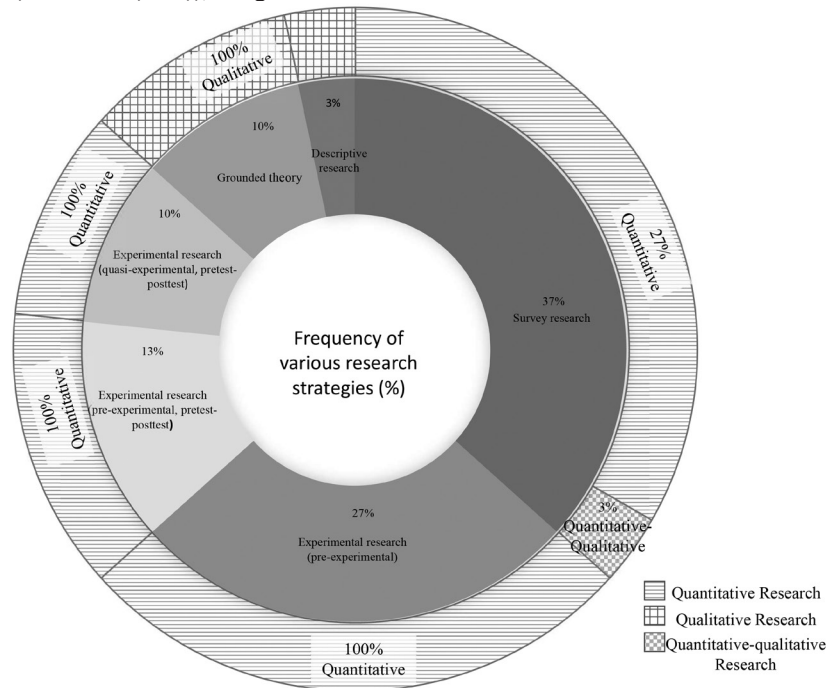


Fig. 5. Frequency of Various Research Strategies (in Percent)

Accordingly, it can be said that 84% of the articles have used quantitative strategies and only 16% of them have used qualitative and mixed strategies. Research strategies based on how to collect data in the quantitative approach are generally based on the paradigms of positivism and meta-positivism and both deductive and inductive approaches and include a variety of experiments and surveys (Cresswell, 2017, p. 36; Mohammadpour, 2010, p. 20). The qualitative study of the data collection methods and processes applied in selected studies showed that (Table 1) among the four types of experimental strategies, i.e. Pre-experimental, true experimental, quasi-experimental, and single-subject design (Cresswell, 2017, p. 231), pre-experimental strategies (27%) have been used more than other types of strategies, followed by pre-experimental (13%) and quasi-experimental (10%) strategies with pretest-posttest, respectively. In pre-experimental studies, unlike true experimental studies, only one target group is studied, but the researcher intervenes in the process of studying and measuring the quality studied (Cresswell, 2017, p. 233). Since according to the two theories raised in this field, studies in this field aim to assess the possibility, extent, components, and elements affecting the restorative quality of urban environments to reduce individuals' stress or improve their impaired attention and it is generally difficult to access those people under such conditions, in pre-experimental studies, researchers use written and oral instructions to induce a feeling of stress and to create the impression of "impaired attention" in individuals (a1), and simulated images in which the elements and components forming the landscape are represented in a controlled way

or some elements are added to or removed from the main image (a2), or create controlled environmental conditions (controlling of sound, temperature, and light) when evaluating images to intervene the research process and control the experiments (a3). In some pre-experimental studies (a4), during a controlled and precise process, the subjects are evaluated in terms of physiological⁵ and psychological⁶ traits before and after the experiment and the components intended are measured in relatively controlled conditions by researchers. In other words, in the two stages of before and after being present in different urban and natural environments, individuals are evaluated physically and mentally. Out of the selected articles, three articles (a5) have also used a quasi-experimental strategy, meaning that in this type of study, experimental and control groups have been applied simultaneously in the form of non-random sampling and pre-test-post-test process as follows: according to the purpose of the experiment, which was a comparison of the effects of urban and natural environments on the individuals' perception of the restorative quality or a comparison of the psychological status of individuals when facing different environments, participants were classified into two groups and were tested before and after facing images or real environments. In addition to a variety of quantitative experimental strategies, survey strategies have also been widely used using a variety of questionnaires and random sampling with a relatively large number. Out of the articles selected, only one article has applied a mixed strategy to collect data by using a questionnaire and an in-depth interview simultaneously (a6) (Table 1).

Table 1. Results of Coding Data from Selected Articles

Category	Code (Types of Strategy)	Number	Percent	Code (Quantitative, Qualitative, and Mixed)	Number	Percent	Code (Research Method)	Number	Percent
Research Strategy	Experimental (Pre-Experimental)	8	27%	Quantitative	25	84%	Mono Method	7	24%
	Experimental (Pre-Experimental-Pretest-Posttest)	4	13%						
	Experimental (Quasi-Experimental-Pretest-Posttest)	3	10%				Multiple Method	18	60%
	Survey	11	37%	Quantitative-Qualitative	1	3%	Mixed Method	1	3%
	Grounded Theory	3	10%	Qualitative	4	13%	Mono Method	1	3%
	Descriptive-Analytical	1	3%				Multiple Method	3	10%
	Total	30	100%	Total	30	100%	Total	30	100%

Only four articles have applied qualitative-descriptive strategies, and techniques of in-depth interview, semi-open-ended questionnaire, and data coding. In the fourth layer, data collection techniques and their analytical processes are divided into three categories: mono method, Multiple method, and mixed method. The study of coded data indicated most studies have used several quantitative methods simultaneously in data collection and analysis processes. This is due to the wide use of quantitative strategies (experimental and survey). In the fifth stage, the time horizon of the research is introduced and refers to the time spent on data collection. The time horizon can be cross-sectional - short-term or long-term – longitudinal, depending on the research question and purpose, although this layer is independent of the selected research strategy and methods (Saunders, Lewis, & Thonhill, 2007, p. 148). All selected studies, except for one of them, which has been carried out over a long period of three years (a7), were cross-sectional and short-term. In the final stage, Saunders names data collection and analysis techniques as the core of the research. The study of the analysis showed that the techniques used in the studies can be divided into three main categories: physiological traits measurement techniques, psycho-mood traits

measurement techniques, and environmental quality measurement techniques (Fig. 6). Various types of techniques have been widely used in the selected studies to assess and measure environmental characteristics and qualities (23 articles), among which the Perceived Restorativeness Scale (original questionnaire and its short-form) was used in half of the studies (15 studies). In addition, the Restoration Outcome Scale, Environmental Preference Questionnaire (EPQ), and eye-tracking technique were the most important and widely used techniques. Techniques such as Perceived Stress Scale (PSS), Profile of Mood States (POMS), overall happiness scale (OHS) were also the most widely used techniques for assessing psycho-mood traits. Also, to evaluate cognitive performance and attention of individuals, the memory-loaded search task used by Smith and Miles (1987), Symbol Digit Modalities Test (SDMT) and Cognitive Performance Test (CPT) have been used. Regarding analysis techniques, the selected studies have applied a wide variety of analysis techniques based on the type of research strategy and the type of data. The applied analysis techniques are presented separately in Figure 7 to provide guidelines for future research.

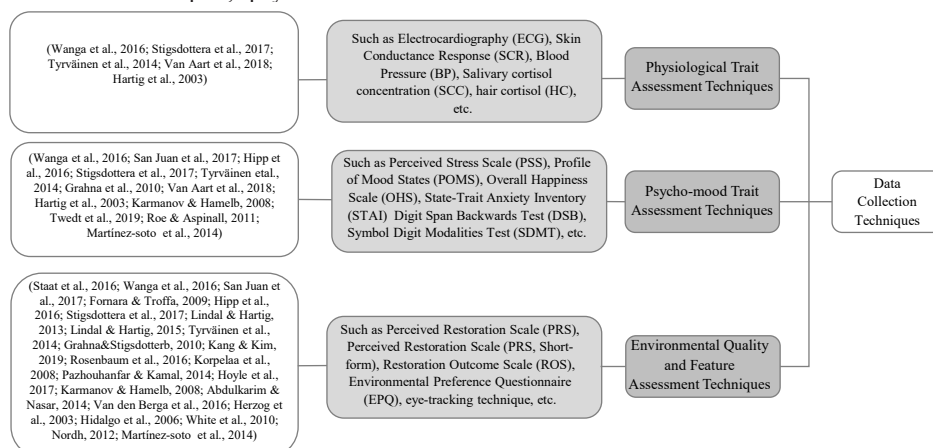


Fig. 6. Classification of Data Collection Techniques

Since a significant number of articles (84%) have used quantitative data and quantitative data collection methods, and in all articles, there is a wide variety of variables, the use of quantitative statistical tests is obvious and necessary. Due to the multiplicity and diversity of the studied variables, 36% of the articles have used two (a8) or more (a9) statistical analysis techniques.

About 80% of quantitative studies have used mean (a measure of central tendency) and standard deviation (an index of dispersion) as descriptive statistics of variables. To obtain inferential statistics, all studies have used various parametric tests as the main analysis technique and only four studies (a10) have used non-parametric tests to measure the relationships between some specific variables that did not have a normal distribution. The comparative parametric tests (28 studies) have been used more than relational parametric tests (12 studies). Moreover, various analysis of variance tests has been widely used. The Tukey's range

and Bonferroni post hoc tests have been used to identify the quality of the relationship between variables in different groups, and in a few qualitative studies, content analysis, and data encoding have been used predominantly. In general, it can be said that the studies on urban restorative environments have been carried out using quantitative and qualitative methodologies, with more use of the quantitative methodology. The content analysis of the selected studies indicated that the selected studies can be categorized into five groups in terms of research purpose and type of the studied spaces: 1. Comparative study of various urban built environments; 2. Comparative study of various urban natural environments; 3. Study of various urban natural spaces in comparison with urban built environments; 4. Study of a specific urban environment; and 5. Study of constituent components and elements of urban environments. As seen in Figure 8, the main trend of studies is to compare urban (man-made) natural environments with urban built environments.

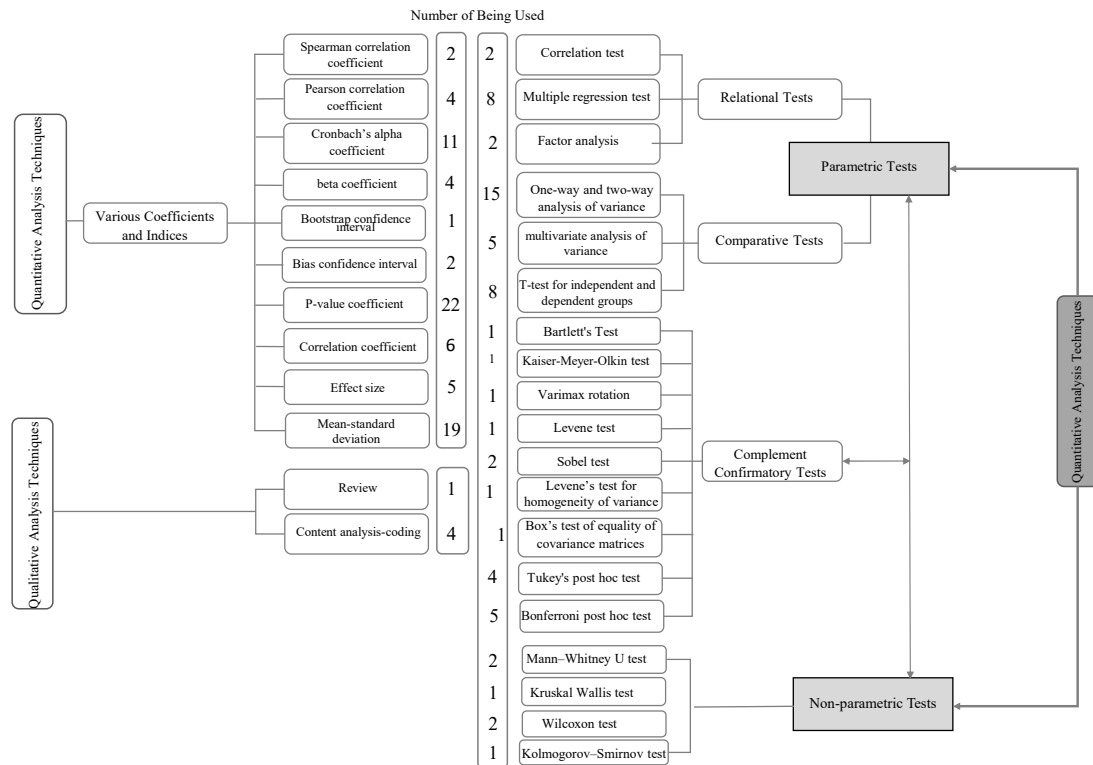


Fig. 7. Analysis Techniques Used in Quantitative and Qualitative Research

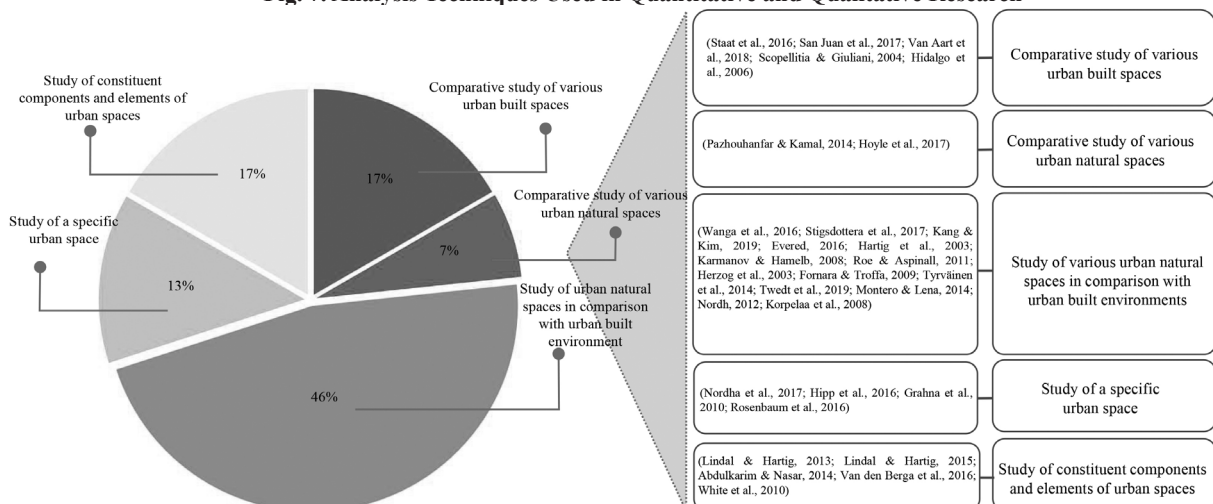


Fig. 8. Content Classification of Research

Findings and results show that urban natural environments (such as parks and lakes) have better restorative quality than urban built environments (a11). As the results of studies (a12) have shown, the presence or increase of natural or quasi-natural elements (such as trees, flowers, grasses, various forms of water, and green vegetation) can positively and significantly influence individuals' perception of restorative quality in urban environments. The study of some specific urban environments such as cemeteries or academic spaces also emphasizes the relationship between the presence of natural components and the enhanced restorative quality perceived by people (a13). In other words, the findings of studies indicate that the more the urban environment enjoys the characteristics of pristine natural environments, the higher the perception of restorative quality in it (a14). Some studies have shown that the presence of humans or high activity density, even in natural urban environments, can act as a factor reducing the restorative quality (a15). There is no more information about the quorum of humans or activity density. Since the theories forming the "restorative environment" approach have basically defined and described the restorative quality in natural environments, most studies have mainly focused on pristine natural environments or man-made natural environments and urban built environments have generally been used as a background or control variable. However, in recent years, few studies (a16) have shown that urban built environments can have as much restorative quality as natural environments and influence individuals' perception of the quality by adding or removing some elements and components. Scopelliti and Giuliani (a17) have concluded that from the people's point of view, there is no major distinction between urban or natural environments that create a restorative experience, and the type of activity and the possibility of compatibility provided by the environment are more effective factors. Numerous studies (a18) have shown that urban built environments with symbolic features and cultural, social, and historical values can have as much restorative quality as natural environments, just as according to Hidalgo (a19), urban residential environments have the poor restorative quality from the people's point of view. Findings of some studies indicate that components such as sense of place (a20), sense of security (a21), four components of visual preferences (coherence, complexity, legibility, and mystery) (a22), visual fascination (a23), visual permeability, and the presence of some physical components such as cars (a24) and extent of confinement (a25) are also among the mediating factors influencing the perception of restorative quality. Only studies on how the physical-visual features of urban environments affect the perception of this quality (a26) showed that the height of buildings can affect the perception of restorative quality by influencing the enclosure as well as the shape and form of the skyline and the architectural details of

the walls. Overall, these studies have concluded that the architectural features of a space can be even more effective than the presence of vegetation. Some studies have examined how individual, social, and personality differences of humans influence their perception of restorative quality. Staats (a27) has found that people of different nationalities have different perceptions of restorative quality. The people's living conditions, mental states such as mental health, energy level, mental fatigue (a28), working-economic conditions, and type of social relations (such as group or individual presence in spaces) (a29) are also among the factors affecting the perception of restorative quality in different environments. Moreover, the results of some studies indicated the relationships between different age groups (a30) and education types and levels (a31) with the perception of restorative quality. In contrast, the results of one study (a32) showed that no individual-social characteristics have any major effect on how restorative environments are perceived (Table 2).

5. CONCLUSION

From a methodological perspective, none of the studies in this field have addressed the philosophical foundations and research approaches, because most of them have been applied research and aimed to identify and complete the basic theories. More than 80% of the articles have used a quantitative research design and a small number of them have used qualitative methods. Accordingly, experimental and survey strategies have been used more than the grounded-theory and descriptive strategies. The wide range of unproven dimensions and hypotheses in the field of restorative urban environments and the existence of various environmental and human variables affecting the formation of this quality, lead the researcher to use quantitative strategies to achieve acceptable validity, reliability, and generalizability and overcome the breadth of the issue while identifying and accurately proving the cause-and-effect relationships. Moreover, various experimental methods have been used more widely than other methods since they provide more control over variables and especially human mental conditions and states. About 70% of the studies have simultaneously used different measurement techniques, indicating the interdisciplinary nature of the subject and the necessity of identifying different objective and subjective dimensions simultaneously. The data analysis showed that the analysis techniques applied in the studies are compatible with the type of data, variables, and research strategies. As shown in the methodological framework of the studies in this field (Figure 9), it can be said that according to the type of strategies, data collection, and analysis techniques used, quantitative studies are based on the philosophical paradigm of post-positivism and mostly deductive approach, while qualitative studies apply the

philosophical paradigm of interpretivism and inductive approach.

Although most of the studies in this field have generally examined or compared urban environments without restorative quality with natural environments, in the last two decades, proving urban environments can have as much restorative quality as the natural environment has led the studies to the identification of restorative urban environments and investigation of the components influencing this quality. As shown

in (Figure 10), the findings of the studies reviewed indicate that the presence of natural elements (such as trees, flowers, grass, and various forms of aquatic elements) in urban environments and increasing their presence have improved the perception of restorative quality in most cases. Therefore, man-made natural environments such as various parks and urban gardens always have a higher restorative quality compared to other urban spaces.

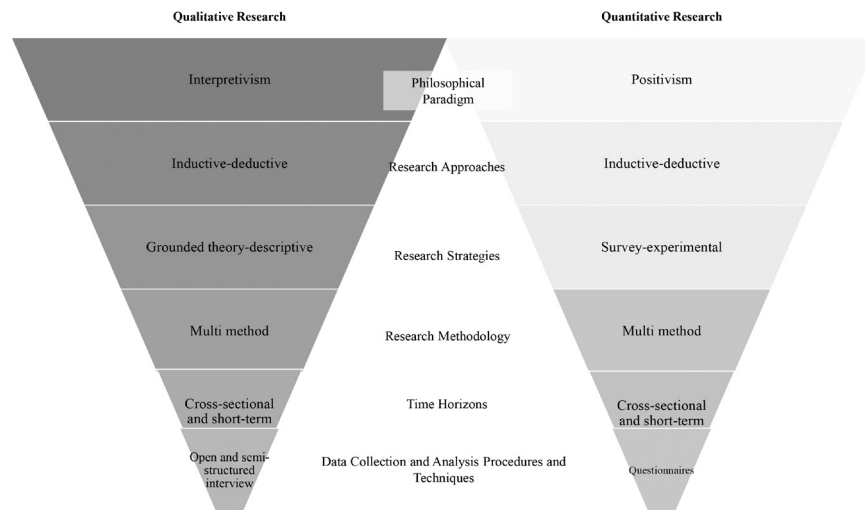


Fig. 9. Methodological Framework of Studies on Restorative Urban Environments

However, urban built spaces can have restorative quality as much as they include the features of being away, coherence, fascination, compatibility, complexity, and mystery. Moreover, the existence of identity, historical, cultural, and social values along with the sense of belonging and memorability of spaces can be effective in this regard. Few studies have demonstrated the effects of micro physical-visual components (such as the height of buildings, the shape and form of the skyline, and the architectural details of walls) on the perception of restorative quality. In general, urban environments that are fascinated, beautiful, and visually functionally preferred by the public can potentially have restoration quality. Some studies have also proven the effects of individual components (such as gender, age, education type and level, and even emotional-psychological conditions and working conditions) on individuals' perception of this quality in urban environments. Despite the growing trend of research in various objective and subjective fields, many questions about the restorative quality in urban environments remain unanswered and require numerous research and time to reach definitive answers. On the other hand, proving some of the discovered relationships about individual variables, especially where the components are combined with social and cultural values, requires further, in-depth

studies in the indigenous and local contexts of each community. The following are some important points to consider in future studies:

- To apply mixed research methods to identify and deepen the effective dimensions neglected in common quantitative methods. For example, one can mention differences due to individual characteristics and identity, historical, cultural, and social values of urban environments.
- To apply more up-to-date techniques and tools such as eye-tracking techniques, virtual simulations, etc. to develop cognitive techniques.
- To emphasize the identification of the effective physical dimensions and components of environments (such as buildings, walls, furniture and urban equipment, cars, and the presence of people and other organisms) on the formation and improvement of restoration quality as a component that has been less addressed.
- To emphasize the identification of the characteristics of each physical component (such as shape and form, dimensions and size, color, material) affecting the formation and improvement of restoration quality as a component that has been less addressed.
- To emphasize the identification of the effects of non-visual sensory components such as sound, smell, touch on the formation and perception of restorative quality in cities.

Table 2. List of Selected Articles Mentioned in the Manuscript

No.	Index No.	Articles Mentioned in the Manuscript	No.	Index No.	Articles Mentioned in the Manuscript
1	a1	(Staats et al., 2016; Lindal & Hatrig, 2013; Lindal & Hatrig, 2015; Pazhouhanfar & Kama, 2014)	17	a17	(Scopelliti & Giuliani, 2004)
2	a2	(Lindal & Hatri, 2013; Lindal & Hatri, 2015; Abdulkarim & Nasar, 2014; Van den Berga et al., 2016; White et al., 2010)	18	a18	(Fornara & Troffa, 2009; Evered, 2016; Karmanov & Hamelb, 2008; Herzog et al., 2003; Hidalgo et al., 2006)
3	a3	(Kang & Kim, 2019)	19	a19	(Hidalgo et al., 2006)
4	a4	(Wanga et al., 2016; San Juan et al., 2017; Stigsdottera et al., 2017; Tyrväinen et al., 2014)	20	a20	(Hidalgo et al., 2006; Korpelaa et al., 2008)
5	a5	(Hartig et al., 2003; Karmanov & Hamelb, 2008; Roe & Aspinall, 2011)	21	a21	(Korpelaa et al., 2008)
6	a6	(Hoyle et al., 2017)	22	a22	(Pazhouhanfar & Kamal, 2014; Herzog et al., 2003)
7	a7	(Van Aart et al., 2018)	23	a23	(Twedt et al., 2019)
8	a8	(Lindal & Hartig, 2015; Hartig et al., 2003; Karmanov & Hamelb, 2008; Hipp et al., 2016; Van Aart et al., 2018; Korpelaa et al., 2008; Hidalgo et al., 2006; Hoyle et al., 2017)	24	a24	(Roe & Aspinall, 2011)
9	a9	(Rosenbaum et al., 2016)	25	a25	(San Juan et al., 2017)
10	a10	(Juan Wanga et al., 2016; Sanet al., 2017; Stigsdottera et al., 2017; Hidalgo et al., 2006)	26	a26	(Lindal & Hartig, 2013; Lindal & Hartig, 2015)
11	a11	(Wanga et al., 2016; Kang & Kim, 2019; Pazhou hanfar & Kamal, 2014)	27	a27	(Staats et al., 2016)
12	a12	(San Juan et al., 2017; Lindal & Hartig, 2015; Grahna & Stigsdotterb, 2010; Kang & Kim, 2019; Hoyle et al., 2017; Karmanov & Hamelb, 2008; Montero & Lena, 2014)	28	a28	(Twedt et al., 2019; Roe & Aspinall, 2011)
13	a13	(Nordha et al., 2017; Hipp et al., 2016; Lindal & Hartig, 2015)	29	a29	(Korpelaa et al., 2008; Twedt et al., 2019)
14	a14	(Tyrväinen et al., 2014; Kang & Kim, 2019; Hoyle et al., 2017)	30	a30	(Scopelliti & Giuliani, 2004; Hoyle et al., 2017)
15	a15	(Wanga et al., 2016; Scopelliti & Giuliani, 2004; Twedt et al., 2019; White et al., 2010)	31	a31	(Hoyle et al., 2017)
16	a16	(Karmanov & Hamelb, 2008; Scopelliti & Giuliani, 2004; Abdulkarim & Nasar, 2014)	32	a32	(Twedt et al., 2019)

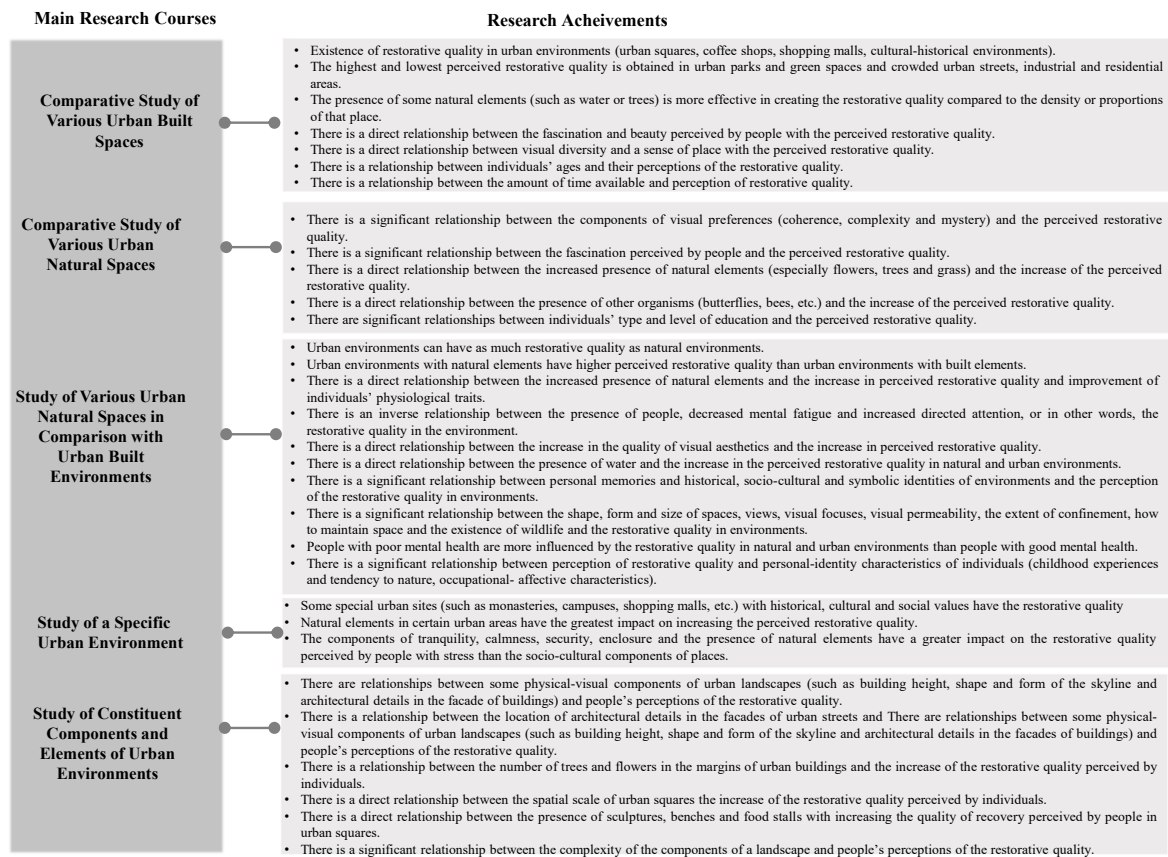


Fig. 10. Findings and Achievements of Selected Articles

END NOTE

1. Ulrich, 1984; Kaplan & Kaplan, 1989; Kaplan, 1995; Leather et al., 1998; Cooper-Marcus & Barnes, 1999; Ulrich, 2002; Stigsdotter & Grahn, 2002; Taylor et al., 2002; Stigsdotter, 2004; Diette et al., 2003; Ottosson & Grahn, 2005; Sherman et al., 2005; Grinde & Patil, 2009; Hartig, 2011; Hagerhall et al., 2015.
2. Nili, Nili, & Soltanzadeh, 2013; Adibi & Akbarzade, 2013; Mardomi, Mirhashemi, & Hassan por, 2015; Motalebi & Vojdanzade, 2016a; Motalebi & Vojdanzade, 2016b, Taheri & Shabani, 2016; Zojaji, Nikbakht, & Kafi, 2017.
3. Ulrich, 1983; Ulrich, Simson, Losito, Fiorito, Miles, & Zelson, 1991.
4. Kaplan & Kaplan 1989; Kaplan 1995.
5. Salivary Cortisol Concentration (SCC), Blood Pressure (BP), Heart rate Variability (HRV), Electrocardiography (ECG), Skin Conductance Response (SCR), The General well-being Questionnaire (EQ VAS), Health Survey (RAND-36 Health Survey).
6. Digit Span Backwards test (DSB), Symbol Digit Modalities Test (SDMT), State-Trait Anxiety Inventory (STAI), Profile of Mood States (POMS), Overall happiness scale (OHS), Overall Stress Scale (OSS), Perceived Stress Scale (PSS), Positive and Negative Affect Scale (PANS), and Subjective Vitality Scale (SVS).

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