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The Role of Urban Design on Mental Health: A Proposed Conceptual Framework for the Relationship between Urban Environmental Qualities and Mental Health of City-Dwellers, with an Emphasis on Depression*

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ABSTRACT

The city, as a place of residence, work, leisure and communication, has a significant impact on the mental health and mental ill-health of citizens. Nowadays, the growth and expansion of the city, urban environment and urbanization have created a wide range of factors threatening mental health, especially in developing countries, Thus, mental disorders are one of the serious and prevalent disease in cities, and depression is the most common of them. Nevertheless, most studies have focused on physical health and less addressed the psychological impacts of urban environments. The few existing studies have also less addressed the qualitative characteristics of the environment with an emphasis on the quantitative aspects. Therefore, the purpose of current study is, first, to analyze and investigate the relationship between the urban environmental qualities and mental health with the emphasis on the most common mental disorder which is depression, and second, to develop a conceptual framework to introduce this relationship in the field of urban design. It is a qualitative review study. The data has been gathered through the documentary study of reliable scientific papers and to identify environmental qualities and their effects, qualitative content analysis has been used. The results indicate that the quality of the urban built environment as a factor at the meso-level with other factors at the micro and macro levels has a synergistic effect on the mental health of city-dwellers, and permeability, safety, security, richness, climate comfort, aesthetics and quality of landscape, and sociability are the most important qualities. These qualities, directly and indirectly, affect the depression and mental health of the individual, so that in indirect relationship, the physical activity, social interactions, sleep quality, resilience to stress, and mood are mediating factors that causes possibility and more sustainability of the impact of some qualities of built environment on mental health. Therefore, this evidence supports the necessity of improvement of urban environment quality to prevent depression of city-dwellers and treat it, and explain the role of urban design as a creative and effective way to promote the mental health of the general public exposed to the environment.

Keywords: Urban Environment, Mental Health, Depression, Urban Design, Conceptual Framework.

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1. INTRODUCTION

The health, as a fundamental need and basic right of the human beings (Keyes & Shapiro, 2004), is the principal subject in urban ecosystems the worries about which have been increased with the growth in urbanization and the prediction of urban residences of 5 billion people in the cities by 2030 (Xing et al., 2009, p. 209), with the main portion of these concerns being related to the mental health.

Mental health, as the ability to adapt to environmental conditions, showing the right reaction, and resilience to the problems and incidents (Goldberg et al., 1997), is a concept beyond the lack of mental disorders. Nevertheless, mental disorders are themselves one of the most prevalent and critical illnesses in the contemporary era, which ranks second in terms of the disease burden and causing the disability (Elliot et al., 2015, p. 17).

Meanwhile, depression is the most prevalent mental disorder in the world in a way that at least one in six people experiences it during their lifetime (Sheahan, 2014, p. 1), and 322 million people are suffering from it (Who, 2017, p. 5). In Iran also, based on the National Mental Health Survey (2011), major depression is the most prevalent. (Asadi et al., 2017, p. 4). This disease is, in the most optimistic case, the most important non-lethal and debilitating threat, and in the most pessimistic case, the most important cause of death and suicide. In addition, the burden of depression in developed and developing countries is projected to reach first and second places by 2030 (WHO, 2010). Hence, depression is a critical issue in the current and future state of human health that the World Health Organization (2017) also necessitates dealing with it, with the slogan "Depression: let's talk".

Obviously, the mental health/disorder is affected by several factors such as the individual factors, lifestyle, and economic, social, cultural, and environmental states (Jackson, 2003, p. 193), among which the environment plays an important role (Jackson & Kochtitzky, 2001). In fact, perhaps, the built environment is not the main cause of mental disorders such as depression, but it is an aggravating factor for the disease and the process of the patient's recovery (Sarkar, 2018, pp. 2-3). One of the proofs of this claim is the 40% increase in the risk of depression in cities compared to villages, which is mainly due to the increase in urbanization, urban growth, urban sprawl, apartment and nature-deprived life (Tomita et al., 2017, p. 152), since today, relying on car-centeredness, quantity-centeredness, and climate incompatibility, urban development has created low-quality environments that ignore potential psychological effects, and mental disorders continue to thrive in urban environments, despite advances in psychiatry and psychology. Improving mental health, therefore, requires interdisciplinary collaboration and is the goal of many disciplines, including urban design, that focus on the built environment.

The correlation between the environment and mental health was first proposed in the social stress model, in 1930, in the framework of the correlations between neighborhood characteristics and mental disorders (Berke et al., 2007, p. 526). It has been two decades since the introduction of this correlation into the urban design field (Gong et al., 2016). Since the new movements of urban design such as the "smart growth", "new urbanism", "landscape-oriented urbanism", and "pedestrian-centered cities" have numerous benefits for the mental health because of some characteristics (in support of walking, reducing car dependence, and neighbors meeting), and reduce depression, the proponents of these movements have stimulated the growth of research on the relationship between the environment and depression with the emphasis on these benefits (Miles, Coutts, & Mohamadi, 2011, pp. 3-4).

Nevertheless, the mental aspect of the health (especially the depression) has been less studied than the physical aspect of the health (such as physical activities, and obesity), while the depression, due to its impact on outbreaks and severity of other diseases such as diabetes, cardiovascular diseases, cancer, and Parkinson (Sheahan, 2014), and coronavirus is more important. Also, most studies have investigated the correlation between the measurable characteristics of the environment such as the density (Weich et al., 2002; Ho et al., 2017), green space (Lee et al., 2017), transportation (Miles, Coutts, & Mohamadi, 2011), and deprivation (Matheson, 2006) and mental health, and less addressed the qualitative characteristics, while the depression is "a debilitating illness and psychological disorder that impact the thought, emotions, behavior, and physical performance" (Buttler & Hope, 2010), and is mainly understood and expressed by people's qualitative evaluation of the environment quality.

This issue has recently been considered in Iran, in a way that the few available studies have mainly explored the environmental qualities relevant to the mental health (Hakimian & Mazhari, 2020; Abroon, Gharaei, & Tabatabaeian, 2019), and have rarely addressed the depression (Karimi, Heidari, & Balaghi, 2018). They have sometimes emphasized the role of social interactions (Khosrawi, 2016) and physical health in this regard (Mirgholami, Gharebegloo, & Noozamani, 2016).

Therefore, the problem in the current study is the negligence of the effects of the urban built environment's qualitative characteristics on the residents' mental health. The objective of the study is first to investigate the environmental qualities relevant to the mental health with an emphasis on the depression, and second, to develop a conceptual framework for the promotion of the mental health in the urban design field, so that it would help with the development of this interdisciplinary subject.

Therefore, the research questions are:
- Which qualities of the urban environment are correlated with the mental health (promotion or disorder) of the citizens, especially depression?
- What is the position of the environmental qualities among the factors effective in mental health, And what is the relationship between them?

2. METHOD

The current study is a review of the available articles about the "environmental qualities and the conceptual models relevant to the mental health for the provision of a framework to conceptualize the key opportunities to promote the mental health". The current study is a qualitative research. Due to the vastness of mental health concepts and the difference between the mental disorders, depression (the most common disorder) has been focused on.
In this regard, the data have been collected through a documentary study of the authentic foreign and domestic texts in the field of urban design, environmental psychology, and psychiatry. The selected databases to search and extract the articles were the Pubmed, Proquest, Medline, Web of Sciences, and Scopus, and the keywords searched were "environment", "physical environment", "built environment", "urban environment", "neighborhood", "urban space", "environmental quality", "urban design", "urban planning", "mental health", "mental disorder", "psychiatric disorder", and "depression".
Also, qualitative content analysis was used to detect the quality of the intended correlations. To do so, the results of each study were investigated and their explicit and implicit concepts were extracted to be used as a basis for interpretation and investigation of the new concepts (Krippendorff, 2004). Then, these concepts, including the topics (qualities) and sub-topics (attributes) were analyzed and interpreted in the form of the model of a "sustainable place". Finally, a proposed framework for mental health promotion through urban design was provided based on the social ecological model.
3. Theoretical foundations:
The built environment is a set of human adaptabilities to the geographical and cultural environments which affects their interactions (Lang, 1987). And in other words, it is some aspect of the environment surrounding human which is created by his interference. According to the studies, this environment, as a place, is correlated with the mental health, including the depression, in terms of three dimensions: (1) location, (2) sense of place, and (3) Locale (Nielsen, 2012, pp. 25-26), which can affect it in two ways:
- Increasing the stimuli- since citizens experience more stimuli that are strengthened through affecting the action and thinking in the human subconscious and his disability to cope with them, or by increasing stress, encourage people to seek peace and privacy that can lead to isolation and possibly depression and anxiety over time.
- Decrease in the protective factors- since the citizens have less access to nature and social networks support, and due to the increased working time, traffic time to workplace and less leisure, they have less time for sports and daily activity, and probably, they have less privacy and sleep. Therefore, they are more prone to the mental disorders (McCay, 2017, pp. 4-5).
In this way, the built environment is the source of both infliction and confrontation with the depression depending on its desirability and non-desirability. As on the one hand, it is an intensifying factor for depression and prolonging the healing process (Sarkar, 2018, pp. 2-3), and on the other hand, by the creation of a desired ground and stimulation of the intrinsic capacity of the body, it is able to heal depression (Ananth, 2008, p. 274). In this regard, there is evidence about the environmental factors effective in the mental health/depression, which is presented in Table 1.

Table 1. The Frequent Concepts in the Literature related to the Environmental Factors Effective in the Mental Health/ Depression

The Manner of Affecting	Concepts	References
Increase in the Stimuli	Density: (Population, Residential, Vehicles Density/ Passengers & Congestion)	(Evans, Wells, & Moch, 2003; Berke et al., 2007; Saarloos et al., 2011; Miles, Coutts, & Mohamadi, 2011; Melis et al., 2015; Orban et al., 2016; Ho et al., 2017; Sarkar, 2018; Koohsari et al., 2019; Wang et al., 2019)
	Pollution: (Air/Noise Pollution, Garbage & Lack of Cleanliness)	(Evans, Wells, & Moch, 2003 Miles, Coutts & Mohamadi 2011; Nielsen, 2012; Orban et al., 2016; Sarkar, 2018; Dzhambov, 2018)
	Visual Disorders: (Vandalism, Graffiti, Abandoned/Ruined Lands/ Tools)	(Mair, Diez Roux, & Morenoff, 2010; Orstad et al., 2017)
	Physical Exhaustion: (Declining & Abandoned Buildings)	(Mair, Diez Roux, & Morenoff, 2010; Orstad et al., 2017)

The Manner of Affecting	Concepts	References
Increase in the Stimuli	Housing : (Form, Date, Internal & External Characteristics)	(Evans, Wells, & Moch, 2003; Galea et al., 2005; Weich et al., 2002; Ho et al., 2017)
	Weather & Climate: (Heat, Humidity, Climatic & Seasonal Changes, Climatic Comfort)	(Nielsen, 2012)
Reduction of Protective Factors	Natural Elements: (Water, Green Space & Richness)	(Miles, Coutts, & Mohamadi, 2011; Melis et al., 2015; Sarkar, 2018; Koohsari et al., 2019; Dzhambov, 2018; Wang et al., 2019)
	Public Space: (Support, Cohesion & Social Interaction, Walkability, Accessability)	(Weich et al., 2002, 2003; Berke, et al., 2007; Mair, Diez Roux & Morenoff, 2010; Koohsari et al., 2019)
	Safety & Security: (Fear of Crime, Accidents & Dangers)	(Weich et al., 2002, 2003 Miles, Coutts & Mohamadi, 2011; Orstad, 2017)
	Land Use: (Mixed Land-Use, Sports & Entertainment Services)	(Miles, Coutts, & Mohamadi, 2011; Saarloos et al., 2011; Melis et al., 2015; Orstad, 2017; Wang et al., 2019)
	Urban Landscape: (Aesthetics, Motivation)	(Nasar, 2011)

It is noteworthy that the effects of the environmental factors on mental health depend on the perception of the determinant factors and their correlations. Based on their objectives, concepts, and complexity, there are various models in this regard (Von-Szombathely et al., 2017). Many primary approaches have been limited to the detection of single pathogenic causes and generally biological factors, while the modern approaches try to detect a set of factors effective on the health in different aspects and levels, with a comprehensive and health-centered view (Barton & Tsouron, 2000).

Therefore, with reliance on the recent approaches, there are two general categories of models: (1) behavioral theory that considers various factors to be effective in the self-improving behaviors and subsequently the health level (Pender, 1996). (2) The models based on the ecological framework that consider the effects of various factors at various levels (Barto & Grant, 2006). The more important factors according to the studies are presented in Table2.

Despite the existing evidence about the environmental factors and their correlation with other determinant factors of depression, a matter of reflection is the limitation of the models in explaining the environmental components and qualities in the urban design field. To do so, the model of a sustainable place is used to organize the concepts and factors relevant to the urban design qualities. According to this model, the urban design qualities are the result of three "functional, experimental-aesthetic and ecological" components, which are obtained from the combination of the four aspects of the environment (Golkar, 2001). The rationale behind the selection of this model is the close correlation between sustainability and health since the interaction between the environmental, social, and economic aspects leads to sustainable development with health being at the center of these interactions (Price, 1997, p. 35).

Table 2. The Theories and Models about the Correlation between the Environment and Health (Mental)

Category	Name of the Theory/Model
Behavioral Models	Pander's Health Promotion Model (1996); Bandura's Self Determination Theory (2001)
Ecological Models	Hancock's Mandala of Health (1985), Whitehead & Dahlgren's Health Determinant (1991), Laughlin & Black's Health Traiangle (1995), Salis & Owen's Ecological Model of Health (1996), Meade & Earicsons' Triangle of Human Ecology (2000), Nortridge, Sclar & Biswas' Social Ecological Model (2003), Barton's Settlement Health Map (2005), and Coutts' Public Health Ecology (2010)

(Von-Szombathely et al., 2017; Barton & Tsouron, 2000; Bandura, 2001; Pender, 1996)

4. FINDINGS

The investigations indicate that the research in this area has been mainly conducted in developed countries such as France, England, and the United States (Vallée et al., 2011; Miles, Coutts, & Mohamadi, 2011; Sarkar, 2018). And most of these studies have dealt with the elderly due to their higher vulnerability (Ho et al., 2017; Melis et al., 2015), which although may lead to different results for other age groups and contexts, is necessary for understanding and developing the environmental qualities and formulating a conceptual framework for mental health in the field of urban design.

4.1. The Urban Design Qualities Relevant to the Mental Health (Especially Depression)

As mentioned, the built environment as the place, and the place as the objective of the urban design in terms of the location, the sense of place and local is correlated with the depression, which includes the natural and physical environment, the features based on the perception and experience, and the social aspects of the environment, respectively (Nielsen, 2012, pp. 25-26). These aspects are correspondent to the four dimensions of the environment including the "physical attributes, activity, imaginations and ecosystem," which are the constituents of the "functional, experimental-aesthetic, and ecological" components as the constituent forces of the urban design qualities in the model of sustainable place (Golkar, 2001), which is the basis for explanation and organization of the urban design qualities relevant to the depression (Fig. 1.).

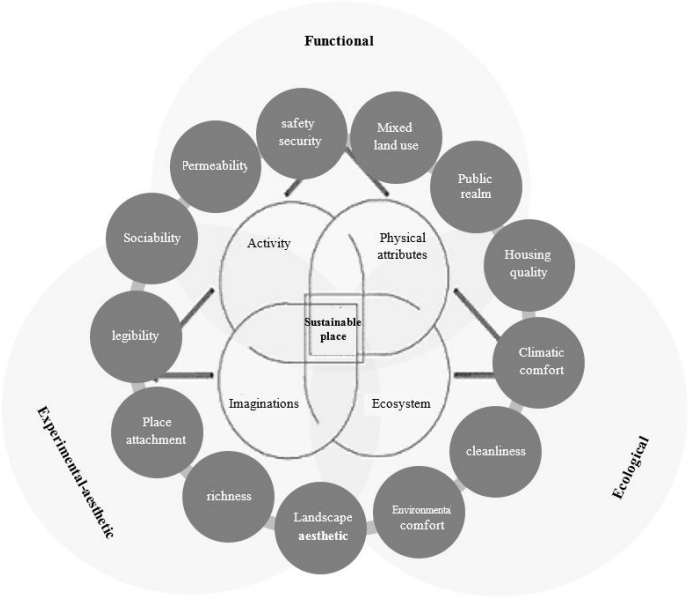


Fig. 1. The Urban Design Qualities relevant to the Mental Health in the Model of a Sustainable Place

Of course, to do so, first, the concepts (environmental factors) related to depression were extracted through qualitative content analysis, and their similarities and differences were categorized. Then, based on the urban design qualities of the sustainable place model and the use of the data reduction technique, the topics (qualities) and sub-topics (attributes) as well as their correlations were identified (Table 3). The urban design qualities relevant to the mental health or disorders, especially the depression, and their effects were as follows:

- Permeability: The vehicle traffic and the stresses created by it are associated with the increased risk of depression (Orban et al., 2016), and the walkability of the neighborhoods are associated with the decreased risk of depression (Mair, Diez Roux, & Morenoff, 2010) and its symptoms (among men) (Berke et al., 2007) in a way that the active places that encourage the physical activity, especially walking and cycling, play an important role in the prevention and treatment of this disease, and promote the mental health with the promotion of the mood, sleeping, social interactions, and resilience to stress (McCay, 2017). The ease of access to the necessary services and facilities and entertainment is also effective in mental health promotion (Brodsky, O'campo, & Aronson, 1999). For example, access to public transportation with the promotion of physical activity leads to increased resilience and decreased anxiety and depression among the elderly and the women (Melis et al., 2015).
- Mixed land-use: The diversity of the land use in the neighborhoods leads to a decrease in the residents' depression symptoms due to an increase in the probability of physical activity and social interactions

(Miles, Coutts, & Mohamadi, 2011). Of course, some pollutant land-use such as the airport and high vehicle traffic centers have adverse effects on the mental health despite the diversity (Nielsen, 2012, pp. 15-27), and increase the risk of depression (Saarloos et al., 2011), because they contradict the human need to peace and comfort.

- Safety and Security: The fear of crime, delinquency, being lost, accidents, and incidents lead to an increase in chronic Stress, anxiety and negative feelings in the person. Therefore, in the unsafe neighborhoods in terms of crime, due to the lower tendency of people to social interactions and physical activity, depression is more prevalent (McCay, 2017, p. 5). In this regard, physical disorders such as vandalism and graffiti can also lead to fear of crime and the outbreak of depression symptoms (Mair, Diez Roux, & Morenoff, 2010) since they are signs of lack of control and surveillance.

- Sociability: Both the isolation and the crowd are effective on mental health. The crowd and high population density are associated with the risk of depression and anxiety (Weich et al., 2003) and aggressive behaviors resulting from unwanted interactions (Dannenberg, Frumkin, & Jackson, 2011). Excessive loneliness can also lead to isolation and depression (Heidari, Tavakol, & Behdadfar, 2013, p. 732). Therefore, although the high residential density is correlated with a decrease in the depression symptoms through preparing the grounds for activity and interaction (Miles, Coutts, & Mohamadi, 2011), it can also lead to a decrease in resilience and an increase in the risk of depression (among the elderly) by exposing people to the pollution and stress (Ho et al., 2017). Hence, the spatial arrangement of the behavioral settings should allow for relaxation by maintaining privacy (Altman, 1975), so that social interactions can prevent depression.

- Housing Quality: The physical quality and inappropriate maintenance of the housing are correlated with an increase in depression (Galea et al., 2005) and a decrease in mental health. Of course, the children under 5 years old and the women are more affected by the negative effects of living in the residential towers than others (Jackson, 2003) in a way that living on the upper floors is associated with a decrease in physical activity, children's behavioral disorders, and anger and isolation of the housewives (Evans, Wells, & Moch, 2003, p. 475). On the contrary, the design of the entrance, porch, and roof light play an important role in decreasing the mental disorders due to enjoyment of the natural light, view, and social support (Weich et al., 2002).

- Quality of the Public Realm: The residents of the neighborhoods with high-quality Public Open Space (POS) experience fewer mental disorders (Francis et al., 2012), since more attractive and equipped spaces, even in the areas far from the house, lead to more walking and effectiveness on the health[1] (Sugiyama et al., 2010) and stronger social interactions (McCay et al., 2017). However, the increase in the confined space is associated with an increase in stress, isolation, and depression (Heidari, Tavakol, & Behdadfar, 2013).

- Aesthetics and Quality of Landscape: Visual qualities play an important role in the promotion of mental health and the decrease in mental annoyance (Dannenberg, Frumkin, & Jackson, 2011). Attractive natural landscapes and their relaxing experience (Nasar, 2011) protect against depression (Sarkar, 2018). The attractive and innovative architecture and façade are also pleasant, while long, uniform and concrete-façade blocks are boring (McCay, 2017). Therefore, the risk of depression in the neighborhoods with old, exhausted, abandoned, and unused buildings (Galea et al., 2005, p. 825) and stressful visual disturbances such as graffiti and vandalism is higher (Gong et al., 2016).

- Richness: The combination of the environment's pleasantness and excitement creates different feelings such as exciting/boring, and relaxing/stressful feelings (Nasar, 2011), which are highly affected by visual stimuli. For example, the blue color leads to peace, the yellow improves the mood (Jackson & Kochtitzky, 2001), and cheerful and varied colors lead to a decrease in stress, anxiety, and depression among the children (Daykin et al., 2008). The desired level of complexity and mystery is also exciting (Nasar, 2011). In addition, the non-visual stimuli such as the pleasant odors, and the sound of the birds and water are also relaxing and decrease the stress (Henshaw & Bruce, 2012).

- Legibility: The legible places (nodes, paths, districts, landmarks, and edges) that help with the navigation decrease the anxiety caused by the interaction with the environment and recurrence of the mental diseases (Dannenberg, Frumkin, & Jackson, 2011) because they provide a sense of comfort, convenience and the ability to understand the location, meaning, and identity (Kaplan & Kaplan, 1982).

- Place Attachment: The place attachment (neighborhood) is significantly and inversely correlated with the depression (Valléea et al., 2011), anxiety, and sleep disorder, since the attachment facilitates the social relationships and participation in the local activities, and increases the positive emotions and adaptability of the people (Paivastegar, Darvizeh, & Tavoosi, 2016), in a way that people with higher emotional and place attachment are less motivated to move and have greater mental health (Dannenberg, Frumkin, & Jackson, 2011).

- Climatic Comfort: The shortage of natural light increases depression and stress by increasing melatonin, drowsiness, isolation, decreased mobility and happiness, and light intensity with impaired perception and disability to control the environment (Heidari, Tavakol, & Behdadfar, 2013, pp. 732-736). Therefore, high building density and buildings that lack sunlight are associated with negative

mental effects while natural light has significant healing benefits in terms of treatment of anxiety and depression (Sheahan, 2014). The increase in the environment's temperature (above the comfort zone) is also correlated with violence and aggression (Evans, 2001). On the contrary, the contact with the nature has a protective role, and access to it in the everyday life heals the depression, reduces the mental fatigue (McCay, 2017), stress, and anger, and increases the resilience by promotion of the physical activity and social interaction (Sarkar, 2018, p. 3). Therefore, the extent, quality, and proximity to the green and blue spaces are important for mental health (Dzhambov, 2018, p. 343).

- Environmental Cleanliness: The air pollution of the cities affects the mood, mental state (Henshaw & Bruce, 2012), and depression symptoms, which are mainly caused by the vehicle traffic and fossil fuel consumption (Yen et al., 2006). The noise and light pollution intensifies the depression (Orban et al., 2016), anxiety, irritability, and nervousness by disturbing the sleep, activities, and biological reactions, which is more severe among the minorities and the poor. Odor pollution also affects the disease (Mccay, 2017), and waste dumped in the neighborhood is positively correlated with depressive symptoms (Yen et al., 2006).

Also, in addition to mentioned physical environment qualities, two non-physical environmental qualities (social and economic) are associated with the mental health on which the desirability of the physical qualities depends. These qualities are:

- Social cohesion: The social cohesion, especially in the neighborhood, is closely tied to the reduction of the depression symptoms, since the residents, due to the common values, neighbor relations, trust, and adaptation enjoy the social support to encounter the incidents (Mair, Diez Roux, & Morenoff, 2010), and the urban design can promote the mental state by facilitating the opportunities for interaction such as walking (McCay, 2017).
- Justice and Equity: The economic inequalities in the cities which is manifested in the form of poor neighborhoods with low environmental quality and crime rate intensify the mental disorders by creating a sense of insecurity in residents (Dannenberg, Frumkin, & Jackson, 2011). Therefore, social and environmental equality such as gender equality, security, and access to basic services positively affect mental health (Who, 2012).

Table 3. The Correlation between the Environmental Qualities and Attributes and the Mental Disorders, Especially the Depression

Component	Topics (Environmental Qualities)	Sub-Topics (Environmental Attributes)	Descriptions: Mediating Factors
Functional	Permeability	Active spaces / incentives for walking / cycling (+) Neighborhood walkability (+) Vehicle traffic (-) Access to Services (- / +)	Sleep, mood, social interactions, resilience, physical activity
	Mixed Land-Use	Land use diversity (- / +)	Social interactions, physical activity
	Safety and Security	Social Security: Fear of Crime (-) Physical safety and security: fear of accidents, physical disorders, etc (-)	Stress, social interactions, physical activity
	Sociability	Isolation (+) Crowd (+) Density (population, and residential) (- / +) Arrangement of behavioral settings (-)	Interactions, physical activity, stress, anxiety
	Housing Quality	Physical quality (-) Height or number of floors (+) Entrance, porch, roof light (-)	Physical activity, isolation, social support, mood
	Public Realm Quality	Facilities, equipment (-) Enclosure (+)	Physical activity

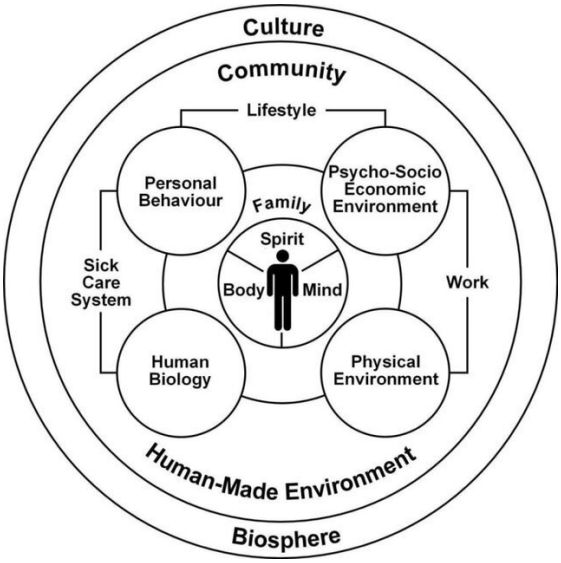
Component	Topics (Environmental Qualities)	Sub-Topics (Environmental Attributes)	Descriptions: Mediating Factors
Experimental-Aesthetic	Aesthetics and Quality of Landscape	Natural landscape (-) Built Landscape (-) Visual disturbances (+) Durability, wear and tear, uselessness (+)	Stress, isolation, sleep
	Richness	Visual/non-visual stimuli: color, landscape, odor, light (-) Relaxing places (-) Exciting places (-)	Stress, peace, mood
	Legibility	Legible places (-) Guide Signs- Places (-)	Anxiety
	Place Attachment	Space attachment (-) Emotional attachment (-)	Social interactions, sleep, physical activity
Ecological	Climatic Comfort	Natural light (- / +) High temperature (+) Green / blue space (-) Building orientation, building density (- / +)	Sleep, physical activity, happiness, violence, stress, resilience, social interactions
	Environmental Cleanliness	Air / Sound / Light / Odor Pollution (+) Abandoned waste (+)	Sleep, irritability, stress, anxiety, mood

(+) is indicative of a positive correlation, (-) is indicative of a negative correlation, and (-/+) is indicative of the probability of both negative and positive correlations

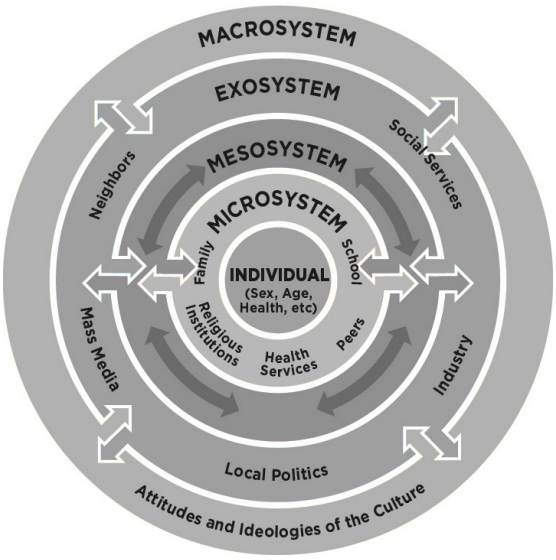
4.2. Conceptual Framework of the Correlation between Environmental Qualities and Mental Health

According to the studies, health (mental) is a multidimensional and multilevel phenomenon (Mellor, Karanika-Murray, & Waite, 2012). Different models have explained the determinant factors of health and their correlations which have been mainly formulated in the framework of the social ecological models based on Bronfenbrenner's ecological theory for human development (Fig. 2.). Bronfenbrenner viewed these factors in the form of levels surrounding the individual which affect the health at the individual, micro, meso, and macro-levels (Bronfenbrenner, 1979). The Mandala of Health (Fig. 3.) also, through linking the human ecology and health theories, indicated that the health analysis is among the social and environmental factors of the environment analysis reflection (Hancock, 1985), and other models were also gradually developed.

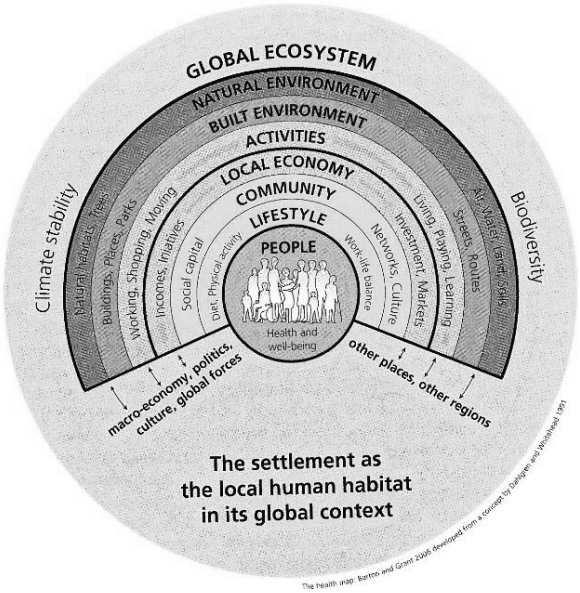
Currently, one of the most comprehensive models for the explanation of the correlation between the environment and health (mental) is the Settlement Health Map (Fig. 4.). According to this model, the variables effective on the health (from micro to macro factors) are Individual characteristics (age, sex, heredity), lifestyle (physical activity, diet pattern), social factors (capital and social network), local economy, daily activities, built environment, natural environment, and global ecosystem (biodiversity, climate change) (Barton & Grant, 2006).



(Hancock, 1985)



(Bronfenbrenner, 1979)



(Barton & Grant, 2006)

Fig. 2, 3, and 4. Development of Conceptual Health Models Based on Ecological Framework: Ecological Theory of Development, Mandala of Health, the Settlement Health Map

Accordingly, a conceptual framework is proposed based on the Settlement Health Map model and the urban design qualities based on the model of sustainable place. In this framework, the effective factors have been considered at three macro (natural environment, major structures), meso (built, social, and economic environment), and micro (individual and social factors) levels which together disturb or promote the mental health in some processes or correlations (Fig. 5.).

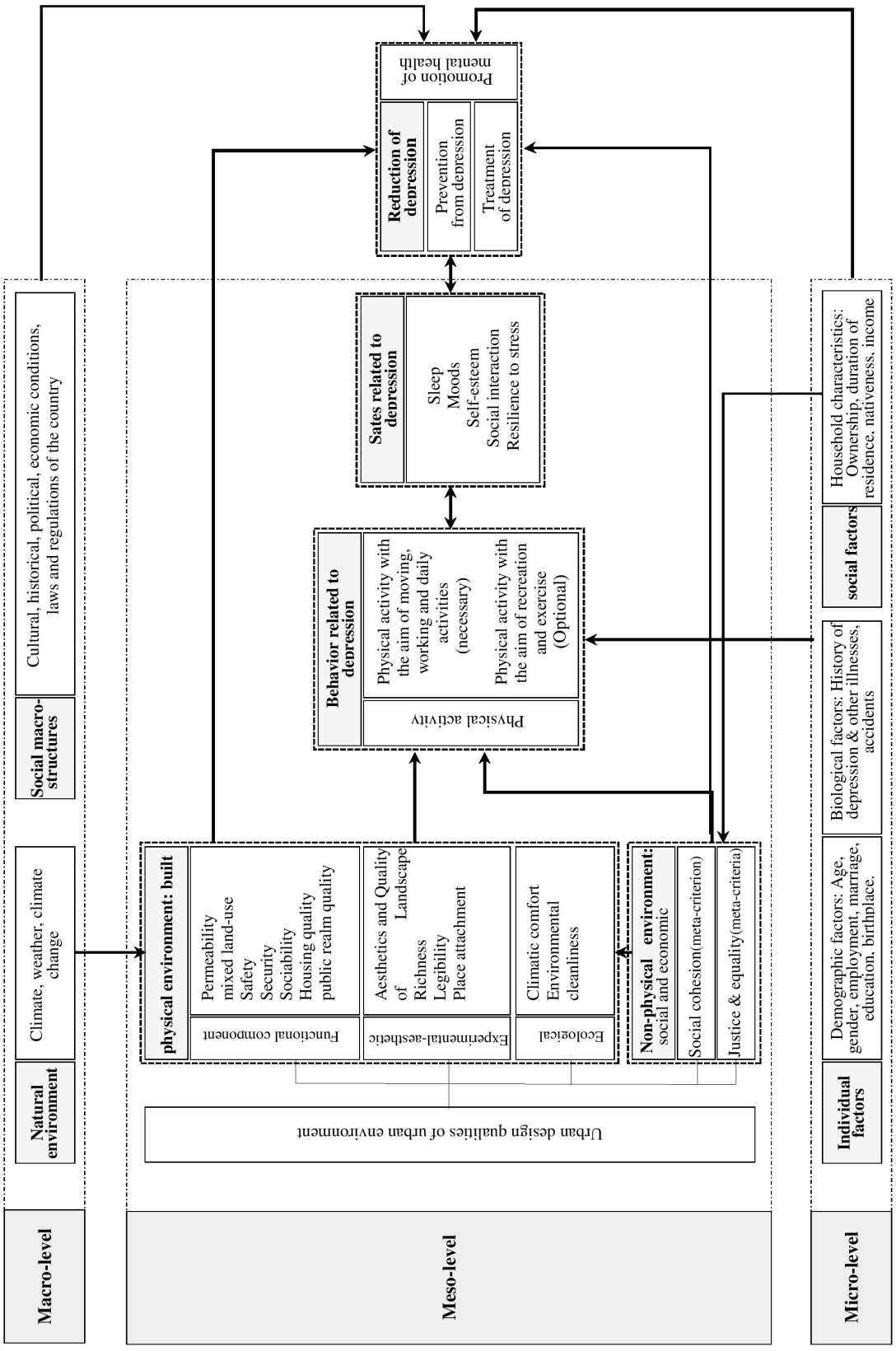


Fig. 5. Conceptual Framework of the Correlation between the Urban Environment Qualities and Mental Health of the Residents with Emphasis on the Depression

5. DISCUSSION

The current study has dealt with the analysis of the role of urban design in mental health with an emphasis on depression. In this regard, the results indicated that the urban design has an important and Creative role in the prevention and treatment of depression and promotion of the mental health of the citizens, which is in line with the findings of the previous studies (McCay et al., 2017; Sarkar, 2018), since the urban design affects the human life quality through promotion of the functional, experimental-aesthetic, and ecological qualities of the urban places that consciously or unconsciously affect feelings, emotions, behaviors, and mental health promotion. Other disciplines (environmental, non-environmental) related to mental health have different emphases, which are as follows:

- Non-environmental disciplines: In public health, medical and behavioral sciences, the emphasis is primarily on health and regulatory care for the prevention, diagnosis, and treatment of mental illness, and includes educational programs, medication, counseling, and lifestyle changes (Saveanu & Nemeroff, 2012). Sociology pays special attention to demographic, social and cultural characteristics and considers mental health through social capital, participation, interactions and lifestyle (Hua et al., 2015). In the economic field, the evaluation of the economic effects of mental health is examined (Sheahan, 2014). Therefore, these disciplines generally require the conscious cooperation of a person with a mental disorder, which is almost difficult for patients. In addition, their recommendations and prescriptions are often beneficial to a limited community (the victim).
- Other environmental disciplines: Micro-scale interventions (single-building) are emphasized in architecture. The preventive and healing role of the natural and humanistic landscape is considered in the landscape architecture (Gesler, 1992). In traffic and transportation engineering, the positive effects of public and non-motorized transportation on mental health are considered, which help to prevent and treat these diseases by increasing physical activity and reducing pollution (Badland & Schofield, 2005). In urban planning and management, it is important to pay attention to the consequences of urban planning decisions and policies on mental health (Tsouron & Barton, 2000). In general, intervention in the physical environment at any scale, consciously or unconsciously, affects mental health that benefits all people exposed to the environment, not the behavior of one person at a time. Therefore, environmental approaches complement behavioral and therapeutic approaches and play a more supportive and sustainable role in reducing depression. Of course, these interventions generally focus on quantitative characteristics and specific aspects of the environment, but urban design emphasizes the promotion of environmental qualities in various dimensions.

In fact, the multiplicity of disciplines involved indicates the multiplicity of factors affecting depression, and the built environment is one of them (Sarkar, 2018), which in interaction with other social, cultural, political, economic, and individual factors, increases the likelihood of occurrence and prevalence of the disease. Therefore, the realization of mental health in cities depends on the interaction of all the above professions, including urban design.

Similarly, in the conceptual framework of mental health promotion in the field of urban design (Fig. 5.), the built environment is considered an influential factor at the meso-level, as it has a similar position in most ecological models of health. The model of social determinants of health and environmental health promotion, which has categorized the factors at the macro, meso, micro, and individual levels, also considers the built and social environment as a factor at the meso-community level (Northridge, Sclar, & Biswas, 2003). Thus, the built environment is affected by macro-political and social structures and the global ecosystem on the one hand, and it interacts with individual and social characteristics on the other hand, and thus affects the mental health of individuals.

In this conceptual framework, the qualitative dimensions of the built environment are emphasized because the objective of urban design is to create place and improve quality, which has been less considered in previous models, especially ecological models. However, Brunswik (1956)'s model of perception refers to qualities related to people's evaluative reactions to the environment that have a potential effect on emotions. The key factors of this model are pleasantness, excitement, calmness, and Arousing (Nasar, 2011), which are mainly the characteristics of the townscape. Also, in the model of social determinants of health and environmental health promotion, some qualities of urban design such as mixed land-use and density are mentioned (Northridge, Sclar, & Biswas, 2003), which are not sufficient according to the findings of this study. Recently, researchers at the Center for Urban Design and Mental Health have also identified four urban design potentials related to mental health, including green, active, safe, and social spaces (McCay et al., 2017). However, in the proposed framework of this study, a diverse range of urban design qualities related to depression was identified (Fig. 5.), the most important of which with the highest frequency are "permeability", "safety and security", "richness", "climate comfort", " aesthetics" and "sociability."

In addition, in this framework, the complexity of the correlations between the environment quality and other factors has been explained while other models have generally dealt with the rating of the determinant factors and correlations between each level and the

upper and lower levels which affect the individual's health in an international manner (Barton & Grant, 2006). However, according to the findings of the current study (Table 3), the built environment is, directly and indirectly, correlated with the depression and mental health that in spite of obtaining this result in some studies (Evans, Wells, & Moch, 2003; Dzhambov, 2018; Orstad et al., 2017), has not been applied to the models. Similarly, the probable mechanisms of the indirect effect of the environment on depression were detected which generally threaten mental health by affecting the other risk factors as mediating factors. The most important factors in this regard are low activity (Koohsari, et al., 2019; Dzhambov, 2018), sleep disorder (Mccay, 2017; Berke et al., 2007), stress (Orban et al., 2016), unwanted social interactions (Wang et al., 2019; Miles, Coutts, & Mohamadi, 2011) and mood (Mccay, 2017).

Low activity (low and irregular physical activity) is a very effective risk factor for depression while on the contrary, physical activity is a strong anti-depressant factor (Mammen & Faulkner, 2013, p. 65), as every 20 minutes of regular physical activity plays an important role in the reduction of depression (Stavrakakis et al., 2012). The research indicates that permeability, security, safety, climatic comfort, and sociability qualities of the environment are associated with a decrease in depression and mental disorders due to the creation of ground for more physical activity (Berke et al., 2007; Miles, Coutts & Mohamadi, 2011; Mccay, 2017). Therefore, the presence of active spaces near the house is a good stimulus to attract the people to the public space, sense of satisfaction, continuous presence, and doing physical activities, especially walking.

Sleep disorder is another risk factor and mutually, sleep quality is a protective factor in terms of the environment and depression (McCay, 2017). The findings indicate that the low level of permeability, climatic comfort, and richness are associated with depression due to the creation of sleep disorder (Heidari, Tavakol, & Behdadfar, 2013; Mccay, 2017; Berke et al., 2007) since the cities and neighborhoods with vehicle traffic, noise pollution, shortage of natural light, and light pollution (artificial light) distort the sleep quality in a way that the residents of these areas are more likely to sleep at times that do not match their biological clock. The noise can also distort the natural patterns of sleep by increasing the heartbeat and changing the sleeping phase from deep to light sleep. According to the studies, people suffering from insomnia are four times more likely to be depressed, less likely to respond to treatment, and more likely to have a relapse (McCay, 2017).

Stress and unwanted social interactions are the next risk factors. Most environmental qualities such as mixed land-use, security, safety, richness, and climatic comfort are correlated with reducing depression by the creation of ground for social interactions and reduction of stressful factors. Previous studies have also emphasized that positive social interaction and friendly relationships with others create self-confidence, self-esteem, and sympathy. Increase people's need to support and belonging to the society, help encounter the challenges, reduce the loneliness, anxiety, isolation, and depression, and increase their resilience to stress (Mccay et al., 2017; Miles, Coutts, & Mohamadi, 2011). Therefore, one environmental potential is the prevention of depression. However, the findings of this study show that this potential can sometimes lead to an increase in depression by exposing them to stress and tension caused by unwanted interactions. Thus, the creation of a desirable level of interaction and privacy is necessary.

A matter of reflection in most research is the emphasis on the spatial scale of the "neighborhood unit" (Miles, Coutts, & Mohamadi, 2011; Valléea et al., 2011; Dannenberg, Frumkin, & Jackson, 2011, Berke et al., 2007). In fact, the emphasis on the neighborhood is an extension of the approaches focused on the demographic features towards the analyses based on various factors such as the built environment in the field of health. According to the studies, the effect of a built environment on mental health on this scale and on people who spend more time in the environment is stronger (Miles et al., 2015). For example, there is a positive correlation between the housing quality and mental health of housewives and children who spend more time at home and in the neighborhood (Evans, Wells, & Moch, 2003, p. 475), and this group are more affected by the neighborhood's environment.

Therefore, it is concluded that urban design qualities may have different effects on different groups since they have different needs, expectations, perceptions, and emotions. For example, an environmental feature such as high residential density is an opportunity for interaction and physical activity for young and active people without physical limitations, which positively affect their mental health and reduces depression, while for the elderly with lower tolerance threshold, it can be a source of noise pollution and stress, and increase their depression thus, in terms of the built environment and mental health, consideration for the individual, collective, and biological characteristics are important.

6. CONCLUSION

In this study, The correlation between the urban environment qualities and depression as well as the role and position of the environment was investigated alongside other non-environmental factors, to explain the whatness and howness of this correlation between the environment quality and mental health in the field of urban design. Generally, it was concluded that although several factors affect mental health, urban design is an important and creative method that can help to prevent depression and treatment

it, and promote the mental health of all individuals exposed to the environment, through the promotion of the environment's quality. The most important findings of this study indicate that among the qualities effective on the mental health/disorders, the most prominent ones are "permeability", "safety and security" "sociability", "richness", "aesthetics and quality of landscape", "climatic comfort", and "cleanliness". The whatness and howness of the effectiveness of the mentioned qualities indicate that first, the quality of the built environment is one of the intensifying factors on the meso-level that has a synergistic effect on other personal, social, cultural, political, economic, and ecological factors. Therefore, the promotion of the environment quality on the neighborhood scale in which people spend more time is more effective. Second, the built environment is correlated with mental health directly and indirectly. In the indirect correlation, there are likely mechanisms and mediating factors such as "physical activity", "social interactions", "sleep quality", "resilience to stress", and "mood" that make the effects of the built environment more stable. Therefore, the most important achievement of the current study is the detection of urban design potentials for reduction of the depression and promotion of mental health, and the development of this interdisciplinary subject in the field of urban design, which led to the provision of a conceptual framework in this regard. Thus, not only does it not consider any priority for a specific discipline, but also emphasizes that the realization of mental health and reduction of depression in the cities depend on the interdisciplinary cooperation and interaction between all environmental/non-environmental disciplines including the urban design. It is noteworthy that the findings of the current study are mainly focused on the substantial dimension of urban design. So, further studies are needed to detect the process and mechanisms of impact, especially the indirect impact of the environment on depression and mental health. In fact, the shortage of interdisciplinary research, the complexity of relevant environmental/non-environmental factors, the lack of invariable definitions for concepts in different fields of knowledge, and the shortage of research in terms of the design process are among the limitations of the current study, and the reasons to focus on this dimension of knowledge.

END NOTES

1. More than 150 minutes per week

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