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Mental health and urban design – zoning in on PTSD

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Abstract
The review firstly explores the relationship between mental health and urban design, pursuing the role of urban design in both health promotion and illness prevention against the mental illness epidemics, by conducting a comprehensive literature search; secondly, a systematic literature search is conducted to explore the relationship between urban design and post-traumatic stress disorder (PTSD) specifically. Apparently, health in general and urban design do share a solid history, however, even though mental health/urban design relationship has been increasing over the past 20, they seem to share a weak historical relationship, and even recent research that tries to define links between the two is still preliminary. On the other hand, a gab in knowledge can be addressed regarding the relationship between PTSD and urban design.

Keywords Mental health · Urban design · Environmental psychology · Post-traumatic stress disorder (PTSD) · Public health

Introduction

The Psychologist Abraham Maslow (1966) said in his book *The Psychology of Science*: "I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail" (Maslow 1966). This famous concept is known as Maslow's law of the instrument, and while it represents an over-reliance on a familiar tool, it also draws attention to the importance of trying new approaches to develop our conventional methods or even to try new methods that have not been used before; a practice that would require an understanding of both the conventional tools and the new tools that will replace or improve them (Kaplan 1973). In our case, it means understanding the interrelationship of both mental health and urban design, two domains that were presumed to have a weak, or almost no, relationship about one hundred years ago (Drummond 2013).

Mental health is defined as "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community" (Mental health: A state of well-being 2014). Urban design, on the other hand, has been defined in variety of ways according to the different opinions of the writers and practitioners of this discipline. Generally speaking, it is the design of towns and cities, streets and spaces (Bahrainy and Bakhtiar 2016); however, it can be defined as "an inter-disciplinary subject that utilizes elements of many built environment professions, such as landscape architecture, urban planning, architecture, and civil engineering" (Van Assche et al. 2013).

It is unfortunate that the separation between mental health and urban design has been so longstanding (Drummond 2013) considering the high degree of interconnectivity between both fields. There is now a growing interest in how mental health promotion requires amenable environments to support wellbeing and to allow people to adopt and maintain healthy

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lifestyles (Mental health: strengthening our response 2016; Golembiewski 2016). This goes in line with the goal of urban design that is making urban areas functional, attractive, and sustainable (Boeing et al. 2014). In other words, the more we understand the links between these disciplines the better we address and cope with today's major health concerns, which becomes crucial in cases when mental disorders become widely spread such as in post-war societies, when Post-Traumatic Stress Disorder (PTSD) in addition to other major mental disorders can be found in high rates (Junne 2010). This review discusses the connections between the two major disciplines – mental health and urban design, with a particular focus on PTSD relationship with urban design.

Methods

Literature Search Strategy

A systematic search was done to identify studies of the general history and relationship between health and urban design. The search was conducted in April 2017, and no time span was specified for date of publication. First step was to search using Google® search engine, NCBI®, and Google Scholar® databases. Synonyms relating to the topic (e.g. history of urban design) were combined with terms for mental health (e.g. the relationship between health and urban design). Terms related to mental health were used and combined with terms related urban design, such as "PTSD", "Post-traumatic Stress Disorder", "well-being", "depression", "stress", "mental health", "public health", "schizophrenia", "psychosis", "built environment", "natural environment". Another systematic search for studies of the relationship between PTSD and urban design was conducted in all the databases of NCBI®, and in Google Scholar®, using the following terms combinations in exact match mode to make sure the studies have both of them: "PTSD" AND "Urban Design", "Post-traumatic Stress Disorder" AND "Urban Design".

In a second step, the reference lists of the articles included in the review were manually checked for relevant studies not identified by computerized literature searching. There was no language restriction, however, all included papers were in English.

Results

Studies Found

The combined search strategies of the first search yielded a total of 122 articles, of which after a complete full text analysis, 41 were included. The second search resulted in 223 articles, 217 results in Google Scholar®, and only 6 articles in all NCBI® databases. After a complete full text analysis, surprisingly, only 3 studies were included; 2 from NCBI ®, and 1 from Google Scholar®. The reason why the 216 excluded studies appeared in the search is simply because they have both the terms "PTSD", "Urban Design", in their text, however, these articles had totally unrelated topics to our scope despite the existence of both terms in them, and the terms weren't related to each other. In addition, 2 of the 3 included studies are only remotely related to our topic, while only 1 study is firmly related to the relationship between PTSD and urban design. The final overall number of studies that were considered eligible is 44 published studies.

The Historical Presence of Health as a Factor in Urban Design

Urban movements have always happened whenever citizens attempted to achieve some control over their urban environment which consists of the built environment, the social fabric of the city, and the local political process (Pruijt 2007). Such movements in the nineteenth and early twentieth centuries drew urban design and health sectors together until the 1930s (Hebbert 1999), when again these ideas fell out of favor. While the following examples of integration between urban design and health sectors (including public health) do not directly represent an explicit relationship between mental health and urban design, they seem to have paved the way for this relationship to emerge later.

Examples of emergent urban/public health plans include "the Sanitary Movement in 1840s England," "the City Beautiful Movement" and the "tout a l'égout" Movement in Paris, later in the Century, and "the Garden City" concept of the early twentieth century, to the era of Modernism and post-war suburban expansion. At the time, infectious diseases were a major problem of the health sector, while mental health didn't seem to be as important. Finally, and as infectious diseases were faced by both aforementioned disciplines in the early twentieth century, the invention of antibiotics in the mid-century appeared to be the final blow to this integration, making both disciplines appear to be forever separate henceforth (Drummond 2013).

The most likely first effective integration that happened between health and urban design was mainly enabled by movements that were created to combat health epidemics of the 1800s which were not related to mental health. Epidemics such as cholera, typhoid, and yellow fever were believed to be caused by the environment. This led to developing new city-wide sewer systems, an action that "marked a shift toward public intervention in city services" (Peterson 1979). According to the studied literature, it is clear that relationships between mental health sector and urban design were not investigated during this period.

In the late 1800s, and after the establishment of the American Public Health Association (APHA), a simple approach was adopted: "The prevailing views that dense urban populations and overcrowding were at the root of disease meant that open space and nature were cures for this disease". The result was more focused on the sanitary value and uses of shade trees, clean air, bright sunlight and abundant nature (Drummond 2013); that is, the features of the natural environment.

In the early twentieth century, utopian ideas such as Ebenezer Howard's Garden Cities of Letchworth and Welwyn endeavored to separate living areas from industrial zones and thereby make cities less polluted, greener, more livable, and attractive. A major component of these plans included public parks and citywide systems of open space. This high integration of general natural environment features improved health conditions; they might have helped – unintendedly – to improve mental health, even though mental health was not a direct aim of these movements (Hebbert 1999; Hall and Tewdwr-Jones 2010).

Thus, urban design played a major role in controlling physical disease spread until the 1920s by zoning to isolate pollutants and to quarantine infections. This led to more healthy and hygienic cities during the 1930s (Duhl et al. 1999). Ironically, this was a turning point that paved the way to the separation between the disciplines few years later because the new – relatively – healthier cities decreased the need for planners to deal directly with health concerns, therefore, less of a need for these professions to work together toward the same goals. The public health field began to drift away toward the biological causes of diseases rather than the environmental and psychological ones. During this era, urban design and health were still linked in title but not in practice (Drummond 2013). No direct consideration of mental health -as a part of public health- was addressed by urban designers.

The separation between public health and urban design lasted till the end of the twentieth century. The need for reconnecting the fields of urban planning, urban design, and public health including the mental health sector emerged again in (1999) in the WHO's Healthy Cities project. It focused on the impact of behavior, health delivery, and interagency coordination to adopt precautionary approaches to health, taking into account issues of the designed environment (Duhl et al. 1999). The WHO's report Making a difference (World Health Organization 1999) highlighted major aspects regarding urban environments and health support, including higher attention to mental health problems and a focus on how to deal more effectively with inter-sectoral issues; in particular, the threats to health that result from environmental causes. Since then, both urban design and health fields have once again started to connect deterministically. Relationships between the physical, natural, social environments, and health, were observed in order to focus on chronic lifestyle related epidemics such as diabetes, heart disease, obesity, asthma, and finally, mental illness. But even with this renewal of shared outlook, the silos of expertise between mental health and urban design are very difficult to breach (Drummond 2013).

Recent Research on the Relationship between Mental Health and Urban Design

Since the new millennium, the search for links between urban design and mental health has been in the shape of an explosion of interest in the effects of the designed environment -which is a part of urban design- on mental health and well-being, largely due to the discovery that environmental factors cause significant variation in genetic expression; epigenetics and ecogenetics (Choi and Kim 2007).

From the urban design point of view, most research focuses on the ways that natural and designed environments can improve human well-being (White et al. 2013).

The reviewed literature regarding the urban design\mental health relationship suggested that this aforementioned research hasn't yet formed a clear body of knowledge with defined boundaries, but instead, many studies with rather preliminary results can be found, that might -combined- help to shape this area knowledge in the future. Some examples of these studies, for instance, the findings of one study suggest that natural green environments offer better opportunities for moderating or coping with stress (Thompson et al. 2012); another study proved that greater access to green space is associated with fewer incidences of depression (Cohen-Cline et al. 2015). Some other study found that higher levels of green vegetation were associated with decreased mortality rates (James et al. 2016). Other researchers studied the impact of views of water – such as lakes, sea, and waterfalls – on health. These studies found that these effects are no less important than green spaces; in fact, their findings showed that views of water were associated with lower psychological distress and a significant positive impact on mental health (Miller et al. 2012; Nutsford et al. 2016). This is not directly related to urban design; however, the elements of natural environment are essential elements of urban design (Van Assche et al. 2013; Lang 1994), thus, these studies and other similar studies might help to improve mental health through urban design.

In addition to the impact of natural environment, research was also concerned with the impact of designed environment -also a part of urban design- on health and behavior. Some of these studies tried to identify abstract elements of the design that might affect the psychology of a person, thus, might have an effect on his mental health. For instance, a study concluded that an environment which features sharp shapes led to more aggressive behavior while rounded shapes were associated with warmth or pleasantness (Hess et al. 2013). While this

type of psychological studies is cutting edge, it is still very low in terms if quantity.

It is also important to notice that where urban designers have focused on wellbeing in general, public health researchers have been far more specific. They have made extraordinary associations between the mental illness sector of mental health, and urban development, including replicating epidemiological data (Kelly et al. 2010; van Os et al. 2010), and even tied these findings to specific neurological morphologies (Haddad et al. 2014; Lederbogen et al. 2011; Lederbogen et al. 2013). Attempts to draw the science of public/mental health and urban design is still rare according to the found literature, although it has been done, leading in some cases to practical recommendations for architects and urban designers to put mental health factors into consideration during the design process (Golembiewski 2012, 2013, 2016).

A look at these examples leads us to conclude that there is a general acknowledgement that urban design and mental health has connections that are mainly observed through the epi- and eco-phenomenal impact of environment on general health including mental health – and thus, there has also been some interest in the recovery effects that some appropriate environments could have. This type of research is also still in preliminary stage; however, it suggests a possibility of improving the treatment of mental health disorders including depression, stress, anxiety, and Posttraumatic Stress Disorder (PTSD) with the help of the features of the designed or natural environments, as there are many other studies that support this claim. For example, there is growing awareness that environment has specific effects on other mental illnesses such as depression (Golembiewski 2017) and severe psychosis; for instance, a study found that urban environment as place of birth increases the odds of developing schizophrenia up to 28–34.3% (Haddad et al. 2014), and again, studies that have discovered that early-life urbanicity appears to cause anatomical alterations in many brain regions that are associated with environmental stress and risk for schizophrenia. Such studies relate city living to an increased prevalence of mental health disorders, particularly schizophrenia, due to increased social stress; a potential feature of urban environment that could be one reason of such disorders (Haddad et al. 2014). This factor is considered as one of the most powerful causes for the development of mental disorders including schizophrenia in urban minority groups but it still needs to be validated in the general urban population (Lederbogen et al. 2013). Form another perspective, a study has linked living in a rural environment with lower odds of developing schizophrenia on the grounds that rural setting may have protective factors such as the high social interdependence and low social fragmentation compared to urban setting (Padhy et al. 2014).

While many studies have confirmed that exposure of individuals to natural environments – including blue and green spaces – can boost stress reduction and assist in mental recovery (Golembiewski 2012, 2013, 2016; Depledge et al. 2011), there are still very few studies that address features of the designed environment that may either trigger mental illness or protect against it (Golembiewski 2016). This area of the urban design/mental health relationship can be particularly important in the post-war urban design, as a high percentage of people most probably suffer from various mental illnesses. Many of these mental disorders can be triggered by elements of the surrounding environment such as PTSD, so it is logically safe to say that post-war urban design could play a big role in illness prevention by using mental health factors and considerations.

The Relationship between Urban Design and PTSD

Posttraumatic Stress Disorder (at first known as "shell-shock," then "Gross Stress Disorder" was reported widely following the First World War, and in all conflicts since. The codification of PTSD in the Diagnostic and statistical manual of mental disorders: DSM III and onwards has relaxed the definition to include any severely traumatizing event, even outside of war, "a psychiatric disorder that can occur in people who have experienced or witnessed a traumatic event such as a natural disaster, a serious accident, a terrorist act, war/combat, rape or other violent personal assault" (American Psychiatric Association 2013; Sherin and Nemeroff 2011). PTSD and other mental disorders such as stress and anxiety disorders, are associated with – but not defined by – the dysfunction of several brain structures such as the amygdala, hippocampus, insula, and specific parts of the cerebral cortex; and also somatic symptoms including neuroendocrine alterations associated with the development of these disorders such as abnormal regulation of some hormones (Baker n.d.; Holzschneider and Mulert 2011), sweating, nausea, loose motions, and raised blood pressure (Sherin and Nemeroff 2011). This disorder causes clinically significant distress or impairment in the individual's social interactions, capacity to work or other important areas of functioning including somatic problems (Sherin and Nemeroff 2011). In war-torn countries like Syria, for example, between 50 and 57% of refugees experience PTSD (Junne 2010). Current treatment protocols are constantly changing, but usually employ a suite of cognitive or talk-therapy methods (Sherin and Nemeroff 2011).

Most found studies in the systematic search explain the association between PTSD and neighborhood crime and unsafe traffic, and the role of community in helping individuals to overcome their illness (Jaśkiewicz and Besta 2016; Gapen et al. 2011).

A new understanding of the relationship between urban design and mental illness presents an opportunity in countries and cities that are recovering from war, as there is a confluence

of new knowledge, increased PTSD incidence and the need to completely rebuild all coming together, and should be an important consideration during the development of reconstruction strategies (Galea et al. 2005).

This relationship has been noticed recently, and a study was done that is one of the very few studies that directly explore the links between PTSD and the architectural environment, but not urban design. PTSD is known for the "Re-experiencing Symptoms" which means reliving the traumatic event which can be easily triggered by a stimulus of any kind such as visual, tactile, acoustical, and olfactory sensations, as long as they are related to the traumatic event. The study, is limited to the visual contributing factors, as posttraumatic stress is complex and multifactorial. The study is on US veteran who live with PTSD, showing how human-centered design could help to provide a setting in which patients and providers can most effectively perform psychotherapy. The study discusses the features of the designed environment and how it affects people with PTSD by triggering intrusive memories and causing the re-living symptoms. The importance of the study is that it is one of the first in regarding this topic, and it points out to the need for an interdisciplinary research team including psychology experts to uncover the knowledge required to be able to achieve such type of design as it far exceeds what can be expected of any individual (Finn 2013.). Even though this is not directly related to urban design, but understanding how architectural spaces affect people with mental illnesses can contribute in understanding the relationship between mental health and a higher scale type of design; that is, urban design.

These effects are not limited to PTSD, as effects of environment can also be more severe and noticeable among people who already live with a mental disorder like schizophrenia as they might be suffering from symptoms such as paranoia (Golembiewski 2017). A study explores why psychotic patients are supersensitive to what is called "negative environmental features", for instance, triggers of a specific paranoia for schizophrenia patients and places that create the feeling of being trapped for PTSD patients (Golembiewski 2016). This study concluded that environments characterized as nice and homely, for instance, are not enough for people who live with a mental disorder, especially those who seem to be highly sensitive to negative environmental features as a result of their mental illness. In such case, this study recommends designers to aim for achieving an environmental effect that helps decreasing the symptoms of the targeted mental disorder (Golembiewski 2016). This could be done by following a number of suggested environmental and psychological design considerations and guidelines to achieve a design with recovering features; that is, a "genuine respite". These recommendations include – but not limited to – removing environmental features that might trigger war-related memories; considering higher quality design; providing good wayfinding, access, and exit because people with PTSD – for instance – should not feel trapped; and other recommendations to assure a greater benefit and protection against unwanted symptoms (Golembiewski 2016). Such studies help to develop a body of knowledge about the physical environment and how it affects people living with a mental disorder, however, much more is still needed to work on a large scale such urban design.

A practical example of this is another study which made some recommendations for post-war reconstruction, mindful of the new needs that emerge after wars (Junne 2010). This study suggested achieving stability and peace via the designed environment by pointing out the importance of ideas such as focusing on both the future and also the past, as the conflicting parties in wars are often prisoners of their past. They tend to blame each other for past atrocities. The study explained how architecture can play a major role in turning people's attention from what has been, which is war and division, to what should be, which is peace and unification. For example, after tearing down the Berlin Wall followed by the reunification of Eastern and Western Berlin, a coordinating committee of district planning officers was designated with a balanced participation from the East and West on the aim of planning the wall area after the reunification. The notable thing is the presence of the Wall in all the plans that were created after reunification. The reason was the consideration to preserve the memory of the wall; by locating landmarks; leaving walkways and bicycle paths along the border strip; and preventing temporary uses along the border zone. In other words, the designers did not erase the past; they managed the division by transforming it from "what it was" to "what it should be"; that is, an urban space that hosts functions for both sides of the previously divided city, Berlin (Caner and Bölen n.d.). In case of cities which became divided during and after a war by real walls just like the previous example, or by barriers in the minds of their inhabitants, people usually become isolated in different communities located in different parts of the city. When the war ends, planners are advised to focus their attention on the possible role of the border areas between these parts of the city as a safe shared space that could function as meeting grounds for people of each side to interact with each other. To overcome these mental borderlines in the minds of people, it is recommended to construct buildings with high symbolic value for both sides, and those in charge of the planning have to avoid the trend of building something new which intends to symbolize that change has taken place or to insult second party, simply because this could lead to more violence in the future (Junne 2010). These guidelines seem to be based on psychological aspects by considering the emotional side of city inhabitants after wars, or may lead to psychological effects but it is not clear whether these aspects are intentional or not. This study,

though, sets a good example of how could mental health aspects and considerations be practically added to the urban design process with the aim of designing better, more sustainable spaces for affected societies.

Conclusion and Discussion

A historical relationship between health and urban design has emerged and disappeared as the disciplines drifted toward and away from each other to finally meet again in the early twenty-first century.

While it is clear that no relationships between mental health and urban design were noticed before the late twentieth century, the mentioned cases of integration between urban design and other health sectors in this review can be looked at as steps that led to the urban design/ mental health sector relationship in the end. The same logic can be applied on the usage of the natural environment elements in urban design, as they drew the attention to the importance of these elements, which could be the first unintentional step towards the mental health\urban design relationship as the elements of the natural environment are an essential part in this relationship as we know it today.

In other words, as a combined understanding, the disciplines of public health and urban design have been of help in combat epidemics due to pollution and infectious disease. Today's public health problems such as mental health disorders can again be addressed by this multidisciplinary confluence. This hypothesis is supported by many recent empirical studies in psychology and urban design which give a general acknowledgement that the environment has an epi and ecophenomenal impact on mental and physical health, however, the features of environment that may affect mental health and any theories regarding this matter need to be empirically verified. Along with new discoveries about epi- and ecophenomenal impacts on the brain, body and even genes, it seems legitimate to say that better understanding the mental health\urban design relationship, can be helpful to design for a better living environment.

In addition, the gap in knowledge regarding the aforementioned relationship when it comes to PTSD should be covered with epidemical studies as understanding the effects of both the natural and the designed environment on people living with PTSD could have considerable results in urgent cases of urban design such as post-war reconstruction where special measures for mental health should be considered.

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Compliance with Ethical Standards

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical Approval This article does not contain any studies with human participants performed by any of the authors.

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