

The impact of blue space in the interior on mental health

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received June 22, 2021 Received in revised form July 10, 2021 Accepted September 28, 2021 Available online April 01, 2022</p> <p><i>Keywords:</i> Blue space Mental health Sense of water Water sounds Water visual</p> <p>*Corresponding author: Azizi Bahaiddin School of Housing, Building and Planning, Universiti Sains Malaysia Email: azizigt@gmail.com ORCID: https://orcid.org/0000-0002-0050-7499</p>	<p><i>Human beings are connected inextricably with nature that can influence our mental and physical well-being. People nowadays working in the hustle and bustle city has a low connection with nature, resulted in humankind suffering from mental illness. Connection to nature is essential for human beings to keep a healthy mind. This study mainly concentrates on the impact of blue space in the interior on mental health. In this research, previous studies are analysed to understand the theory behind the blue space on how water benefits humans. Moreover, the researcher identifies thirty pieces of literature about water and health. The literature review is categorised into sensual perception (visual, sound or music and sense or motion of water) and the impact of blue space (emotional benefits, stress relief, direct health benefits) to reveal the idea of how the blue space benefits people. This paper is carried out through qualitative methods. Research shows intervention evidence of the visuals, sounds and sense of water impact our health in the interior. The findings indicate the function of blue space in the interior on mental health. These findings help in a better understanding of the impact of water sounds in the interior on mental health.</i></p>

Introduction

Human beings are connected inextricably with nature that can influence our mental and physical well-being (Kellert, Heerwagen, and Mador 2013). Nature can heal, soothe, restore (Huynh et al. 2013) and connect humans with not only affect our mood but also our stress, nervous and immune systems (Delagran 2016). Nature such as earth, water, air and space can boost human feelings while lowering blood pressure, muscle pain, and stress hormone production (Mindfulness 2020).

Neighbourhood vegetation tends to improve mental well-being by recovering the depression, anxiety and stress level (Cox et al. 2017). Artificial nature images, sounds and smells can lower human stress level (Sifferlin 2016). Connection to nature is essential for human beings to keep a healthy mind, especially for those

who stay in urban areas and have a low connection with nature.

Nowadays, people work in the hustle and bustle of the city and have a low connection with nature which causes humankind to suffer from mental illness. Cardiovascular and mental illness are predicted to be the highlighted health issues in present and the future (Annerstedt et al. 2013) due to the urbanized lifestyle nowadays when chronic stress has become one of the critical factors of health diseases (Godfrey and Julien 2005). The National Health and Morbidity Survey (NHMS) revealed that every 3 in 10 Malaysian who sit in the range of 16 years and above have suffered from mental illness (Psychiatrist Group and Ministry of Health 2017). Mental illness is the second highest health issue for Malaysian by 2020. There is as much as a quarter of Malaysian adults which in total 424,000 children in Malaysia suffer from mental illness based on the National

Health and Morbidity Survey (NHMS) in 2019. Therefore, more studies are needed on how to recover these health issues in the urbanized life.

Most of the studies in this field reveal the benefits of connection between humans and the nature of the scope of green space, whereas fewer studies focus on the benefits of blue space. A protocol of study in Europe's blue spaces introduced a BlueHealth project. The BlueHealth project mainly focuses on the relationship between blue space and human well-being as well as the intervention of the idea of blue space into a more critical idea. This is to promote sustainable uses of blue space in the urban, alleviating environmental and climate change (Grellier et al. 2017). Blue mind had been published in 2013 which reveals the connection of water and human emotional, physical and psychological in affecting people towards a better emotion. The theory of blue mind is a study of water in lowering the cortisol levels (stress hormone), slowing down the heartbeat and breathing rate as well as resulting in an ideal mood (Sachdev 2020). An analysis of walking distance of urban blue spaces is done, showing that the use of blue space does evoke the benefits of mental health (Völker et al. 2018). After exposure to water, humans will reach a state of tranquility called "blue mind" which makes a person tend to be happier, calmer and clearer (Filstrup 2019).

However, evidence shows that the mental health and the behavioral responses to the blue space in the interior is barely clear. When talking about the blue space, people always refer it to coastal, lake or river. Most of the researches reveal the benefits of staying outside, having a connection with people. There is a lack of study in applying the idea of blue space into interior space. Understanding the theory on how blue space boosts our mental health is the key to switch the benefits of the blue space landscape to the interior. Therefore, some research questions arise.

They are: RQ1: What blue space in the interior does for mental health? RQ2: What are the benefits of having blue space in the interior for mental health? RQ3: How to apply blue space in the interior for mental health?

This research paper is to reveal the theory of blue space that can bring positive impacts to our mental health and eventually integrates it into the interior. In this research paper, the researcher aims to achieve some research objectives which are: RO1: To determine the impact of blue space in the interior for mental health; RO2: To investigate the benefits of having blue space in the interior for mental health; RO3: To produce the method of bringing blue space into the interior for mental health.

The past studies have revealed the blue space theory and blue mind theory in exploring the secret of how water heals a person internally and externally (Filstrup 2019). Besides that, the BlueHealth project is carried out to understand the relationship of blue space with human well-being. It is also tried to be applied in urban infrastructure (Grellier et al. 2017). Studies were done on 30 articles to analyse and investigate the relationship of water and human - the blue space theory. Table 1 shows the analysis of 30 pieces of literature in the categories of sensual perception and impact of blue space. Based on the literature review, the factors that indicate the relationship between blue space and well-being are visuals, water or nature sounds - white noise (Allen Pools and Spas n.d.) and sense or motion of water. The experiment of blue space is mostly done outdoor such as experiment nearby the coastal, river or even waterfall. The study of blue space in indoor remains unclear. Hence, more intervention evidence of blue space application in interior needs to be taken or studied to bring benefits to all users in the building as nowadays people spend most of their time in the interior.

Table 1. Analysis of 30 pieces of literatures

No	Concept of paper	Author	Sensual perception			Impact of blue space		
			Visual	Sound/ music	Sense/ motion	Emotional benefits	Stress relief	Direct health benefits
1	Coastal Blue Space and depression in older adults	Dempsey et al. (2018)	x			x		
2	Marine Biota and Psychological well being	Cracknell et al. (2016)	x			x	x	x
3	Residential exposure to visible blue space (but not green space) associated with	Nutsford et al. (2016)	x	x	x	x		

No	Concept of paper	Author	Sensual perception			Impact of blue space		
			Visual	Sound/ music	Sense/ motion	Emotional benefits	Stress relief	Direct health benefits
	lower psychological distress in a capital city							
4	The importance of nature in mediating social and psychological benefits associated with visits to freshwater blue space	de Bell et al. (2017)	x	x	x	x	x	
5	The Thermal Effects of Water Immersion on Health outcome	An, Lee, and (Yi 2019)			x	x	x	x
6	Urban blue space and health and wellbeing in Hong Kong	Garrett et al. (2019)	x			x		
7	Blue Mind: The health benefits of being by the water	Brown (2017)	x	x	x	x	x	x
8	Water's Wonders	Schiff (2001)		x	x	x	x	x
9	Why do people fall asleep more quickly when it rains?	Yufeizhang (2019)		x		x	x	
10	How the beach benefits your brain	Gherini (2017)	x	x	x	x	x	x
11	Why does looking at water relax us?	Matt (2019)	x	x	x	x	x	x
12	There's a Scientific Reason Why Water Is So Calming	Heid (2020)	x	x	x	x	x	x
13	Feeling Stressed at Home? Listen to Nature	Bockarova (2020)		x		x	x	
14	Buxton quoted in Reader Digest article on sleep sounds	Reynolds (2018)		x		x	x	
15	4 Soothing Benefits of Listening to The Sounds of Nature	Henderson (2018)		x			x	
16	Why our brains love the ocean: Science explains what draws humans to the sea	Nichols (2014)		x		x	x	
17	The Innate Human Attraction to Water	Maxon (2016)	x	x	x	x		
18	'Blue' space_ Access to water features can boost city dwellers' mental health	Roe (2019)	x		x		x	
19	Neighbourhood blue space, health and wellbeing: The mediating role of different types of physical activity	Pasanen et al. (2019)	x	x	x	x		
20	Blue spaces: why time spent near water is the secret of happiness	Hunt (2019)	x	x	x	x	x	
21	Freshwater blue space and population health an emerging research agenda	McDougall et al. (2020)	x	x	x	x	x	x
22	Aquatic Meditation: How to Achieve Mindfulness in the Water	Kaskaras (2021)		x	x	x	x	
23	Why Being Near the Ocean Can Make You Calmer and More Creative	Gregoire (2017)	x	x	x	x	x	x
24	5 Health Benefits of Living Near Water	Crumpley (2016)	x	x	x	x	x	
25	Want to Be Happier? Live Near Water, Research Shows: A study shows that living near a body of water has a number of therapeutic benefits, ranging from	McNulty (2019)	x	x		x	x	

No	Concept of paper	Author	Sensual perception			Impact of blue space		
			Visual	Sound/ music	Sense/ motion	Emotional benefits	Stress relief	Direct health benefits
	increased happiness to creativity							
26	Living Near Water Is Extremely Good for Your Health	Mallon (2019)	x	x	x	x	x	
27	5 reasons why living near water benefits your health	Stojanovic (2017)	x	x	x	x	x	x
28	Why Does Looking at Water Relax Us?	Matt (2019)	x	x		x	x	
29	Blue Mind science proves the health benefits of being by water	Livni (2018)	x	x		x	x	
30	The Blue Zone: How the Ocean Heals Body, Mind & Soul	Alexander (2019)	x	x	x	x	x	x

Method

The method used in this paper is the qualitative method by investigating and identifying the previous studies on blue space and mental health. In this study, qualitative methods by John Creswell which are case studies is applied. Interviews, documents, reports and observations within an organization, entity, individual or event act as case studies in this research paper.

By using the qualitative method, the first step is to get more intervention evidence related to the title or idea of the study. Finding the codes of the paper is essential before starting any research. It acts as guidance and direction in carrying out the research. The codes for this paper are the sensual perception of blue space which includes sounds, visuals, sense of the blue space (Völker and Kistemann 2011) and mental health. The key of conducting this study is to understand the idea of blue space on how sounds of water and how looking at blue space or how things related to blue space affect one's mental health. Search engines such as Google Scholar, Google, Science Direct, SAGE, NCBI and BMC are used to get relevant articles and case studies related to the title. Codes and phrases used in searching relevant studies and articles are blue space, water sounds, nature music, nature sound, mental health, mental illness, water, nature in meditation, water healing, blue mind, sense of water, hydrotherapy and visible blue space.

Case study

Water sounds

Insomnia is a common sleep disorder that a lot of people nowadays are experiencing this disorder every day. Reynolds (2018) had revealed the power of water in how listening to the water sounds can help in solving insomnia. The water waves, water crashing on rock and sand is soothing and relaxing which is known as white noise. It is a good masking for noises. White noise reduced the disparity between background noise in the hospital's noise environment, so patients in an intensive care unit awoke less often during the night. Listening to nature's sound relaxes the nervous system and increases our outward focused attention in the mind instead of inward focused such as anxiety, fatigue and depression. Listening to a soothing sound can lower the blood pressure and heart rate and eventually reduce anxiety. Listening to an equal frequency sound could enhance memory (Reynolds 2018). The utilisation of outdoors water sounds in the interior is one of the easier solutions to connect humans with nature. Recording of the nature sounds can be played in the interior; the use of water features and the water curtains can also be installed to bring the water sound into the interior.

Visual water

A study of blue spaces' health benefits has highlighted the importance of quality features such as flow, colour and water clarity are associated with aesthetic value and psychological benefits. This intervention evidence shows that the distance of blue space from home has a relationship with our health. People get positive

health in both general and mental health when staying near to coastal. Higher visibility of coastal reflects a lower rate of psychological distress and increases social interaction. However, limitations are observed as a lot of variation not being explained in the study. As a result, the impact of blue space exposure on the potential health is unable to determine when using a self-reported test in conducting the study. The perceptions and memories of people visiting blue space may differ. The findings of this study are more likely to show that social interaction is the primary benefit for those who visit blue space. Besides that, it also brings along general and psychological benefits (de Bell et al. 2017). Water features showing the flow of water evoke the feelings of attachment to the blue space and give sensation impact in improving our ability to communicate and empathize. Looking at the motion of water is calming and relaxing to our mind.

Sense of water

Hydrotherapy is beneficial to emotional, psychological and physical health. It is commonly used for rehabilitation and hospital care. Hydrotherapy is a treatment that maximizes the properties and benefits of water and acts as an alternative medicine. Properties of water such as buoyancy help in reducing pain and stress. Sometimes, minerals, ions, oxygen, mud, and herbs applied to freshwater may create a chemical reaction that boosts skin integrity and immunity. Immerse in warm water improves blood flow and reduces atherosclerosis and sleep-related stress, result in enhancing cardiovascular function. Moreover, heating with non-liquid states such as sauna therapy will reduce anxiety and depression. In contrast, icy water helps to reduce musculoskeletal pain. The findings benefit the application of water immersion (An, Lee, and Yi 2019).

Result and discussion

This research believes that there is a theory in the relationship of blue space and mental health on revealing. The findings bring an idea to more people since people living in the city spend more time staying indoor rather than having a walk nearby to the coast. This has raised a lot of emotional, psychological and physical issues.

Studies on the relationship of how the blue space can affect healing and meditation have become the key to achieve the idea of bringing in blue space to the interior. This can be done by revealing the benefits and the impact of blue space in the interior. The blue space can be applied by bringing the sensual perception of blue space such as the visuals, sounds and the sense of water into the interior.

An analysis of blue space and health benefits emphasizes the importance of the quality aspects of water such as the visibility, colour and motion of water which offering or having psychological benefits to the users (de Bell et al. 2017). A reading taken from various electrodes researchers revealed that the heart rate changes in tandem with the nervous system. The subjects (individuals volunteers) experienced a decrease in sympathetic responses and have a rise in parasympathetic responses, which control voluntary actions such as breathing and serotonin. Therefore, it can be concluded that listening to the sound of nature improve the disconnected feeling, thus calming the nervous system and have a better connection with one's inner peace (Henderson 2018).

Listening to sounds of nature increases the rest digest nervous system function, the body's relaxation and shows greater success in external attentional management activity (Reynolds 2018). Michael Wenger who position as the dean of Buddhist studies at San Francisco Zen Center mentioned that moving water is white noise. Listening to the water sounds could wash you over by letting go of the idea and having direct experience. Sound of nature such as water babbling (MacMillan 2017) and water rippling (Thoma et al. 2013) have connections with our human well-being for relaxation (MacMillan 2017). According to Wallace, the sight or sound of water stimulates the release of calming neurochemicals which shows that there is a strong reliance or biochemical link between our mental health and the water (Matt 2019).

Water sound so-called "white noise" brings constant repetition, giving a sense of internal tranquility which helps us to get into a state of deep relaxation. According to Orfeu Buxton, a faculty member at the Harvard Center for Population and Development Studies mentioned that slow whooshing sound as a non-threatening noise. It calms, heals and strengthens people's brains by achieving a meditation state of mind (Gherini 2017; Reynolds 2018). Therefore, the

rain, waterfall or wave sounds are always played in the restoration and relaxation centre such as spa center (Stojanovic 2017). The sound of rain acts as a lullaby for people, which studies found that the sound of rain will produce an alpha wave that has a frequency range of 0 to 20 kHz, equivalent to the state of sleeping (Yufeizhang 2019).

Contact with nature can reduce human stress and induce calm (Roe 2019) which will lead us to forget about the stress and focus on the calming sounds and the feel of the water (Stojanovic 2017). The brain enjoys the power of the sounds of nature as relaxation no matter exposes to nature directly or a mere recording (Henderson 2018) because the human's brain will interpret and connect the sounds with an image which the sound is linked to the memory (Matt 2019; Reynolds 2018).

When people interact or observe the water, it evokes the emotions of connecting to something overwhelming. Humans will try to experience that feeling which increases the ability of connection and empathy. It is calming (Schleinitz 2019) and considered rest for our mental (Gregoire 2017). The concept known as Attention Restoration Theory shows that the water elicits will create excitement and wonder. It is a process of psychological restoration. An experiment using electroencephalography to investigate the neuronal signatures in the human brain showed that there are comparable benefits with people explore to green space and blue space (even a small water feature or rain gardens) (Roe 2019). Interacting or immersing in water can bring a lot of direct and indirect benefits for us such as cold and warm water immersion can bring benefits to the cardiovascular and neuromuscular systems (An, Lee, and Yi 2019; Zinzi 2020). Other studies also reveal that immersion in warm water can bring benefits for relaxation, relieve stress and reduce arthritis pain such as joints, muscle spasms and chronic pain.

Conclusion

In summary, the impact of blue space in the interior on mental health is worth to be studied. Besides that, it is encouraged to further study this topic to reveal and understand the hidden positive effects of blue space in the interior on mental health. The findings and analysis in this paper encourage people to conduct a more detailed

scientific analysis on this emerging idea. The idea of blue space can be categorised into a few sensual perceptions such as visual, sounds and sense of water which could impact our emotional benefits, stress relief and direct health benefits. The idea of how blue space reveals and more experiments need to be conducted as evidence to support this idea. Furthermore, the paper contributes to the potential benefits of mental health and human well-being, both internally and externally.

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Author(s) contribution

Hiew Yoke Ting contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Azizi Bahauddin contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.