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**BIOPHILIC DESIGN WITHIN COMMERCIAL INTERIOR ARCHITECTURE:
THE IMPORTANCE OF ECOLOGY AND BIODIVERSITY ON
HEALTH AND MENTAL WELL-BEING**

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Chapter 1 Abstract & Introduction

Abstract

The objective of this study is to reveal how biophilic design within commercial interior architecture helps improve mental health and well-being while also contributing to the local environment. The purpose of this study is to address the positive and negative effects and consequences that the incorporation or lack of incorporation of biophilic design in environments has on its users within commercial interiors by examination of three different case studies.

The methodology used to gather the data was qualitative using three case studies as they will provide rich data related to this topic.

Incorporating biophilic design into commercial interiors is crucial for creating spaces that support mental health, promote well-being, and enhance productivity. By bringing elements of nature into these environments, a more harmonious and nurturing atmosphere can be created for employees and visitors alike.

Introduction

How can biophilic design within interior architecture improve mental health and well-being while contributing to the local environment?

Biophilic design is an approach to architecture and interior design that seeks to incorporate elements of nature into a built environment. It recognises the innate human connection to nature and aims to create spaces that promote physical health and mental well-being. Biophilic design focuses on creating spaces that not only benefit human well-being but also minimises the environmental impact, encouraging a greater appreciation for the environment while promoting sustainable behaviours.

This dissertation addresses the impact of ecology and biodiversity on the physical health and mental well-being of individuals within commercial interiors.

Throughout this study, I will be reviewing a range of resources and publications and examining how the literature relates to my research question: How can biophilic design within interior architecture improve mental health and well-being while contributing to the local environment?

I will provide a detailed description of how I conducted my research and explain and justify the use of methods and procedures including data collection methods, and any tools or instruments used.

After discussing the methodology, I will compare and contrast three selected studies, discussing their incorporation of biophilic design and highlighting the benefits and negative impacts of each on specific mental and physical health

conditions and how the sustainability aspects of biophilic design contribute to the local environment. By exploring three case studies, I aim to uncover the transformative potential of biophilic design while discussing the consequences of neglecting the incorporation of natural elements.

Chapter 2 Literature Review

2.01 Introductory Overview of the Study

In this study, I will be reviewing different publications and explaining how this literature relates to my research question: How can biophilic design within interior architecture improve mental health and well-being while contributing to the local environment?

I have identified eight key sources on this topic, two of which are primary sources and six of which are secondary. The literature I will be consulting is as follows:

Primary Sources

1. Edwards, B. (2014) *Rough Guide to Sustainability: A Design Primer*. 4th Edition. London: RIBA Publishing.
2. Grimley, C. & Love, M. (2018) *The Interior Design Reference and Specification Book*. Massachusetts. Rockport Publishers.

Secondary Sources

1. Flegg, E. (2022) *Biophilia: the new interior design trend that can breathe life into your home décor and improve your health*. Available at: <https://www.independent.ie/life/home-garden/interiors/biophilia-the-new-interior-design-trend-that-can-breathe-life-into-your-home-decor-and-improve-your-health/41954508.html> (Accessed: 22 October 2023).
2. Channon, B. (2018) *Happy by Design: A Guide to Architecture and Mental Wellbeing*. London: RIBA Publishing.
3. Channon, B. (2022) *Happy by Design Toolkit: Architecture for Better Mental Wellbeing*. London: RIBA Publishing.
4. World Health Organisation. (2023). *Household Air Pollution and Health*. Available at: <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health> (Accessed: 20 December 2023).
5. Kellert, SR. (2018) *Nature by Design: The Practice of Biophilic Design*. London. Yale University Press.
6. National Library of Medicine. (2022) *Patients' Health and Wellbeing in Inpatient Mental Health-Care Facilities: A Systematic Review*. Available at: <https://pubmed.ncbi.nlm.nih.gov/35046849/> (Accessed: 12 November 2023).

I have found these sources to be very beneficial in providing key insights into my research question. It provides an understanding that there is a significant lack of information within the existing literature on the link between mental health and well-being and the benefit of using the biophilic design approach. To contribute to the advancement of biophilic design within interior architecture: the importance of ecology and biodiversity on mental health and well-being, I will be highlighting areas that could benefit from further exploration, such as mental health, the improvement of health both physical and mental, the psychology behind biophilic design, and the impacts of biophilic design on specific mental and physical health conditions.

The chosen research problem is significant within the academic field as I believe it is important to inform people about how we can help promote quality of life within interiors, both physically, mentally, and aesthetically. Additionally, my chosen research problem of how biophilic design within interior architecture improves mental health and well-being while contributing to the local environment is significant as there is a lack of research on this specific topic. I hope my research will add to this topic, filling in that gap.

2.02 Review of Literature

“In design terms, biophilia is a systematic approach to creating interiors that interact with the natural world” (Flegg, 2022), using the benefits of nature to help create healthier spaces. The biophilic design approach is important as research shows that ‘nature can be a powerful force in supporting both our physical and mental well-being’ (Channon, B. 2022) while creating a pleasant space to be in. The name is Greek in origin and translates as “a love of life or living things”.

Primary Source 1 - *A Rough Guide to Sustainability*

My first primary source is the book *Rough Guide to Sustainability: A Design Primer* by (Edwards, 2014). This book was created due to the urgent need to improve the sustainability of Europe's building stock as global warming increases. The author emphasises ‘mitigating climate change impacts by using clever new approaches to design.’ (Edwards, 2014).

I will be focusing primarily on Chapter 8, ‘Sustainable Buildings are Healthy Buildings’. This chapter discusses how to promote health through design with organic materials.

This book provides insights on the research topics on exploring the positive impacts organic materials have on mental health and well-being, the importance of incorporating nature-inspired elements into design, and the specific requirements and guidelines to consider when implementing materials into interiors.

While reading this chapter, I noticed that it was relatively concise and provided limited information on ‘Sustainable Buildings are Healthy Buildings’ (Edwards, B. 2014). However, the information it does offer will still be highly valuable

for my research. This includes insights into how sustainable buildings prioritise the health and well-being of occupants by addressing indoor air quality, natural ventilation, daylight, use of non-toxic materials, energy efficiency, connection to nature, and a holistic design approach.

Primary Source 2 - *The Interior Design Reference and Specification Book*

My second primary source is *The Interior Design Reference and Specification Book* by Grimley and Love (2018). This book is a compact guide that addresses issues related to interior design and was created not only to be accessible to interior designers but also to people without professional or specialised knowledge in the area. Chapter 4 focuses on the importance of 'Environments', discussing natural light, artificial light, environmental conditions, and the recommended light levels for each room Grimley and Love (2018).

Lighting is an important topic within this research as it is a fundamental human need that has a significant impact on mental health. This chapter has been very useful, highlighting areas such as; the effects of natural light on mood and productivity, the impact of artificial light on sleep patterns and circadian rhythms, the relationship between environmental conditions such as lighting and stress levels, and the recommended light levels for different types of rooms to optimise wellbeing. The impact of these research areas on the topic provides valuable insights into the connection between lighting and mental and physical health Grimley and Love (2018).

Secondary Source 1 - *Biophilia: The New Interior Design Trend that Can Breathe Life into Your Home Décor and Improve Your Health*

The newspaper article *Biophilia: The New Interior Design Trend that Can Breathe Life into your Home Décor and Improve Your Health* (Flegg, 2022) states that the name Biophilia is translated from Greek as "a love of life or living things", acknowledging that this design approach has only been explored in recent years. I believe that this article will be a great starting point in my research on this topic.

This article gives insight into the understanding that biophilic design is still a new idea that has not yet matured. The article goes on to mention that biophilic design and sustainability have a lot in common. "Biophilia aims to benefit the people that inhabit a building; sustainable design intends to benefit the wider world" (Flegg, 2022). Considering biophilia is a new concept this might make it difficult to find reputable information on the trend, although sustainability a more mature idea interconnects with many aspects of biophilic design.

I am finding this article to be very beneficial to my research as it has provided me with a new perspective on the topic.

Secondary Source 2 - *Happy By Design: A Guide to Architecture and Mental Wellbeing*

The *Happy By Design: A Guide to Architecture and Mental Wellbeing* book by (Channon, 2018) is a pocket-sized guide to designing buildings that can help improve happiness. Channon states that the industry in the 21st century focused mainly on ‘carbon emissions, safety, and profits. All of these elements are, of course, important. However, if we focus too heavily on them, it is possible to lose sight of something that should be at the core of design: joy.’ (Channon, 2018) This book was written after Channon discovered the magnitude of not giving enough attention to the human experience and benefits of natural materials.

This book outlines the actions that need to be taken into consideration when designing buildings to help promote mental and physical health, actions such as bringing nature in, providing views of nature, designing urban escapes, integrating views of water, and increasing the presence of plant life (Channon, 2018).

I found that this book was written in a way that is accessible to everyone, not just to people in the industry. I thoroughly enjoyed this book as it has simple explanations of these small but effective steps that can be taken and clear diagrams which I have found very useful. This book will be very beneficial towards the research as a whole in particular its chapter ‘Nature’. The chapter explains how spending time in nature can significantly improve mental health and well-being in many ways such as reducing stress, improving cognitive function, and respiratory issues, and helping improve mood and mindfulness. The author's main focus is on biophilic design linking to sustainability (Channon, 2018).

Secondary Source 3 - *The Happy Design Toolkit: Architecture for Better Mental Wellbeing*

The Happy Design Toolkit: Architecture for Better Mental Wellbeing (Channon, 2022) is very helpful, in particular Chapter 4, ‘Nature and Biophilic Design’. I liked Channon’s first book *Happy By Design* (Channon, 2018) and found it so helpful that I was inspired to take a look at his second book, *The Happy Design Toolkit*. Within this book, (Channon, 2022) has cited many other scholarly works that will be of great help to my research. In this chapter ‘Nature and Biophilic Design’ psychological benefits are discussed including potential issues and considerations, such as environmental impacts, maintenance, operational costs, and building costs. Potential issues and considerations will be paramount to know for my research of limitations. Psychological benefits include reduced stress, increased productivity, and mood improvement.

While I have enjoyed reading this book, I would have liked it if the author had delved deeper into the topic of mental and physical health, providing more in-depth information on the topic to enhance my understanding of the potential effects that can be caused by different design flaws on mental and physical health.

Secondary Source 4 - *Household Air Pollution and Health*

The online article *Household Air Pollution and Health* by the (World Health Organisation, 2023) provides useful statistics and information on the guidelines of indoor air quality and the impacts of household air pollution on health and wellbeing. This article provides an in-depth understanding of the specific health conditions, such as lower respiratory infections, strokes, and lung cancer which are caused by indoor air pollution. With this information, I gained valuable insights into understanding health issues that arise from indoor air pollution and identifying how biophilic design can mitigate these problems.

I can then explore how incorporating natural elements, such as plants and proper ventilation can improve indoor air quality and promote better health outcomes. This connection between biophilic design and addressing specific health conditions caused by indoor air quality will be a significant aspect of my research.

While the article provided valuable insight, it would have been more beneficial if it had more detailed information. The World Health Organisation did include some remarkably useful links, which are very useful in furthering research on this topic.

Secondary Source 5 - *Nature By Design: The Practice of Biophilic Design*

The book *Nature by Design: The Practice of Biophilic Design* (Kellert, 2018) is about the integration of nature with the built environment, the book provides a comprehensive overview of fundamental principles, principals such as establishing a connection to nature, maximising light and ventilation, and use of natural materials, along with providing options for effectively implementing the biophilic design approach into interiors. Options such as choosing plants that thrive indoors and require minimal maintenance, using natural materials such as wood, stone, and bamboo, and integrating water features such as indoor waterfalls into interior spaces to mimic the soothing effects of natural bodies of water.

By exploring this book on the practice of biophilic design, I will gain a deeper understanding of the basic principles, practices, and implementation options. This knowledge will not only enhance my understanding of biophilic design but also provide valuable insights and guidance for my research. This book builds a strong foundation in the early days of this topic.

An aspect of the book that I did not find appealing is that the images included on biophilia were uninspiring. I believe it is important to showcase the beauty and effectiveness through the visuals, truly highlighting the potential of biophilic design which I did not see in this book.

Secondary Source 6 - *Patients' Health and Wellbeing in Inpatient Mental Health-Care Facilities: A Systematic Review*

This article argues that the environment within the inpatient mental health care hospital has a significant psychological effect on its users and patients. Stating that “design has become integral to quality healthcare” (National Library of Medicine, 2022). Within this article, methods, search strategies, and data analysis are discussed. This article is specifically about the relationship between the physical environment and the recovery outcomes in inpatients. Outcomes such as faster recovery from illness or surgery (National Library of Medicine, 2022). This article will be very beneficial in my research to understand the recovery outcomes of people with mental health issues that certain environmental changes can help promote.

2.03 Conclusion

In conclusion, the literature review discussed provides valuable insights needed to further my research. As I continue my research I plan to find and consult with many more resources.

The sources reviewed identify issues and concerns on how biophilic design within interior architecture improves mental health and well-being while contributing to the local environment. The gap in research in establishing the link between mental health and the benefit of using biophilic design is highlighted. Another main finding in the research reviewed is that sustainability overlaps with biophilic design and has a longer history and established body of research, making it a more credible source.

Key areas that need to be considered as part of my research are the impacts of biophilic design on specific mental and physical health conditions, promoting health through design with organic materials, and the effects of natural light on mood, productivity, and sleep patterns. The impacts household air pollution has on health, the relationship between environment and recovery outcomes in inpatient mental health care hospitals, and considerations such as maintenance, operational costs, and building costs.

A limitation that I have encountered in the sources is that biophilic design is a developing and new idea that has not yet matured, this is a limitation due to the fact that we may not know all of its benefits and negative impacts yet as research in this area is still growing and evolving.

Based on this review I have decided to divide and focus my research on biophilic design and physical and mental well-being. Narrowing down my research by looking at health and biophilic design separately. I will also be researching areas of sustainability as the topic is a more mature idea that interlinks with biophilia in many ways.

Chapter 3 Methodology

3.01 Introduction

Within this chapter, I will be discussing the methodology that was conducted to address the problem of how biophilic design within interior architecture can improve mental health and well-being while contributing to the local environment.

I will be explaining and justifying the methods and procedures used in my research study while providing a detailed description of how I conducted my research, data collection methods, and any tools or instruments used. In this chapter, I will ensure the utmost transparency and clarity in the explanation of how the data was collected and analysed. This will enable readers to comprehensively grasp the reliability and validity of my research findings.

3.02 How the Data will be Collected

The data will be collected based on on-site visits, observations, photographs, and notes taken from each case study. With qualitative research comes a degree of subjectivity. The points that appear subjective will be supported by evidence from sources such as scholarly authors, strengthening the reliability and validity of my findings.

3.03 Explaining the Methods Used

As part of my methodology, I have chosen qualitative research as it permits the 'narrowness of experimental studies by promoting studies that allow researchers to be more spontaneous and flexible in exploring phenomena in their natural environment' (Newton & Rudestam, 2001, p.33).

For the purpose of this research, my sample is confined to commercial restaurants. Based on my observations from my selected case studies on three different commercial restaurants (focusing solely on the commercial interiors), I will be comparing and contrasting their incorporation of biophilic design, and discussing the impacts of each. My focus is not on the fact that these case studies are all restaurants but the fact that they are all examples of commercial buildings.

Choosing similar environments helps me to compare and contrast my case studies equally.

I have specifically chosen three case studies each with different levels of biophilic design application. One case study where biophilic design appears to be completely absent, another where there has been an attempt to incorporate biophilic design and a third case study that serves as an excellent example of a commercial interior where biophilic design is present. I have visited and evaluated an arrangement of commercial interiors both nationally and internationally. The three case studies that have been selected are the best examples for my case studies, which allow for a broad consideration of the use and impact of biophilic design within commercial interiors.

3.04 Justifying Why I Chose These Methods

These three case studies have helped to gather the data necessary for this study. They provide valuable insights into the effects of biophilic design and how the case studies differ in terms of their incorporation of biophilic elements. The data collection provides in-depth information on how this design approach influences people's health and mental well-being while contributing to the local environment and how environments differ in terms of their incorporation of biophilic elements.

3.05 The Analytical Procedure Used to Draw Conclusions

An analytical procedure used to draw conclusions was thematic analysis. After conducting on-site visits and observations, I transcribed detailed notes. Thematic analysis helped me to find common themes and patterns in the information I had collected from my case studies. Common themes included plants and foliage, light, and airflow. By identifying these themes, I developed a better understanding of the information gathered which helped me to organise and make sense of the data in a systematic way.

3.06 Tools and Instruments Used

Some tools and instruments used in the undertaking of this research were observations, reflections, notetaking, visual elements such as photographs, and analysis of both primary and secondary sources. Digital and physical notetaking tools such as Word and a physical notebook, helped me in writing down ideas, observations, and reflections during the analysis process. Visualisation tools such as the camera on my smartphone were used to take photos of each case study and mind maps helped aid in visualising themes, patterns, contrasts, and comparisons.

3.07 Ethical Considerations

During my research ethical considerations were kept in mind, such as gaining consent when taking photos of each case study while ensuring not to take any photographs of anyone without their prior permission. No real names of the commercial buildings were used to maintain the anonymity of the case studies and to provide confidentiality.

3.08 Limitations

A limitation or constraint that may have impacted my study was that two of my case studies were abroad, meaning that I could not visit them again easily if necessary. Another limitation was that I did not interview the staff of the commercial interiors which may have given me a better understanding of the topic. Due to the size and timeframe of this study, the research was limited to commercial interiors only. In future research, the focus could be broadened to compare different environments other than commercial interiors as biophilic design impacts the health and safety of people, research should be expanded to include interiors such as hospitals, schools, and nursing homes.

3.09 Conclusion

In conclusion for this chapter, a key point that has significantly helped with my research has been using qualitative research based on my observations from my selected case studies. These case studies have helped me to gather information from primary and secondary sources, providing valuable insights into the effects of biophilic design, how the case studies differ in terms of their incorporation of biophilic elements, and gathering in-depth information on how this design approach influences people's health and mental well-being while contributing to the local environment. Without these case studies, I would not have been able to address the problem of how biophilic design within interior architecture can improve mental health and well-being while contributing to the local environment, as efficiently.

Chapter 4 Research Findings and Discussion

4.01 Introduction

In this chapter, I will present the findings of Case Studies 1,2 and 3. I will also discuss the themes and patterns found within each case, providing specific evidence-based examples to support the findings. I will now be comparing and contrasting the incorporation of biophilic design in Case Study 1, a commercial interior where biophilic design is absent, Case Study 2, a commercial interior with minimal artificial biophilic elements, and Case Study 3, a commercial interior where the biophilic approach is abundant. I will be discussing the impacts on psychological and physical health, such as circadian rhythm, respiratory health, cognitive function, psychiatric disabilities, mental health, and cardiovascular disease. I will discuss how the sustainability aspects of biophilic design contribute to the local environment while highlighting the similarities and differences that helped me gain a broader understanding of their implications.

What was the Purpose and Objective of Each Case Study Selected?

I have selected three different commercial buildings, all of which happen to be restaurants for my case studies. I chose Case Study 1 to help me explore the negative impacts of what an interior without biophilic design can have on mental health and physical well-being. Case Study 2 helped me to investigate the effects of an interior which attempted to incorporate biophilic design. Case Study 3 helped me to explore the positive aspects of a well-executed biophilic design approach.

My objectives for selecting these case studies were to examine and discuss the positive and negative impacts and to explore the effects of each.

By analysing these different case studies, I have aimed to provide a comprehensive understanding of the role and significance of biophilic design within commercial interiors.

It will be very beneficial in my research to understand the recovery outcomes of people with mental health issues that certain environmental changes can help promote.

4.02 Description of Case Study 1



Fig.01 Interior of Case Study 1: A Fast-Food Restaurant, Dublin.



Fig.02 Interior of Case Study 1: A Fast-Food Restaurant, Dublin.

Observation Case Study 1: A Fast-Food Restaurant, Dublin.

Case Study 1 is an open but not spacious fast-food restaurant located in Co. Dublin, Ireland, located in the basement of a pub. Biophilic design seems to be absent within this interior.

Within the interiors of Case Study 1, I noticed no external windows within the space resulting in the almost complete absence of natural light, fresh air, and air circulation. The artificial lights that were present were few, poorly positioned, and not very powerful, with a lack of task or focused lighting, creating a very dull and dark atmosphere. The absence of windows within an interior results in the lights being turned on for extended periods adding to the carbon footprint of the environment.

There is minimal furniture with non-sustainable materials which has institutional-looking metal frames, plastic leather upholstery, hard plastic surfaces, low stark ceilings, and cold lino flooring, creating a sterile environment. No real or artificial plants are used.

The interior design approach of Case Study 1 is a bland version of the vibrant seventies and eighties pop-rock era, when the biophilic design trend was non-existent.

4.03 Description of Case Study 2



Fig.03 Interior of Case Study 2: A Michelin Starred Restaurant, London.



Fig.04 Interior of Case Study 2: A Michelin-Starred Restaurant, London.

Case Study 2: A Michelin Starred Restaurant, London.

Case Study 2 is a Michelin-starred restaurant located in London. Within the interiors of this case study, there are no windows on the walls, and there is a ceiling skylight with frosted stained glass leading to minimal natural light, resulting in a very dull and dark atmosphere. There is some soft focused lighting although ambient lighting is minimal.

I noticed that there is a woodland theme to this restaurant with evidence of artificial biophilic elements within this interior, such as artificial plants, an artificial moss carpet, and murals across the walls of trees and nature. Upon observation, it is evident that there is use of wooden pieces of furniture, though much of this natural material is covered over and not easily accessible to see or interact with. There is no sign of any natural plants or natural design materials within the interior to support the improvement of air quality. Despite the natural elements incorporated being mostly artificial, there has been an attempt to incorporate biophilic design into this interior.

The interior design approach of this restaurant is focused more on the aesthetic experience rather than on the physical implications or the authentic experience and health benefits that natural materials can provide.

There is no evidence of mechanical ventilation within this interior. A combination of an interior without windows or plants such as this leads to poor air quality as ventilation is minimal.

4.04 Description of Case Study 3



Fig.05 Interior of Case Study 3: A Balinese Restaurant, Indonesia.



Fig.06 Interior of Case Study 3: A Balinese Restaurant, Indonesia.

Case Study 3: Cantina, Bali.

Case Study 3 is a Balinese restaurant located in Canggu, Bali, Indonesia.

Upon observation, I noticed that there is a vaulted ceiling and large windows throughout the interior which maximise the sense of space while allowing an abundance of natural light in, with unobstructed views of the lush natural environment.

The interior design approach of this restaurant is focused on bringing the natural elements inside and linking the indoors to the outdoors. This creates a zen-like atmosphere with minimal barriers and a seamless transition to the external environment. The interiors appear to be furnished with all-natural materials, such as stone flooring, wooden tables and chairs, and a vaulted bamboo ceiling. The use of sustainable materials is so extensive that any artificial materials are difficult to notice or identify.

Foliage and potted plants are placed throughout the interior space.

The combination of large windows and plants creates an open atmosphere with ample ventilation.

4.05 Circadian Rhythm

Negative Impacts

As observed in Case Study 1 and Case Study 2, an interior that lacks light, can have a negative impact on the circadian rhythm of the users of this commercial space. “Darkness stimulates the pineal gland to secrete melatonin” (Hardeland, 2013), a hormone produced in the body. When in a dark space for extended periods melatonin will be produced, encouraging sleep. Without natural light, the body’s internal clock will struggle to align with the natural cycles. When the body’s internal clock has been disturbed it is more difficult to fall and stay asleep, leading to fatigue and mood disturbance.

Positive Impacts

An element of biophilic design is the incorporation of large windows, skylights, and light wells to maximise daylight within interiors. The incorporation of natural light can have several benefits for the circadian rhythm of the staff and users of commercial spaces, helping to produce melatonin at the right time while regulating the body’s internal clock which promotes better sleep at night, leading to waking up feeling refreshed and potential mood improvement. According to Channon (2022, p. 70) “the introduction of natural materials into buildings activates our parasympathetic nervous system, which acts to reduce stress”. The positive impact of stress reduction can indirectly influence the circadian rhythm as stress is a leading factor that affects the quality of sleep (National Library of Medicine, 2020).

Comparing and Contrasting

Similarly, Case Study 1 and Case Study 2 both lack natural light, a key element of biophilic design creating a dull and dark atmosphere for their users, resulting in negative impacts on the circadian rhythm. Contrasting with Case Study 3, there is an abundance of natural light promoting better sleep and mood improvement.

The interiors of Case Study 1 and Case Study 2 can result in the disturbance of melatonin production, while Case Study 3 helps promote stronger regulation of melatonin. Strong natural regulation of melatonin has very positive benefits to both physical and mental health. Disturbance of melatonin upsets the natural balance of the circadian cycle, detrimentally impacting both physical and mental health (National Library of Medicine, 2020).

Conclusion

The inclusion of natural light may seem insignificant, however, the benefits of incorporating this biophilic element into commercial interiors are extensive. Within commercial interiors, it is important to have lively employees to ensure work is done to a high standard and that reasonable care has been taken to protect their health.

4.06 Respiratory Health

Negative Impacts

As observed in Case Study 1, an interior that lacks natural plants, foliage, and windows can have a negative impact on the respiratory health of the users within this commercial space. Low ceilings add to a stifling and gloomy atmosphere.

Without windows and foliage, there is an absence of natural ventilation and airflow impacting the overall environmental conditions, leading to poor air quality as stagnant air can accumulate pollutants and allergens. It can also result in higher humidity levels which can promote the growth of mould and mildew. Mould can lead to wheezing and according to The National Health Services United Kingdom, it can be the cause of asthma attacks (The National Health Services, 2022).

The negative effects of mould can become detrimental, especially for individuals with respiratory issues and weak immune systems.

A negative impact of using artificial materials is that they require frequent cleaning and dusting to maintain their appearance and functionality, the accumulation of dust can be problematic for those with respiratory issues.

“Dust particles small enough to be inhaled can lodge in the lungs and make it harder to breathe” (Zeise, 2024). “Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into your lungs, and some may even get into your bloodstream. Exposure to such particles can affect both your lungs and your heart” (United States Environmental Protection Agency, 2023).

Positive Impacts

As seen in Case Study 3, this commercial interior provides an abundant array of biophilic elements, such as large opening windows, plants, and foliage which help ventilate and circulate proper airflow throughout the interior. The vaulted ceilings lined with natural bamboo lighten the atmosphere and together with the large windows create a sense of space and minimise the boundary to the outside air. The presence of plants act as natural air filters, helping to purify the air and

improve its quality. This alone can have positive impacts on the employee's and user's respiratory health and overall comfort.

Comparing and Contrasting

Case Study 1 lacks any biophilic elements which as described previously, has detrimental effects. Case Study 2 attempted to incorporate artificial biophilic elements, however, the artificial biophilic elements and lack of natural plants incorporated do not contribute the same benefits as seen in Case Study 3, in regards to respiratory health.

In Case Study 1, the lack of biophilic elements creates a gloomy dark atmosphere with a claustrophobic and closed-in feeling whereas in Case Study 2, artificial biophilic elements help to soften the overall atmosphere although it remains quite dark and closed in. The lack of natural plants and other natural materials does little to promote a sense of lightness and good air quality.

In Case Study 3, there is an abundance of natural materials and plants that minimise the boundaries between the interior space and natural environment, creating an open, ventilated space that has a positive impact on respiratory health. As stated by the (Department of Environment, Climate and Communications, 2023), “clean air is essential for our quality of life”.

Conclusion

In conclusion, the implementation of biophilic elements such as windows, plants, and live foliage can have several benefits for individuals with respiratory issues. Providing appropriate circulation and ventilation throughout interiors along with natural air filters helps to purify the air, improving its overall quality. A perception of light and space helps to create an open atmosphere that can promote respiratory health.

4.07 Psychiatric Disabilities and its Connection to Nature

Negative Impacts

As observed in Case Study 1 and Case Study 2, an interior that lacks the presence of real plants and natural materials can have a negative impact on users with psychiatric disabilities (Karlin & Zeiss, 2006).

The use of institutional-looking steel furniture, plastic leather, and laminate flooring as seen in Case Study 1, creates a sterile and impersonal environment, lacking the sensory experience and benefits that the incorporation of real plants and natural materials brings.

Depending on the individual, being in a sterile and institutional atmosphere can lead to users with psychiatric disabilities feeling some common reactions such as discomfort, anxiety, withdrawal, and irritability which may result in panic attacks, increased anxiety, and emotional outbursts causing harm to themselves or people around them. This is partly due to a sense of being disconnected from the natural environment. Lack of natural warmth and natural elements can contribute to feelings of confinement, entrapment, and restrictiveness (Karlin & Zeiss, 2006).

Positive Impacts

The incorporation of natural elements and surfaces such as wood is proven to have a calming effect on individuals, according to the National Institute of Health, (National Institute of Health, 2017). The incorporation of these natural elements within commercial interiors would benefit users with psychiatric disabilities, providing a connection to nature that helps them perceive a safe space where they do not feel threatened. This then helps to remove any signals of being in a sterile/institutionalised atmosphere, creating a soothing and peaceful environment that is likely to have a positive impact on the psychiatric health of users. (Karlin & Zeiss, 2006) highlights the importance of light on individuals with psychiatric disabilities mentioning that “sunlight in patient rooms can promote recovery of psychiatric patients with severe depression”.

Not only does this create a more pleasant environment, but it also helps create a more universal design-friendly interior, helping users to perceive a more trustful atmosphere where they are more likely to engage in a calming environment.

Comparing and Contrasting

From observation in Case Study 1, biophilic design is not present. Without biophilic elements, such as plants and natural materials, a person's connection to nature is removed resulting in individuals feeling detached and distant from the natural world. This creates a sterile and unwelcoming atmosphere that is not conducive to psychiatric well-being (Andrews, 2015).

When natural elements are incorporated, we can create a more harmonious and nurturing environment that promotes a stronger connection to nature helping users of this commercial space feel more relaxed, comfortable, and at ease. This promotes an atmosphere that is more likely to enable users to feel more present in the space and open to participation.

The artificial biophilic elements in Case Study 2 can introduce some health and psychological benefits, although not to the same extent as the authentic natural elements as they do not provide the same sensory experience as real plants, sunlight, and natural materials. According to (Planteria Group, 2023) “artificial plants, preserved moss walls,

representational artwork, patterns and architecture evoke nature” which can contribute to a less threatening, more welcoming environment, resulting in stress reduction and a more receptive mood.

In contrast with Case Study 2, while minimal artificial biophilic design can offer some benefits, Case Study 3, an interior with an abundance of biophilic elements such as the presence of real plants and natural light, provides a more immersive and authentic experience, closely resembling the positive effects of being in a natural environment. When a connection with nature is formed, there is a calming and rejuvenating effect on our minds and bodies, which can greatly benefit individuals with psychiatric disabilities to feel more comfortable within commercial interiors.

Conclusion

The inclusion of natural elements may seem insignificant however, in conclusion, the benefits of incorporating biophilic elements into commercial interiors are extensive for users with psychiatric disabilities. For people with psychiatric disabilities, this authentic, non-threatening, and immersive experience helps them to lessen the focus on their mental health difficulties and facilitates them to become more engaged and interactive with their environment and the people around them.

4.08 Sustainability

Negative Impacts

Without the incorporation of biophilic design, there can be multiple negative impacts on the environment. Some examples are the production and disposal process of synthetic products which can contribute to habitat destruction, soil erosion, and water pollution, also resulting in greenhouse gas emissions and energy consumption. Synthetically produced products may contain harmful chemicals which can have a negative effect on the ecology, biodiversity, and human health (European Environment Agency, 2021).

Without the integration of natural elements, such as windows with natural light, commercial interiors may rely heavily on artificial lighting, resulting in increased energy consumption and higher carbon emissions. Similarly, without proper consideration for natural ventilation, commercial interiors such as Case Study 1, may rely more on mechanical cooling systems during the summer, leading to greater energy usage and environmental impact.

Positive Impacts

Biophilic design can help reduce energy consumption, by maximising natural light through large windows as seen in Case Study 3, or skylights as seen in Case Study 2, helping to reduce the need for artificial lighting during the day. Additionally, reducing the need for mechanical cooling systems results in less greenhouse gas emissions.

Biophilic design also promotes the use of sustainable materials. The use of eco-friendly materials helps to minimise the impact on the environment while reducing waste and contributing to a greener future. Natural plants produce oxygen and help to filter pollutants from the air.

Comparing and Contrasting

Metal chairs and hard artificial surfaces as seen in Case Study 1 have a higher carbon footprint to manufacture. Disposal of these materials is difficult, and these types of products are more difficult to repair and reuse than natural ones. Wooden furniture can be sanded, stained, painted, and reused. This is more difficult with metal/plastic furniture.

The furniture and décor featured in Case Study 2 possess some potential for future reuse or recycling. The products are primarily made of wood, a material that is less environmentally harmful, although the production and disposal of artificial products within this interior will have negative impacts on the environment.

Case Study 3 embraces sustainability, contributing to an eco-friendly space through its use of natural light and ventilation, products made with natural materials, and the use of native plants. A unique observation made during my travels around Bali, Indonesia, was that the woven lampshades seen inside are reused woven basket cages used to carry the chickens around locally. This clever reuse of woven basket cages is very commonly seen within interiors around Bali and has become a staple piece in many homes and commercial interiors. Repurposing local existing materials is a cost-effective and eco-conscious approach to furnishing, displaying resourcefulness and sustainability. The use of natural materials seen in Case Study 3 helps in reducing carbon emissions.

Conclusion

By embracing biophilic design approaches we can create spaces that are not only aesthetically pleasing but also environmentally sustainable. By not incorporating some of the biophilic elements discussed we miss out on the opportunity to help support ecology and biodiversity.

4.09 Cardiovascular Disease

Negative Impacts

The lack of biophilic elements within a commercial interior can have many negative effects on people with cardiovascular disease, such as increased stress and anxiety levels and elevated blood pressure and heart rate, resulting in a higher risk of cardiovascular diseases. Additionally, the lack of access to natural light can lead to sleep disturbances and an imbalance in hormone levels, potentially increasing the risk of cardiovascular diseases (Hardeland, 2013).

Stress is a significant risk factor for cardiovascular disease and according to the University of Rochester Health Centre Encyclopaedia (2024), 'even minor stress can trigger heart problems like poor blood flow to the heart muscle'.

Positive Impacts

It is important to prioritise incorporating nature-inspired elements into commercial interior spaces to create a healthier and more supportive environment for our cardiovascular well-being. Research suggests, that exposure to nature can help reduce stress, lower blood pressure, and improve overall cardiovascular well-being. By incorporating biophilic design principles, such as introducing indoor plants, natural materials, and maximising access to natural light and outdoor views, we can create interiors that promote relaxation, reduce stress, and contribute to a healthier cardiovascular system. Studies have indicated that exposure to biophilic design elements can lead to lower blood pressure and heart rate for people with cardiovascular disease. Maintaining healthy blood pressure and heart rate levels is crucial for managing their condition and reducing the risk of complications.

Comparing and Contrasting

Research suggests that exposure to nature and natural elements has a calming effect on our bodies, helping to reduce stress and promote relaxation. In contrast with Case Study 1 and Case Study 2, being in an environment without biophilic elements can contribute to feelings of anxiety, fatigue, and even depression, which can have a detrimental impact on cardiovascular health. In contrast, being in a commercial space like Case Study 3 which embraces the biophilic design, helps to create spaces that not only look aesthetically pleasing but also contribute to the user's cardiovascular health.

Conclusion

In conclusion, stress is a significant risk factor for cardiovascular disease. Biophilic design reduces stress and therefore the risk of cardiovascular disease. By creating environments that mimic natural settings and integrate elements of nature,

biophilic design has the potential to reduce the risks of cardiovascular disease making this design approach immensely significant for the health and well-being of the users of this commercial space.

However, it is essential to note that biophilic design should complement comprehensive medical care and lifestyle modifications recommended by healthcare professionals for individuals with cardiovascular disease.

4.10 Mental Health

Negative Impacts

The absence of biophilic design in commercial interiors can have many negative effects on mental health such as increased stress and anxiety. Sterile environments such as Case Study 1 and artificial environments such as Case Study 2 lack natural biophilic elements which can contribute to higher stress levels and increased feelings of anxiety. The absence of biophilic design can create a disconnection from nature. This disconnection can lead to feelings of restlessness, unhappiness, and a general decline in overall mental well-being. Spending extended periods in a dark interior with minimal airflow can lead to feelings of depression. According to Dr. Najibah Rehman ‘the more poorly lit a room is, the higher the risk is for depression and other ailments’ (Dr. Rehman, 2018).

Positive Impacts

Incorporating biophilic design into commercial interiors can have numerous positive effects on mental health, including stress reduction, improved mood, and well-being. Biophilic design elements, such as natural light, indoor plants, and views of nature, have been shown to reduce stress levels and promote relaxation. This can have a significant positive impact on mental well-being, helping to alleviate symptoms of anxiety and depression.

Comparing and Contrasting

As seen in Case Study 1 and Case Study 2 minimal natural light and dark closed in spaces can create a claustrophobic and oppressive feeling. This can have a detrimental effect on overall mood and well-being.

In contrast with Case Study 1 and Case Study 2, Case Study 3 offers bright, open, airy spaces that include natural tactile materials and natural plants that connect its users to nature. As discussed above, this has been shown to provide many positive benefits on overall mental health resulting in a rejuvenating atmosphere and an overall elevated mood.

Conclusion

Incorporating biophilic design into commercial interiors is crucial for creating spaces that support mental health, promote well-being, and enhance productivity. By bringing elements of nature into these environments, a more harmonious and nurturing atmosphere can be created for employees and visitors alike.

4.11 Limitations

Since biophilic design is a relatively new approach, it was challenging to find extensive research specifically focusing on the connection between physical health issues and their connection to nature. The discussion around biophilic design and its effects is more commonly found in general terms rather than specific studies.

Chapter 5 Conclusion

In summary, the findings of this study reveal how biophilic design within commercial interior architecture helps improve mental health and well-being while also contributing to the local environment. The purpose of this study was to address the positive and negative effects and consequences the incorporation/lack of incorporation of biophilic design has on its users within commercial interiors by examination of three different case studies.

Examining the broader implications of the study, it is clear that the results found contribute to an existing body of knowledge within this field. The results of my study suggest that the incorporation of biophilic design within commercial interior architecture would be very beneficial when applied in real-world scenarios. It is evident that existing research in this area is relatively limited. However, this dissertation aims to fill this void, offering valuable insights that can inform and advance future research.

By shedding light on this issue, this study lays the groundwork for more comprehensive examinations, serving as an opportunity for deeper explorations into the relationship between physical health and biophilic design.

Due to the size and timeframe of this study, the research was limited to commercial restaurants only. As part of future research recommendations, I would suggest that the research should be expanded upon and broadened to be based on different environments other than commercial, as biophilic design impacts the health and safety of people, research should be expanded to include interiors such as hospitals, schools, and nursing homes.

One notable limitation encountered during this study was the lack of literature dedicated specifically to exploring the correlation between physical health issues and their association with nature.

My most significant results related to how biophilic design affects the circadian rhythm, respiratory health, psychiatric disabilities, cardiovascular disease, mental health, and sustainability. From conducting this research study, I have learned about the importance of incorporating biophilic elements into interiors. The subtle benefits discussed when taken in isolation may seem small but the overall benefit to human health is remarkable and worthy of further research and exploration.

The outcome of my research process is that biophilic design within interior architecture can significantly improve mental health and well-being while contributing to the environment, even when implementing minor elements of this approach within interior spaces.

List of Images

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Figure 02. – Sanghamitra Chandra. (2023) *Interior of Case Study 1: Wow Burger, Dublin*. Available at:

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Figure 06. – Cantina Cangu. (2023) *Interior of Case Study 3: Cantina, Indonesia*. Available at:

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