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Undergraduate Dissertation

Biophilic design and the implications it has on the user's well-being and their ability to reconnect to nature within the kitchen space

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Abstract

This dissertation explores the concept of biophilia and biophilic design within the kitchen space and how the user's ability to reconnect to nature has thus been impacted. The data collection section involved the gathering of quantative and qualitative means through the dispersal of questionnaires and the conducting of an interview. The data has shown that the awareness of biophilic design is expanding, and individuals are beginning to realise their kitchen areas are in essence, non-biophilic. Furthermore, it has been discussed that natural materials, dynamic lighting and increased presence of greenery dramatically improves the user's ability to reconnect to nature. This can also have extensive positive impacts on an individual's health and wellbeing which is sufficiently supported by existing literature such as ART and SRT. Previous research into long-term illnesses such as dementia has reinforced these expected benefits through stating that the incorporation of biophilia into the living space can lead to a better quality of life for individuals in long-term residential homes. Restoration projects have also been discussed to analyse the outcomes of the report which highlight numerous cognitive, psychological, and physiological benefits from introducing specific biophilic patterns in these spaces.

This research study has provided an expansion of knowledge in the field of biophilic design since it has provided an insight into the importance of introducing aspects of biophilic design specifically within the kitchen space, an area in which has been underexplored.

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Glossary

HIC – High Income Countries

LIC – Low Income Countries

UN – United Nations

SDG – Sustainable Development Goal

ART – Attention Restoration Theory

BIDI – Biophilic Interior Design Index

SRT – Stress Recovery Theory

QoL – Quality of Life

Introduction

The increasing pressure, both on the High-Income Countries (HIC) and Low-Income Countries (LIC) to resolve global issues through creative solutions has become of paramount importance to achieve global sustainability. In 2015, the United Nations (UN) released a global blueprint known as the Sustainable Development Goals (SDG's) to all UN Member States highlighting the 17 issues to act and improve upon (United Nations, 2015). The United Nations (2015) also covers the issue of health and aims to "promote well-being for all at all ages" under the SDG three blueprint. Through establishing a deeper understanding of biophilic design and how it affects user's within the home, this dissertation study will provide supporting literature which promotes the importance of improving health and well-being amongst all ages. Fundamentally, the research conducted in this report surrounding the social impacts of biophilic design in the kitchen space will widen the existing knowledge, bridge the current gap in literature surrounding biophilic kitchen spaces and promote the awareness of the health and well-being SDG.

The recognition and understanding of biophilia which is the term used to describe the "innate biological connection between people and nature" (Browning et al., 2020:12) is expanding in the UK (Interface, 2015). Many areas of the UK have become significantly urbanised and has consequently produced a divide between people and nature. Kellert et al (2008) goes on to reinforce this by describing humans as becoming alienated from nature. It's clear that the built environment has become unbalanced and has divided the community from the natural environment. This may be driven by economic factors playing a significant role in design and development of the built environment. Social and environmental factors were often not at the forefront when creating the built environment. However, with the emergence of literature exploring the benefits of different building approaches, it is evident that creating an environment that is focused on the concept of biophilic design has substantial positive impacts on both the individual's wellbeing and the community. In essence, this has bought social and environmental factors back in-line with the predominant economic aspect that is used to pave the way for the built environment. Thus, the equal recognition of the highlighted factors is effectively creating a more sustainable approach to design and construction which neatly ties in with contributing to and resolving some of the

underlined SDG issues. Furthermore, restoration projects have clearly identified the opportunity to recreate the built environment that is tailored towards bridging the disconnection between humans and nature whilst retaining a cost-effective plan.

Thesis Statement

The concept of biophilic design has become an increased focus point when designing a kitchen space since users can deepen their reconnection to nature through the implementation of natural material, lighting and visual or non-visual connotations of nature. Presumably, this will positively impact their health and wellbeing from a physical and mental outlook

Aims

- To review how biophilia allows users to re-establish a connection with nature to understand the concept of biophilic design and the reasons for a user's response
- To explore the ways in which biophilic design integrated within a kitchen space can improve a user's health and well-being from a psychological and cognitive perspective
- To identify key attributes of biophilic design that is preferred in current kitchen styles and how this impacts a user's reconnection to nature

Objectives

- Explore current literature surrounding the concept of biophilia and how this has developed within various sectors
- Collect and construct a sample of data to make critical links between biophilic kitchen areas and the benefits on a user's health and well-being
- Analyse the data derived from the research study and assess the fundamental attributes that impact a user's reconnection within the kitchen space

Structure of Dissertation

This dissertation will explore the concept and frameworks of biophilic design and how the users within a kitchen space responds from both a health and well-being perspective. The literature review will analyse and evaluate current research surrounding the proposed topic

to form critical links and arguments. Further in this report, a detailed methodology will explain how the data has been obtained and how each data collection set will answer the objectives highlighted. Subsequently, there will be an extensive analysis of the data collected which will then be discussed to identify links between this data and current literature to ensure this dissertation is credible and supported. Following on from this, all the critical findings will be summarised in a clear and concise manner and will conclude this dissertation study.

Literature Review

Introduction

The predominant aim of this literature review is to explore current research surrounding the effects biophilic design has on the users mental and physical well-being. There is a large amount of research regarding the psychological and cognitive benefits from incorporating biophilic design in the commercial or hospitality sectors (Yin et al., 2018). However, there is a crucial gap in literature encompassing the impacts on a user in the home environment, more specifically, the kitchen space. Within this section of the dissertation, various topics will be explored including the concept and framework of approaching biophilic design. In addition to this, this chapter will draw upon the impacts biophilic design has on the users within the commercial and hospitality sectors. This will contribute to an understanding of the specific cognitive and psychological benefits a user will experience in a biophilic space.

Biophilic Design

Biophilic design is a concept that has evolved from the wider understanding of biophilia and is becoming increasingly more recognised in the architectural industry (Wijesooriya and Brambilla, 2021). It is a method used by architects when designing living and working environments to satisfy an occupant's innate desire to maintain or re-establish a connection to nature (Interface, 2015). Browning et al (2014) goes onto expand on this concept by establishing the '*14 Patterns of Biophilic Design*' and breaks it down into three main categories: 'Nature in the Space', 'Natural Analogues' and 'Nature of the Space'. These categories provide insight into the fundamental ways which users may experience nature, whether it is through representations, direct or indirect experiences.

'Nature in the Space' refers to direct or physical contact with nature which can be represented through visual and non-visual connection, non-rhythmic sensory stimuli, thermal and airflow variability, presence of water, dynamic lighting and lastly, the connection with natural systems. A prime example of how a user may sustain direct contact with nature is walking through a forest or feeling a breeze through a room which is respectively a visual and non-visual connection with nature (Stewart-Pollack, 2006). 'Natural Analogues' are more concerned with non-living, organic, and indirect representations of

nature. This may be in the form of biomorphic forms and patterns, material connections with nature, complexity, and order. 'Biomimicry' which refers to recreating "forms and function found in nature" is the term used to reinforce the concept of natural analogues and how they are represented (Kellert and Calabrese, 2015:18). It is evident that 'Natural Analogues' is more concerned with the functional solutions to an individual's disconnection with nature moreover aesthetical solutions. Pawlyn (2016) illustrates how the rigidity and structure of bamboo which is classified as a type of grass, allows it to exceed 40 meters in height with minimal compromise to its stability. Therefore, skyscrapers and tall structures look towards nature, more specifically bamboo for its biomorphic forms and patterns to resolve the problems humans face in construction and stability at height. 'Nature of the Space' is concerned with the layout and the spatial configuration of the space which expresses prospect, refuge, mystery, and risk. These patterns help to understand how and why individuals respond to designs differently since everyone is different on how they define these four patterns. For example, Kandel et al (2013, cited in Browning et al., 2014) mentions that short term stress can be caused by leaning over a banister to several floors below since a majority of individuals will perceive this design or experience as risk and peril. On the other hand, a minority of people may experience this differently since they perceive it as mystery and do not perhaps experience the same level of stresses compared to the majority. Although people often identify risk and peril as dangerous and uninviting, it can have measurable positive impacts on their physiological health when exposed purposefully in design such as improved cardiovascular health.

Biophilia can allegedly be linked to three mind-body systems, including cognitive, psychological, and physiological (Browning et al., 2014). The cognitive aspect focuses on an individual's mental agility and memory which can be heavily depleted through energy intensive tasks, whilst psychological responses deal with an individual's alertness, emotions and behavioural characteristics. Physiological systems have a prime focus on musculoskeletal, respiratory and overall physical health. Öhman's (1986) study explores the effects biophilic design has on an individual's psychological response by exposing the subjects to various images which included, snakes, spiders, frayed wires and guns. The study deduced that these images caused a response in neurological activity; however, the images of wires and handguns did not. Similarly, Biederman and Vessel (2006) study produced the

same results whereby the individuals responded deeper to an image of a Japanese garden with water. Browning et al (2020) discusses the science behind how humans respond to different visual stimuli. In essence, as the images are processed in the visual cortex of the brain, various neurons are triggered causing an initial response or spike in activity. The further the images travel in this visual cortex of the brain the more neurons are triggered, ultimately leading to higher psychological activity and generating a more pleasurable response. A theory mentioned by Kaplan and Kaplan (1989) further supports this as they emphasise that experiencing nature can result in a quieter prefrontal cortex since neurons are being triggered in the visual cortex and therefore, restores a user's overall cognitive capacity.

Contrary to this, research has also suggested that everything is a part of nature including all that humans design and make as they are each an addition of the human's phenotype (Browning et al, 2014:8). This inclusion involves everything from paperback books to plastic chairs. Therefore, it can be argued that all images or stimuli that are man-made creations should cause a similar level of response to images of nature meaning subjects should not be 'indifferent' to the control variables. Alternatively, Kellert et al (2008) discusses how some biophilic architects believe you can only get neurological nourishment from direct, physical contact with nature. In addition to this, they argue that ornamented forms and patterns are derivative of biological forms and therefore only provided a second-hand experience. Therefore, Kellert et al (2008) argues that the study conducted by Öhman (1986) isn't representative of the true level of response from nature but profoundly disagrees with Browning et al (2014) who mentions that everything is an extension of nature and humans should hypothetically respond to all creations.

Biophilia has become a complex understanding of a human's innate connection to nature which has evolved to encompass an array of values to better comprehend this concept (Kellert, 2002). There are eight identified values of nature, some examples include attraction: the appreciation of nature, exploitation: the desire to utilise and materially exploit the natural world, dominion: the urge to master and control the natural environment, and symbolism: the symbolic representation of nature through image, language and design (Kellert, 2012, XII). The biophilic values are embedded within

individuals and may explain how biophilic design initiates positive behavioural changes based on their value and perception of nature. Kellert (2002:132-136) illustrates the importance of these values at different stages of an individual's childhood and discusses how this impact their relationship and bond with nature based. It is mentioned that 3-6 year olds are developing their understanding of nature through the values and expressions of exploitation, dominion and aversion in order to satisfy their material and physical needs Kellert (2002). From the stages of 6-12 years old they become more appreciative and comfortable and therefore express affection, attraction and symbolism towards nature. Lastly, 13-17 year olds become more attuned with nature and their neurological processes become systematic and abstract. At this stage they develop their final values of nature which include spirituality, reason and naturalistic. However, naturalistic has since been removed in the model presented in Kellert (2012) for better understanding and thus reduced it to eight values. The biophilic values are not limited to these age groups and in some circumstances, adults may value the exploitation of nature rather than reason or spirituality that they are intended to develop in their later teenage years. Overall, the highlighted values provide an insight into how individuals relate to the natural world and thus, provide a deeper understanding of how individuals respond differently to various biophilic design patterns or stimuli (Meltzer et al., 2018 and Richardson and Butler, 2021). Additionally, Gillis and Gatersleben (2015) indicate that one specific biophilic pattern will not satisfy every type of individual or biophilic value, instead biophilic design needs to consider the target audience and tailor the experience to their value of nature. This idea is further reinforced by the restoration on the Kickstarter Commercial Headquarters where a balance between two patterns proved to be more effective than the size or frequency of the biophilic features (Nestor and terrapin Bright Green, 2016).

The growing disconnection humans have between themselves and nature reinforces how important the concept of biophilia is to re-establish a connection and promote the implementation of biophilic design. Even though humans have a biological need to interconnect with nature, it is not a hard-wired birth-right and individuals must therefore have a sustained engagement with nature once re-connectedness has been established (Kellert, 2012). Consequently, a human's innate need to connect to nature is one that must be cultivated and earned, whereby the level of exposure must be at the right level to avoid

biophilic value atrophy. This may infer that people who atrophy from nature may become more negativistic and avoid nature which represents the aversion value. However, Ikei et al (2017 cited in Browning et al, 2022:6) conducted a test on the response of the nervous system when touching different types of natural materials including marble, stainless steel, tile and white oak. The study concluded that the parasympathetic portion of the nervous system (which controls how restful and calm individuals are) had increased activity when the palm was placed on the white oak compared to the three other materials. Vessel (2012 cited in Browning et al 2022) discusses how an individual's brains makes associations with nature through a process known as semantic processing. This involves subconsciously linking wood to trees, tress to nature, nature to life and thus explains why an individual's parasympathetic nervous system is subsequently triggered at this stage. It is evident that not only do individuals need to cultivate and sustain their own connection to nature to avoid atrophy, but they will also need to engage with the correct patterns, processes and materials that will biologically trigger a response and connection to nature.

In addition to this, research has suggested that an individuals' desire to connect with nature serves as a fundamental adaptive function known as psychological restoration (Van den Berg et al., 2007). Attention Restoration Theory (ART) provides a useful account of these presumed restorative qualities of nature as it proposes that an individual's capacity to avoid temptations and distractions is essentially lessened when they are exposed to environments that require prolonged and intensive use of direct attention (Kaplan and Kaplan, 1989). Thus, individuals may experience symptoms of directed attention fatigue, including the increased difficulty to concentrate, amplified irritability and the increased likelihood of errors occurring on tasks that require concentration. Kaplan (1995) proclaims that this condition puts a person at a greater risk of being confronted with stress as they do not have the necessary cognitive resources to cope with everyday demands. This can be counteracted through a stay in an environment that does not solely rely on the use of directed attention as this allows the fatigued individual to restore their cognitive responses and recollect their capacity to evade distraction. Natural environments are a prime example of this since Kaplan and Kaplan (1989) states that it offers the individual an opportunity to escape daily routines that dominate their direct attention. Additionally, the natural environment offers many beneficial stimuli and encourages the use of exploration and sense making skills which

maintains an effortless or involuntary attention span. Ultimately, this theory exists to explore the benefits of human affiliation to nature through its explanations of psychological restoration and how distinctive environments influence this condition.

Contrary to the positive benefits biophilic design has on the user, it is examined that some individuals are neurologically prone to dislike or become unresponsive towards nature. Kellert et al (2008) states that some biophilic architects strongly believe you can only fully experience and reap the benefits of nature from direct, physical contact and not simulated experiences. Simulated forms and man-made environments that mimic nature are considered second-hand experiences thus providing reduced positive impacts on an individual. Furthermore, it is apparent that not all human beings have an innate need to reconnect and, in some circumstances, dislike nature (Bixler and Floyd, 1997). Research suggests that an individual's strong disconnect and change in attitude towards nature is as a result of spending 87% of their time in a controlled and safe indoor environment to which they have become accustomed too (Klepeis et al., 2001). However, Bixler and Floyd (1997) mentions that these controlled environments can be the foundations of which to increase a user's exposure to nature within an indoor environment. Therefore, their dislike and negativistic values towards nature can be reversed and directed towards a strong attraction or dominionistic value instead (Kellert, 2012).

Office & hospitality evidence base

Extensive research indicates that the construction industry consumes over 50% of natural resources, 16% of global water supply and releases over 182.5 tons of CO^2 per year in general construction and transportation (Ardiani *et al.*, 2020). Crucially, Ardiani et al (2020) indicates that the concept of biophilic design is the missing link when approaching building design or restoration projects whilst simultaneously minimizing and mitigating the impact on the natural environment. Kellert et al (2008) refers to this new design paradigm as 'restorative environmental design'. Nestor and Terrapin Bright Green (2015) reviewed a restoration project on the Windhover art gallery on Stanford's campus to which biophilic design was at the center of the motion to restore this area. The restoration focused significantly on creating areas of refuge that helped to improve concentration, attention and perception of safety for students whilst minimising the impacts on the environment and

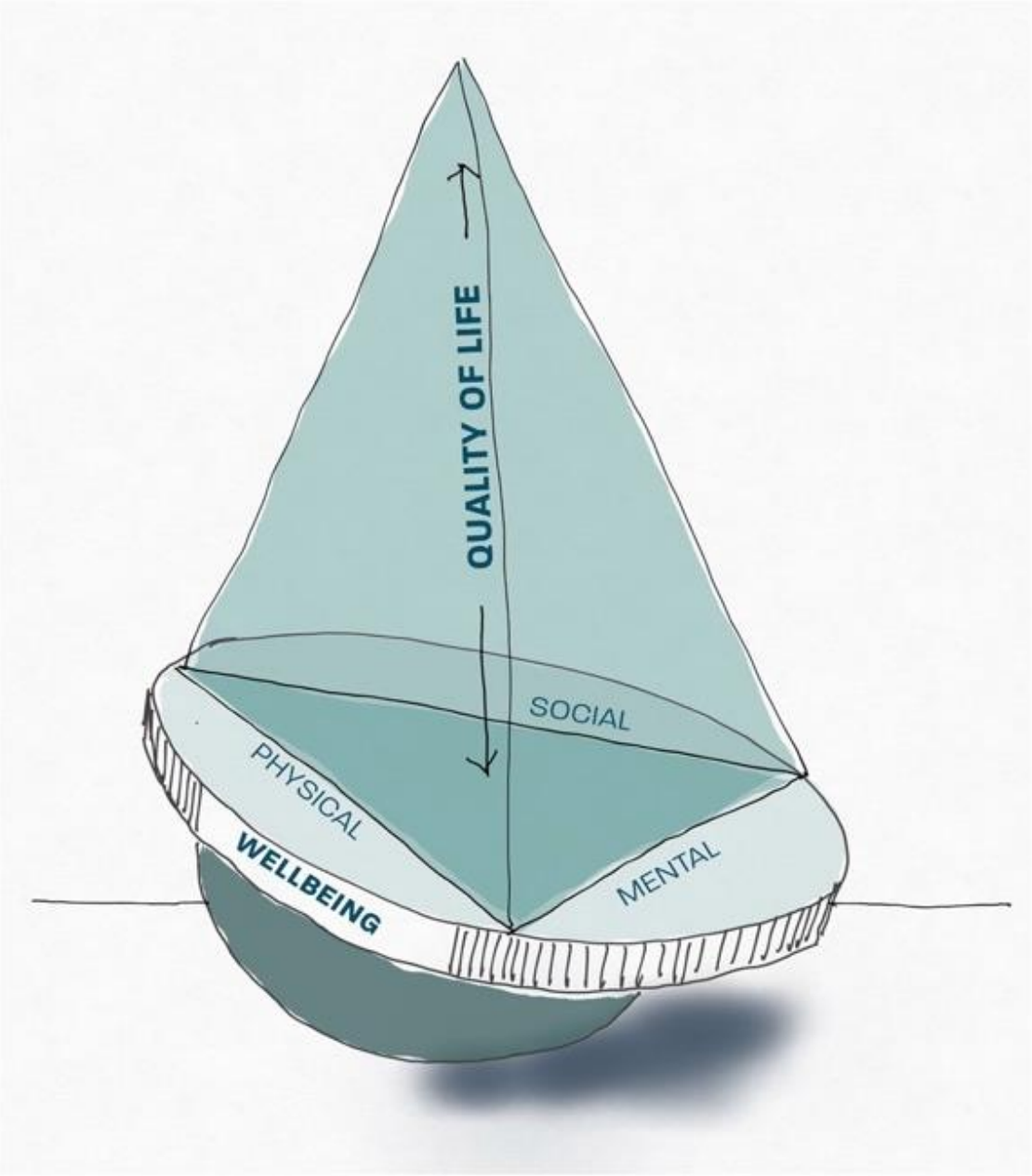
sustaining an engagement with nature. Although mental health issues and psychological restoration cannot be resolved solely by the built environment, it was evident through the Windhover project that an individual's environment is crucial to develop their well-being and enhanced the importance of restorative environmental design.

Through the wider understanding of the ART and the concept of biophilic design, various studies were conducted in office and classroom environments to discover the effects on the occupants. Yin et al (2018:258-259) created a Biophilic Interior Design index (BIDI) ranging from 0 to 54 which collected a user's perception and response towards biophilic and non-biophilic indoor environments. The findings showed that the office common area received a score of 27 out of 54 and generally rated as biophilic whilst the non-biophilic reception and classroom received 0 and 3 respectively. Furthermore, the 28 participants exposed to nature resulted in decreased negative emotions, improved short term memory by 14% and 3.6mmHG lower diastolic blood pressure. Similarly, Interface (2017) conducted a study on biophilic and non-biophilic lobby areas in a hotel. The results link onto the study conducted by Yin et al (2018) since it was discovered that users spend 11% longer in the biophilic lobbies due to the presence of nature over the controlled, traditional lobby. In essence, the findings from both studies are consistent with the ART and Stress Recovery Theory (SRT) but failed to provide insight into the optimum biophilic ratio or coverage to be classed as a biophilic environment. Lei et al (2021) explored this research gap through testing the responses and recording the eye-tracking data at 5 different desks, each desk representing a different percentage of foliage coverage. These results concluded that 12% greenery coverage is the optimum ratio that presented higher alpha wave responses, resulting in a more relaxed individual and thus improves psychological and cognitive health. In addition to this, research shows that solely the presence of nature reduces Sick Building Syndrome's (SBS) and reduces the rate of employee absence which has been enhanced by lack of connection to nature (Gray and Birrell, 2014, Kellert et al., 2008 and Elzevadi, 2011 cited in Heath et al., 2018). It is evident from these studies that biophilic workspaces and the presence of plants allows for an increased visual connection to nature which results in lower SBS symptoms, improved short term memory and improved psychological and cognitive health. This further reinforces the concept of biophilia in both living and working environments.

Residents with health concerns

Previous research suggests that biophilic design can have significant positive impacts on individuals suffering from dementia. An often simple but difficult task for individuals suffering with dementia is simply engaging with the outdoor environment which is a source of multi-sensory therapy (Chalfont, 2007:13). Consequently, this will lead to reduced sensory deprivation and improved well-being for individuals with dementia (Rappe and Linden, 2004 cited in Peters and Verderber, 2021). Furthermore, a study conducted by Riemersma-van Der Lek et al (2008) whereby 189 adults (most of which are diagnosed with dementia) performed a double-blind, placebo trial on the daylight conditions in areas of a residential home. The results indicated that the occupants of the rooms where increased daylight interventions were applied showed slower cognitive decline and less depressive symptoms. The results further reinforce the statement made by Baden-Powell (2005) in the 'Architects Pocket Book of Kitchen Design' that fatigue and depression can be linked to low light levels. It is evident that improving an individual's nature connectedness through engagement with the outdoor environment can be linked to an enhanced Quality of Life (QoL) and promote healthy ageing (Engelen et al., 2021 and Capaldi et al., 2014). Figure 1 further illustrates when a person's physical, mental and social attributes are in unison, QoL is improved, and well-being becomes balanced. Through encouraging the individuals suffering with dementia to directly connect with nature and exposing themselves to sufficient amounts of natural light, improvements will be visible in their cognitive, physiological and psychological systems resulting in a slower cognitive decline which follows the theory of the ART.

Figure 1 – ‘Conceptual model of the relationship between the triangle of well-being in healthy ageing and QoL’



(Engelen et al., 2021:20)

Summary

To summarise, it is fundamentally clear that biophilic design has significant, measurable impacts on an individual’s mind-body systems. These beneficial impacts can range from improved attention, concentration and mental well-being to increased cardiovascular health. The deeper understanding of the ’14 Patterns of Biophilic Design’ and the eight biophilic values towards nature, clearly illustrates that individuals have unique responses

but fundamentally need to affiliate with the natural environment. However, research suggests some occupants have become adapted to their built environment and present negativistic and strong dislikes towards reconnecting with nature. This may play a role in skewing the data collected for this study since user's spend up to 90% of their time indoors and thus the probability of the sample of respondents being negativistic towards nature is higher. Overall, the literature review has provided an extensive insight into the existing literature and highlighted the gap in knowledge of the effects biophilic design has on users within the kitchen space.

Methodology

Introduction

To achieve the outlined aims and objectives, it was concluded that the implementation of surveys and interviews was the most appropriate method to collect the data required for this study given the resources and time constraints. Therefore, both quantitative and qualitative sources of data were utilised. Quantative research uses a controlled design to examine phenomena using precise numerical measurements, whereas qualitative research examines phenomena using an in-depth research design that produces rich narratives (Rutberg and Bouikidis, 2018). Quantative research designs involve methods such as varying forms of surveys, whilst qualitative research involves approaches such as interviews and observations. In this instance, the most appropriate source of data collection was releasing surveys to the public and conducting an interview with a professional kitchen or interior designer. The use of attaining primary and secondary data is to create a structured and convincing argument that is both credible and evidential. In essence, the two sources of data will complement one another. The literature review helps to construct and direct the chosen data collection methods towards attaining relevant, real-time information which can be thematically analysed and discussed further in this study against the existing literature.

Method

The interview is responsible for collecting in-depth details and gaining a professional insight into the topic surrounding biophilic kitchen designs and how users may feel and respond within this space. For this reason, preferably showroom kitchen designers would be suitable for this interview. Either face-to-face or phone interviews will be conducted depending on the availability and location of the interview participant. For the purpose of this dissertation, 1-2 semi-structured interviews will be conducted and plan to be completed within 10-20 minutes. Although, due to the nature of semi-structured interviews, this time limit could be exceeded and participants will be informed that the interview length vastly depends on the detail provided. It will consist of 7 questions with opportunities to ask additional questions based on participants response or thought from a previous question. Figure 2 illustrates the questions that will be asked and purpose of this question in relation to the dissertation topic.

Figure 2 – Interview Questions

Question	Purpose of Question
What do you think are the key attributes when designing a kitchen space?	Question will introduce the areas in which are considered important aspects when designing a kitchen space.
Would you be able to discuss how you would design a kitchen space from your lead taking to the reveal and close stage?	This will provide insight into the design journey and whether the customer has an option to amend their kitchen based on their preferences. This question may provide an insight into how often a customer amends the design and if the designer tailors a design to be biophilic than their current kitchen layout.
Do you believe your clients focus is on bringing aspects of nature inside and/or improving the levels of natural light? For example, where possible do they include Velux windows or perhaps include more solid/naturally occurring materials such as granite or oak.	Previous research shows that light is an incredibly important aspect in feeling connected with nature and improving physical and mental well-being. This question will provide detail into the customers priorities within the kitchen space and assess whether there is an increase in acknowledgement of biophilic design present in the kitchen design industry.
Do you feel earth like tones contribute more than white/grey tones to a client's interconnectedness to nature and why?	This question aims to gain a professional insight into colour and how the designer believes each colour may affect a user's interconnectedness.
Research studies show that biophilic design significantly improves a person's cognitive function and productivity in the workspace.	Incorporating elements of the literature review will help prime the designer for the more in-depth and detailed questions. Particularly with this question, the aim is to

To what extent do you agree with this research and how do you feel a kitchen space that's traditional and perhaps focused on including natural colours, shapes and textures could impact a user's health or wellbeing?	delve further into a designer's perspective of how their products may impact a user's level of reconnection and thus how it will impact their well-being. There is a clear gap in literature surrounding the implications biophilic design has on users within the kitchen space, hence, this question aims to bridge this gap.
Not everyone desires a connection to nature since they are used to the built environment. Do you feel there is an upwards trend of people leaning towards monochromatic themes compared to earth like tones?	The presence of white and grey tones in our modern, built environment is significant. This question aims to investigate how the industry has been affected by this move and if users prefer to include colour in their kitchen which can be considered a spot of refuge and prospect in their home. In addition, this may trigger a more detailed response into the designer's experiences with users who do not desire a connection to nature and how they have been impacted by their kitchen design.
Do you believe that biophilic design could increase the amount of time an individual spends in their kitchen and become a prominent space for them to seek refuge?	Previous research shows individuals spend 90% of their time indoors. This question aims to see if the proportion of the time spent in the kitchen can be affected by incorporating successful biophilic design aspects such as oak worktops, presence of stone or a direct view to nature. This may help to provide insight into the expected benefits if a user would spend more time in a biophilic kitchen.

The purpose of releasing a questionnaire to the public is to gain invaluable data on people who use the kitchen space and how they feel certain design aspects have implicated their health and well-being. The questionnaire will predominately be closed-ended questions and aims to take approximately 5-10 minutes to fill out. It will be divided up into 3 sections, each section aiming to gather various responses and data ready to be thematically analysed against the interview data. The questionnaire will be constructed using google forms and released as a link through various social media platforms such as LinkedIn and Facebook to reach the desired target audience. The target audience will be any member of the public aged between 18 -75+ although for the purpose of the questionnaire, preferably between 25 - 65 as this age group may have experienced various kitchen styles and be able to provide valuable data on the subject. It aims to collect between 40 and 50 responses; however, if for any reason the responses exceed 100, the survey will be closed since a sufficient sample of data will have been collected.

Figure 3 shows the list of questions that will be asked to collect data in relation to the study. Section 1 includes questions 1 to 2 which aims to receive consent and establish their age bracket ahead of the remaining questions. Section 2 ranges from question 3 to 10. The purpose of this section is to attain information on the user's current kitchen style and the industry trends in terms of materials, colour, and style. Section 3 ranges from 11 to 22 and focuses on how their current kitchen space affects their health and well-being, how reconnected to nature they feel and the extent in which the materials or textures impacts their health and well-being. The combination of section 1 and 2 will help to draw upon conclusions and create links, for example one individual may have a plain white, small kitchen with minimal greenery and lighting and feel impacted by this design, therefore the thesis statement can be accepted in this instance. As highlighted in figure 3, most questions are closed-ended to provide strong, reliable quantitative data except Question 15. This question aims to collect data regarding the type of aspects that improve their connection to nature and why this aspect has affected their well-being. In addition to this, question 12 focuses on the extent in which biophilia is present in their kitchen through a scale ranging between 1 and 10 (1=small extent, 10=large extent). This question will help to draw upon conclusions regarding the previous section and possibly indicate which materials, colours or textures may be considered biophilic in the public's eye.

Figure 3 – Biophilic Kitchen Design Questionnaire

Question no.	Question
1	Do you give consent for your responses to be used in this study?
2	What age bracket do you fall into?
3	On average, how many hours do you spend in your kitchen per week?
4	How old is your current kitchen layout/style?
5	What style of kitchen unit doors do you currently have?
6	What worktop material do you have in your kitchen?
7	What colour theme have you used within the kitchen space?
8	What size kitchen do you currently have?
9	What type of layout does your kitchen follow?
10	Does your kitchen have any windows or glass exterior doors overlooking your garden?
11	Have you heard of the term biophilic design prior to this study?
12	In your opinion, to what extent does your kitchen space incorporate aspects of nature? For example you may consider the following features: materials used, layouts, textures, scenery, colour themes, the presence of plants etc.
13	If you were in the position to replace your kitchen, would natural materials/lighting/textures/aesthetics be a key focal point when creating your space?
14	Do you feel your current kitchen space supports your reconnection to nature?
15	If so, why do you feel your current kitchen supports your ability to reconnect with nature?
16	Do you feel natural solid worktops such as oak or granite is more effective at improving your reconnection to nature compared to laminate or engineered solid worktops which are designed to look similar but feel more man-made?
17	Do you feel the different style of kitchen unit fascia's (shaker, slab panels etc) can affect your health and well-being differently when utilising the kitchen area?

18	A study conducted by Lei et al. (2015) indicates that 12% greenery was the optimum ratio within a workspace to improve a user's physical and mental health. Do you feel your current kitchen space has a similar level or more of greenery/plants?
19	If not, do you feel your health or well-being has been subsequently impacted from the lack of greenery/plants?
20	Do you feel increased levels of natural light within the kitchen vastly improves your ability to reconnect to nature?
21	Do you feel you would spend more time within the kitchen space if the level of greenery present increased, and/or your ability to feel reconnected to nature was improved?
22	After conducting this study, would you focus on creating a more biophilic kitchen space and/or increase the levels of greenery present in future refurbishments?

Ethics and Data Protection

It is of paramount importance that ethics and data is to be taken seriously within this study. Either written or verbal confirmation of participation will be asked prior to data being collected in both the questionnaire and interview. All responses made within this study will be kept anonymous in line with GDPR laws and regulations. Furthermore, all the data collected will be kept secure on a password-protected device and stored until October 2022. If the participant decides to withdraw from the study, an email will be provided in the instance of the questionnaire and contact details will have been established with the interview participant. Once the request to withdraw has been submitted, all data regarding this individual will be immediately deleted.

Time Management

Figure 4 breaks down this dissertation into four phases: 'initial preparation', 'literature review', 'methodology & analysis', and 'review'. Imbedded within these phases are the specific tasks required to complete and progress onto the next stage of the dissertation. Phase 1 includes the general preparation of the topic to study which includes preliminary

research and introduction. The timeline allowed 6 weeks to be allocated to this phase and the study remained within this time frame. However, as figure 5 illustrates, the introduction was amended several times throughout the secondary research stage due to new findings and understanding of the topic. In retrospect, the introduction should be placed within stage 2 alongside the secondary research stage.

Phase 2 included the literature review section of the dissertation as well as the proposed methodology. The bulk of the secondary research was collected within the permitted timeframe, although drafting did not begin until week 10 as shown in figure 5. This resulted in the remaining tasks being pushed back and the time remaining only allowed for one week per task which proved to be inefficient and caused the literature review task to become condensed which could have inflicted on the quality of work presented. Successively, the research report outline was submitted on week 13 and reclaimed some of the lost time.

The methodology and analysis are responsible for a large proportion of this dissertation due to the nature of collecting two sources of primary data and the extensive analysis required to construct a clear and concise report. Phase 3 allowed up to 5 weeks to be allocated to the results and analysis task to ensure enough time was available to critically analyse the survey results and the interview data. However, the timeline failed to consider the difficulty in attaining an interview as illustrated in figure 5. Contact was made with numerous kitchen designers. Unfortunately, 3 weeks after contact had been made, some stated that they were extremely booked up for a further 3-4 weeks and others failed to respond to any emails or phone calls made to organise this short interview. Fortunately, through persistence, a kitchen designer responded to my call for an interview which was conducted in week 11, 7 weeks after the original deadline for this task. Clearly this resulted in a significant delay to complete the transcript and analysis for the interview. Although, the analysis of the survey was completed in week 10 which helped to alleviate some of the stress and considerable time lost in the effort to attain a source of qualitative data.

Ultimately, phase 4 involves reviewing and formatting the dissertation ahead of submission. Due to phase 3 considerably overrunning from poor contingency planning, the planned tasks within phase 4 was collated into one week to allow for the discussion and conclusion

sections to be completed. Referencing and formatting were crucial in this stage to avoid plagiarism hence, these tasks were prioritised amongst the proposed tasks given the circumstance of the situation. The review phase was completed within the remaining week and the final dissertation version is due to be submitted on time after overcoming the significant interview delays and reclaiming lost time.

Figure 4 – Major Research Project Timeline

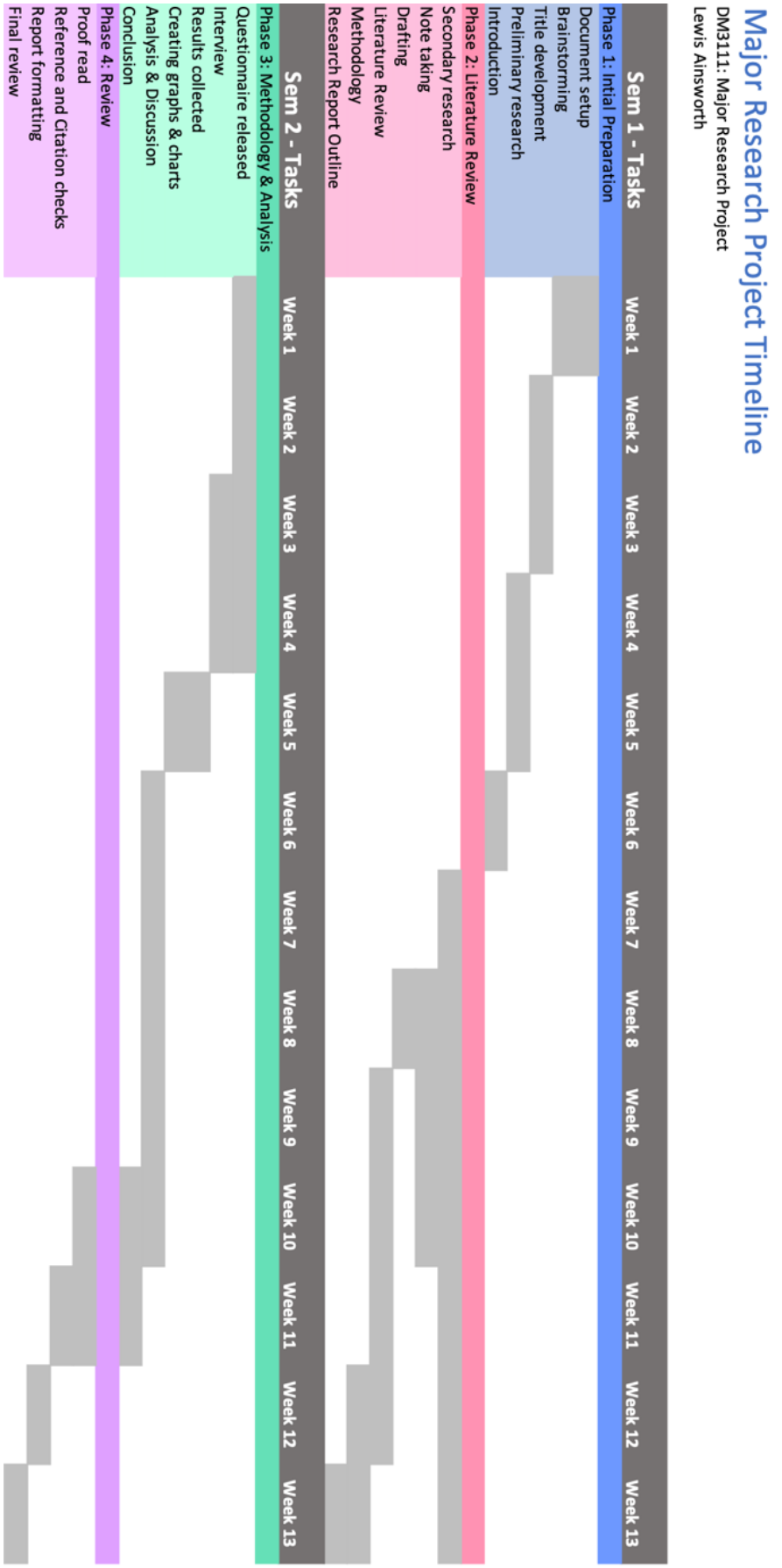
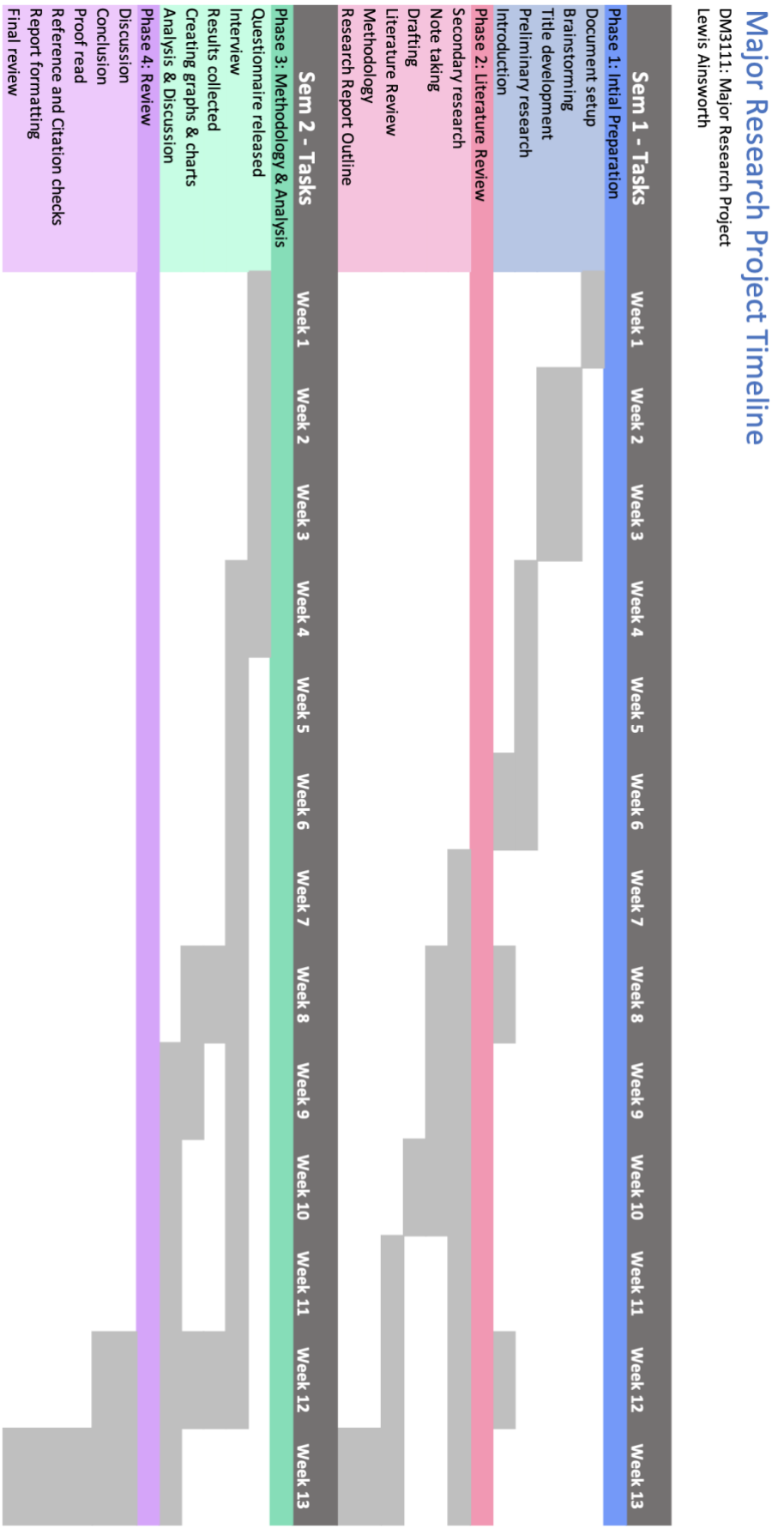


Figure 5 – Actual Major Research Project Timeline



Results & Analysis

Introduction

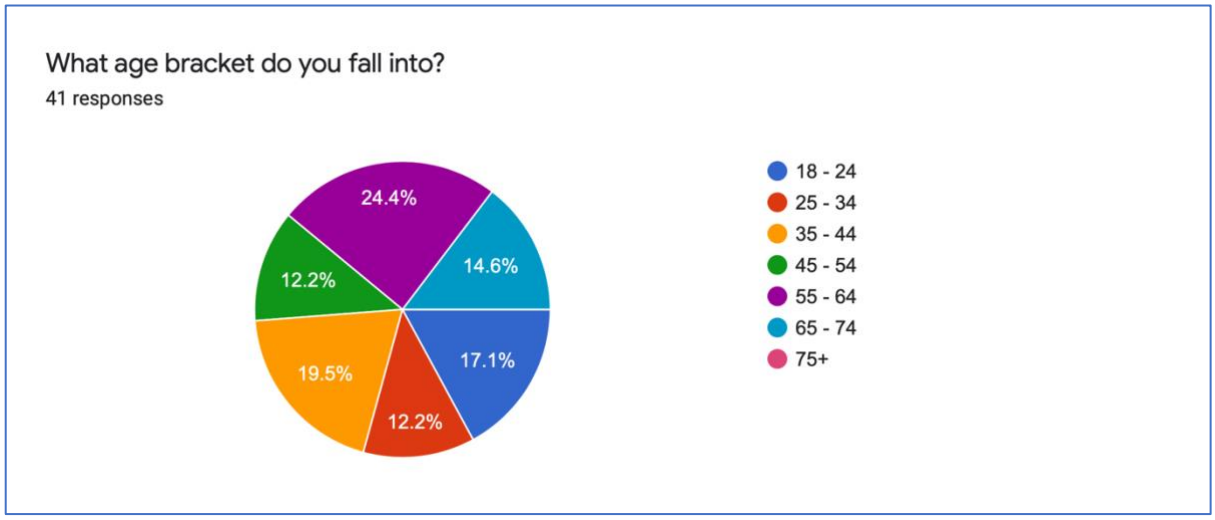
The questionnaire aims to collect a sufficient set of results ready to analyse and provide insight into the various attributes that users are impacted by within the kitchen and how their health and well-being has been affected. The questionnaire was released on week 4 of the semester and closed on week 8 after collecting the proposed quantity of participants. It successfully collected 41 responses through dispersing the link onto various social media platforms such as LinkedIn and Facebook. For the purpose of the analysis section, the questionnaire will be divided into two segments. Segment one includes both sections 1 and 2 of the questionnaire since this segment predominately focuses on the user's current kitchen layout ahead of section 3 of the questionnaire. Whereas segment 2 will solely analyse section 3 of the questionnaire which includes 12 questions more specific to the topic of this dissertation. For the purpose of this study, some questions from section 1, 2 and 3 have been removed from the analysis due to their minor irrelevance in providing insightful data towards to topic.

Through contacting various showroom kitchen designers, one participant agreed to take part in the interview. This was conducted as a phone interview with subject A and took place within week 11 of the semester and the transcript was completed by the beginning of week 12. The main objective of the interview is to collect data and ascertain the key biophilic attributes that have a pivotal role on the impacts to user's utilising the kitchen space. For the purpose of this section, the results from the interview are presented in Table 1 which highlights key themes identified from the interview through the process of thematic coding and analysis. The transcript can be found in appendix 4 whereby the themes have been collated form. Furthermore, the data provided from subject A provides a clear and concise sample of data and thus given the limitations in organising a second interview, this will be the sole source of qualitative data for analysis. Although, an additional interview would have been preferred to compare themes and improve research credibility.

Survey Analysis

Questionnaire section 1 and 2

Figure 6 - Age bracket sample chart



Fundamentally, figure 6 shows that the results collected throughout this survey is representative of all age groups specified. 68.3 % of participants (n=41) responded within the desired target range of 25-65 years old stated in the methodology. The most predominate age bracket is 55-64 years old accounting for 24.4% of responses.

Figure 7 - Average time spent in the kitchen chart

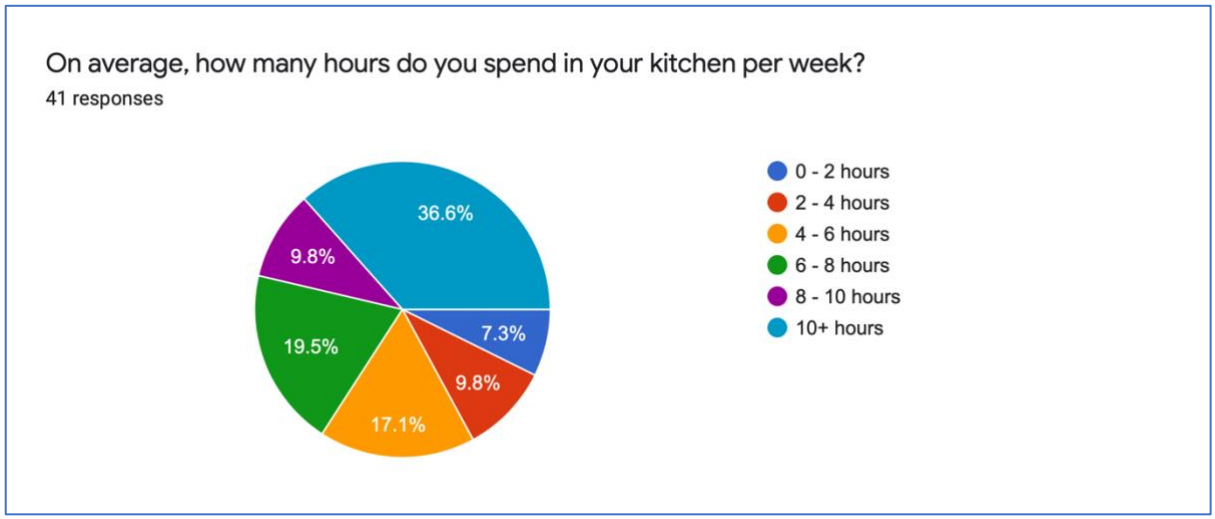
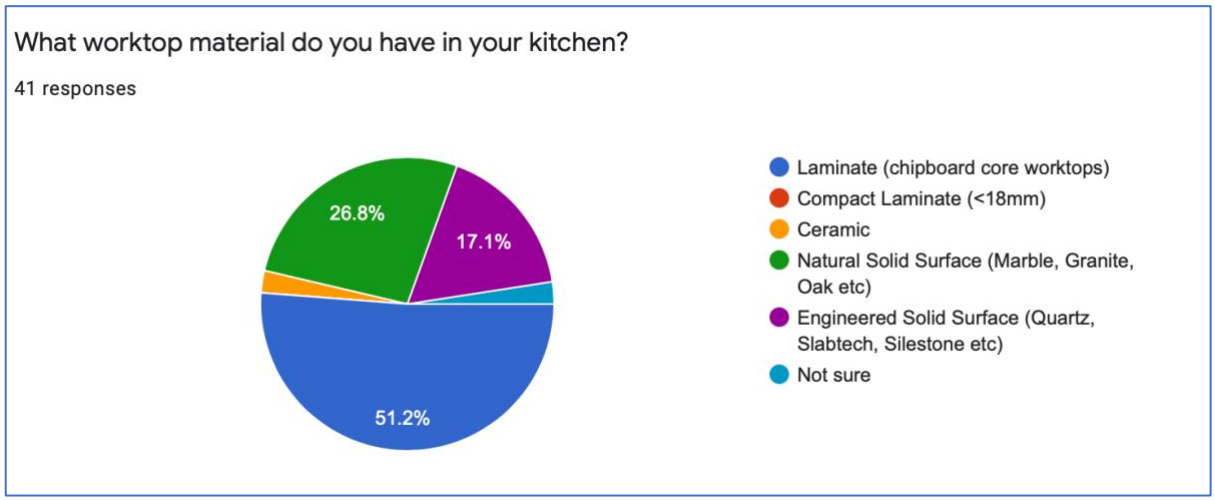


Figure 7 illustrates that 36.6% of respondents spends 10+ hours in the kitchen space per week further reinforcing the credibility of the results in section 2 and 3. Figure 7 also shows that 46.4% of users also spend on average between 4-10 hours within the kitchen space per

week meaning 83% of respondents spend between 4-10+ hours in the kitchen per week thus reinforcing the fairness and credibility of the sample collected.

Figure 8 - Current worktop material chart



A particularly intriguing statistic in figure 10 is the proportion of respondents who have laminate to natural solid worktops is approximately 2:1 which clearly shows that simulated natural worktops is the current trend and style for modern day kitchens. Although, the combination of natural and engineered solid worktops accounts for 43.9% of responses which is 7.3% less than laminate responses. This essentially means from the sample of respondents, 21 people have laminate and 18 people have engineered or naturally occurring worktops in their kitchen space.

Figure 9 - Colour theme of the current space chart

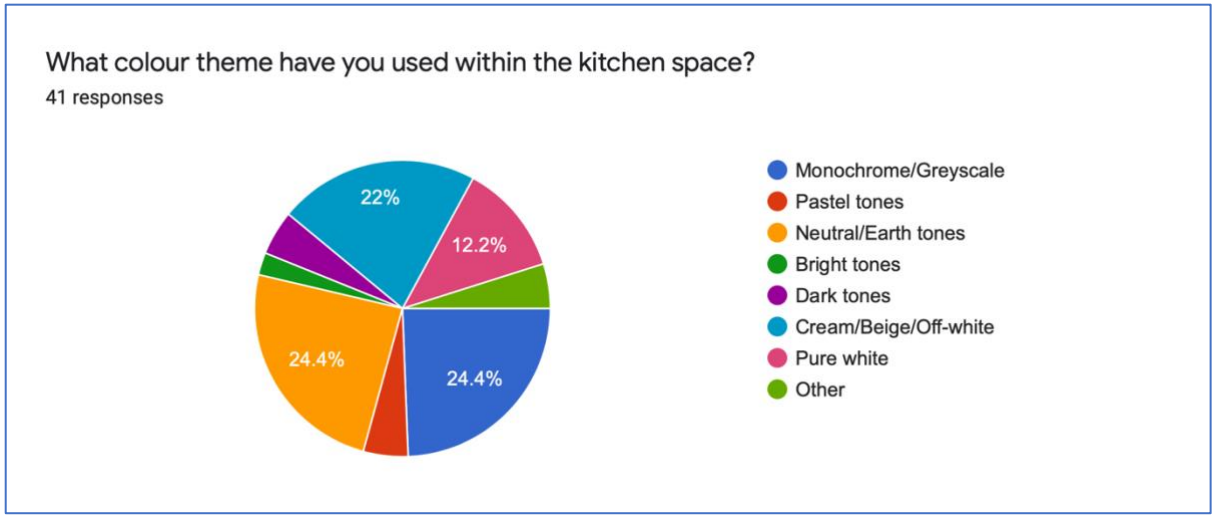
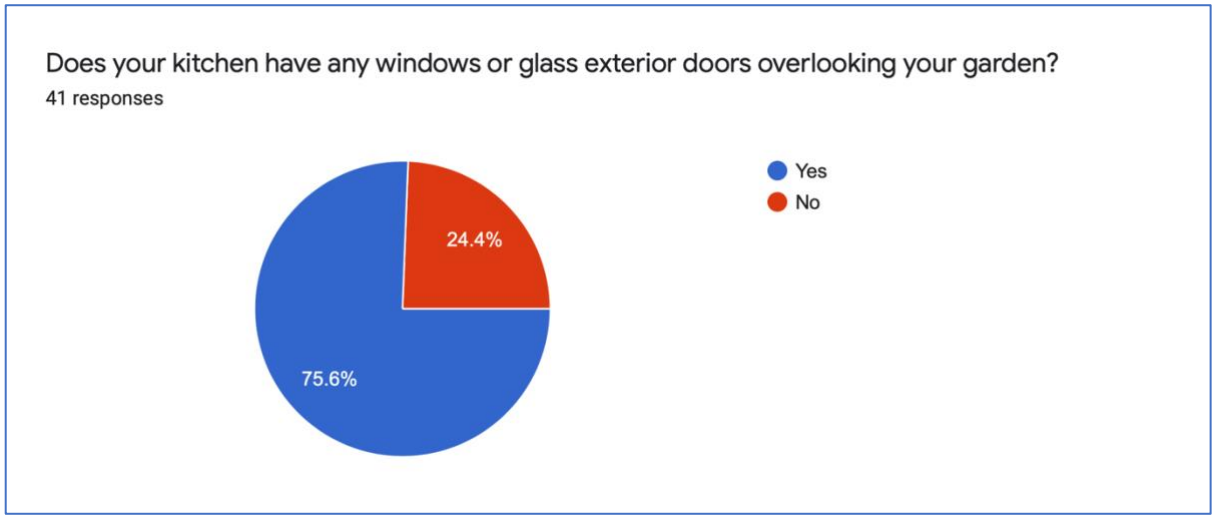


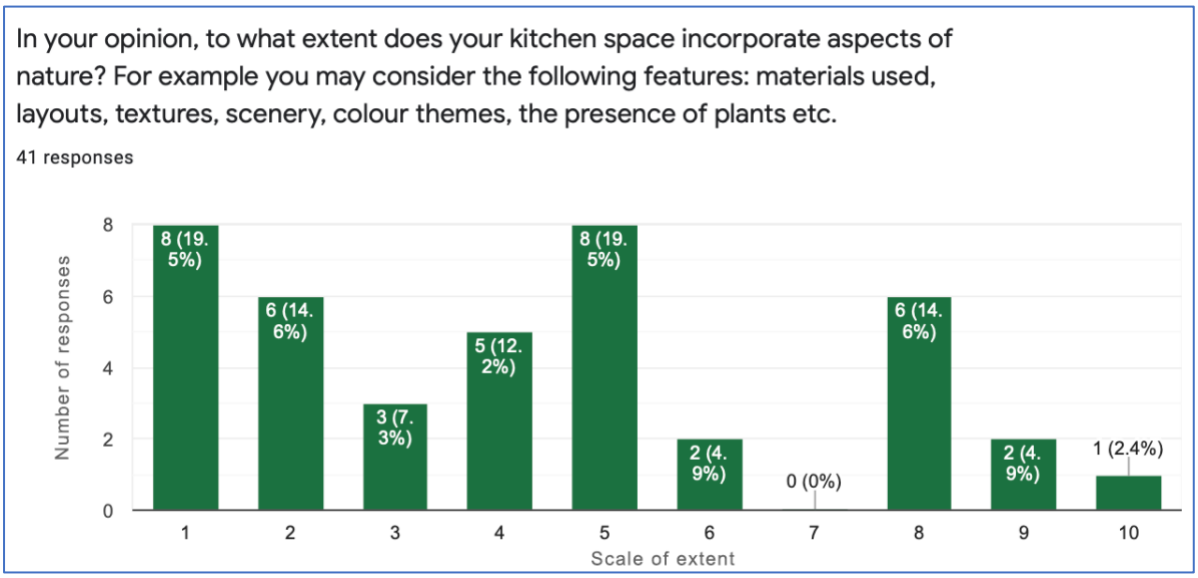
Figure 9 clearly shows from the sample collected, that there is no clear pattern as to the current colour trends; however, it does indicate that the bright, dark, pastel, and other types of tones not listed are unpopular or disliked only equating to only 17% of the data. Interestingly, figure 9 also shows the popularity between greyscale, earth and cream tones are essentially equal at 22%, 24.4% and 24.4% respectively. Unpredictably, the creams and beige tones represented a larger proportion of respondents over the whites with a difference of 9.8%, totalling a difference of 4 respondents.

Figure 10 - View of nature from the kitchen chart



To conclude section 2, figure 14 aimed to ascertain the proportion of kitchens that have a direct view to nature. Figure 14 shows that over 75% of the respondents have visual access to their garden although 24.4% of individuals do not. This indicates 1 in every 4 respondents have visual accessibility to nature or views overlooking their garden.

Figure 11 - To what extent biophilic patterns are present within the space chart



Clearly illustrated by figure 11, there is a wide spread of responses regarding the level of biophilic aspects present in the user's current kitchen space. However, 30 responses are between the extents of 1 and 5 indicating a significant proportion of the respondents have minor aspects of nature integrated within the space. From the collection of this data, the measures of central tendencies can be derived. The average scale of extent is calculated at 4.317 with a standard deviation of 2.672. From these sums, 52.54% of the data collected is within 1 standard deviation from the mean further reinforcing the wide spread of data present. This shows that 47.46% of the data can be considered inconsistent with the general trend in terms of the presence of nature within the kitchen space.

Figure 12 - Key attributes when designing a kitchen space chart

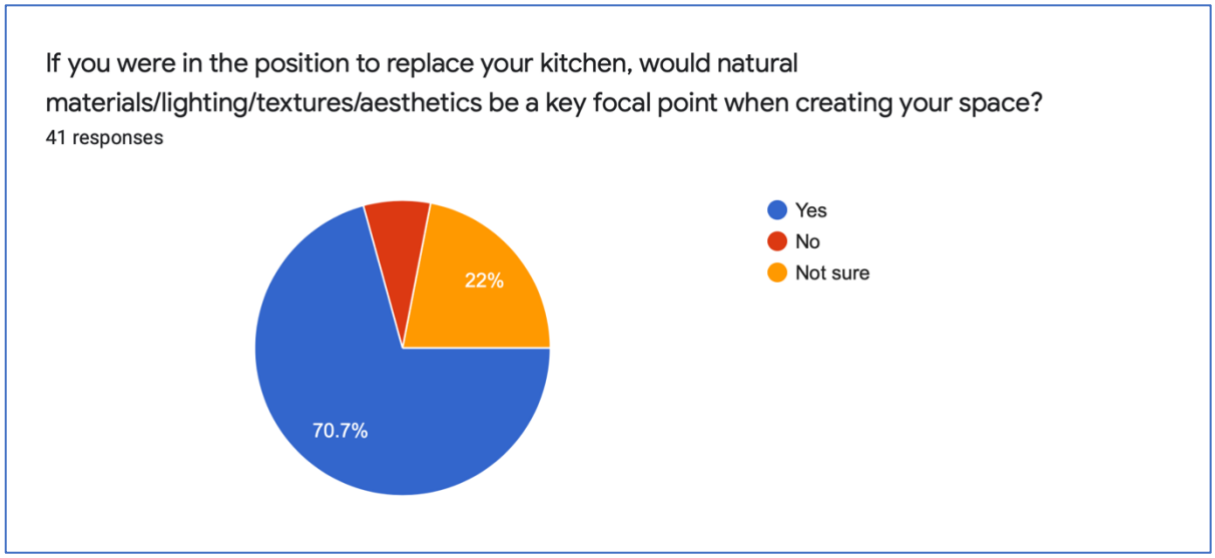
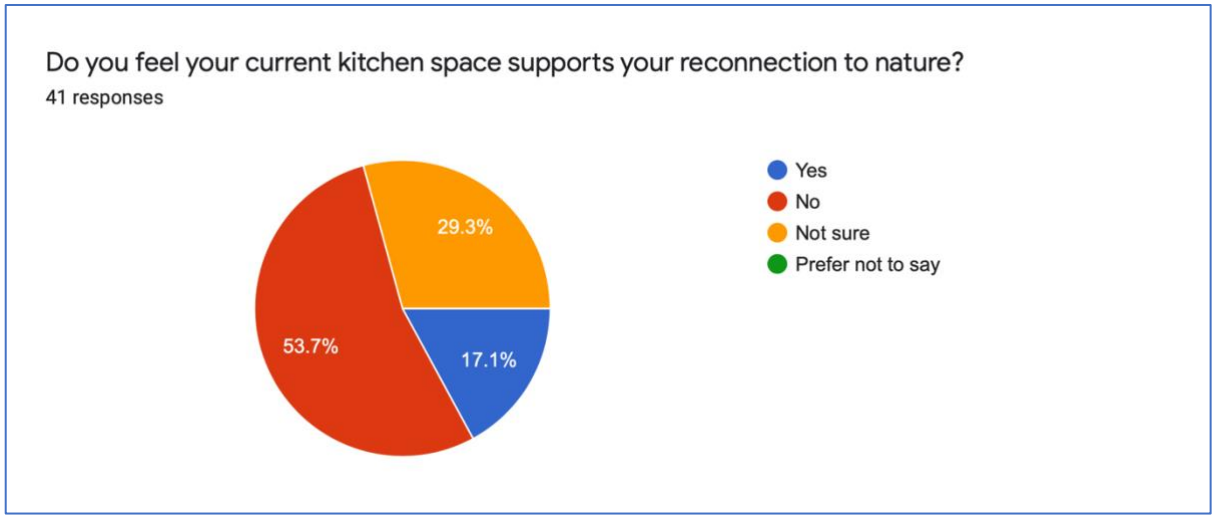


Figure 12 indicates that the main aspects within kitchen design would be a key focal point to 70.7% of respondents. On the other hand, 22% of respondents were unsure as to whether these aspects would be a key focal point. The results from figure 12 also show that 7.3% of respondents believed natural materials, lighting, textures, and aesthetics would not be a key attribute when creating their space. However, further data would be required to access the fundamental attributes that would be of importance to these respondents.

Figure 13 - Level of nature connectedness chart



It is patently clear from figure 13 that over 50% of respondents believe their kitchen space does not inspire or encourage reconnection to nature. However, 17.1% of respondents believe that their kitchen space encourages reconnection meaning 7 out of 29 participants who answered ‘yes’ or ‘no’ have a kitchen which supports the concept of biophilia. If the

remaining 29.3% of respondents who answered ‘not sure’ were certain of their level of reconnection to nature, the data can predict that an additional 9 of 12 respondents would answer ‘yes’ and 3 out of 12 would answer ‘no’ with regards to whether their kitchen supports their reconnection to nature.

Figure 14 - Laminate vs naturally occurring worktop materials chart

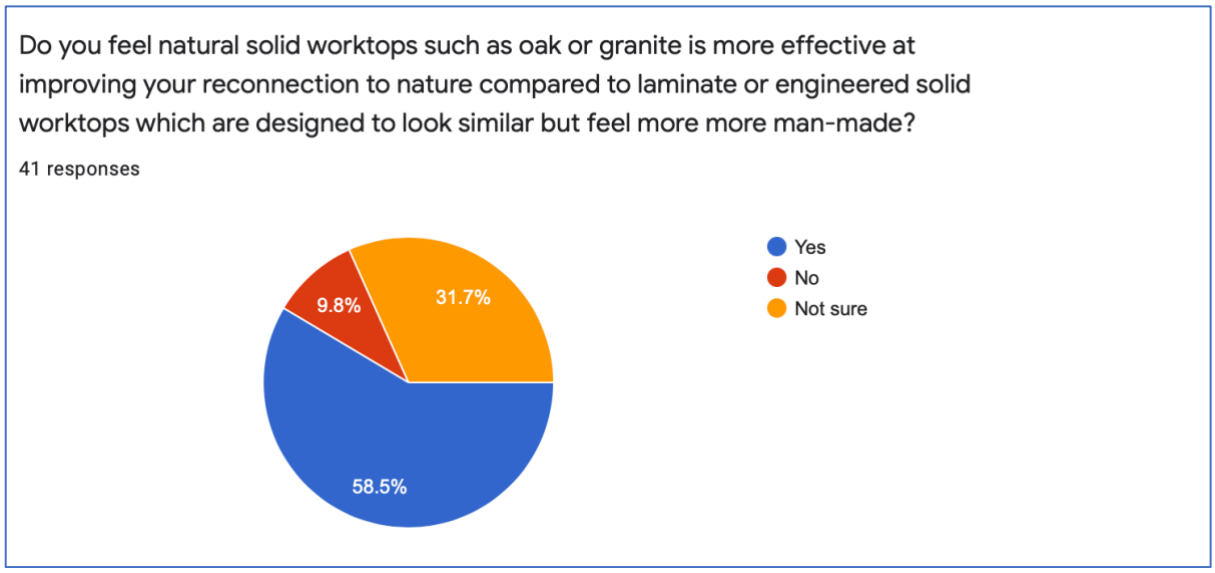
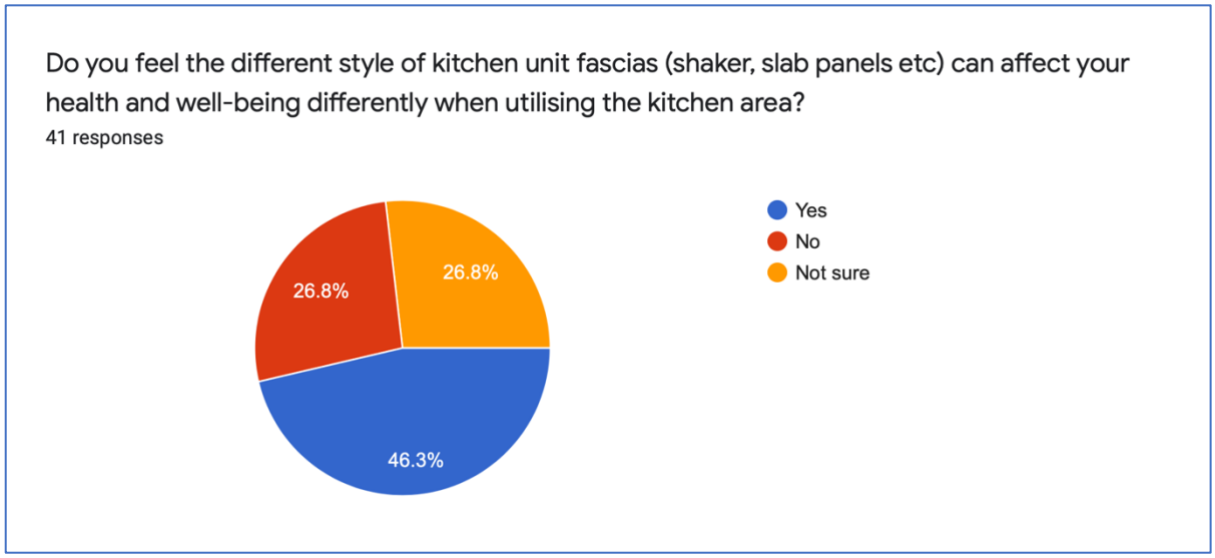


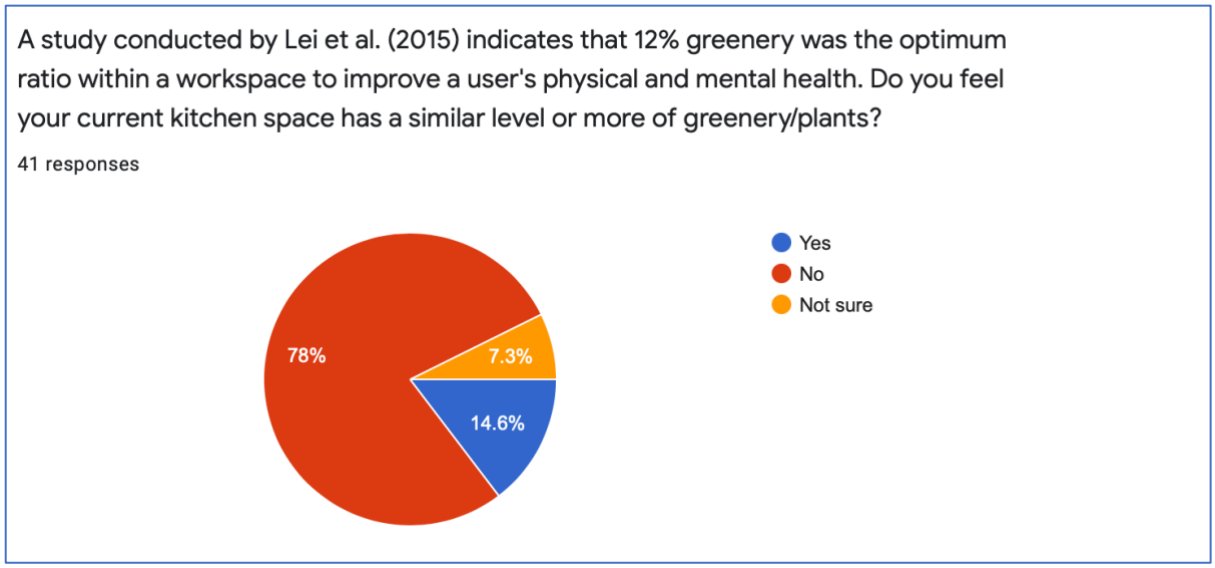
Figure 14 shows that 58.5% of respondents believe naturally occurring materials have a significant impact at improving reconnection to nature which is 596% greater than the proportion of respondents who answered ‘no’ in relation to this question. Additionally, figure 14 exhibits that 31.7% of individuals were unsure on this idea.

Figure 15 - Potential impacts through various styles of fascia's chart



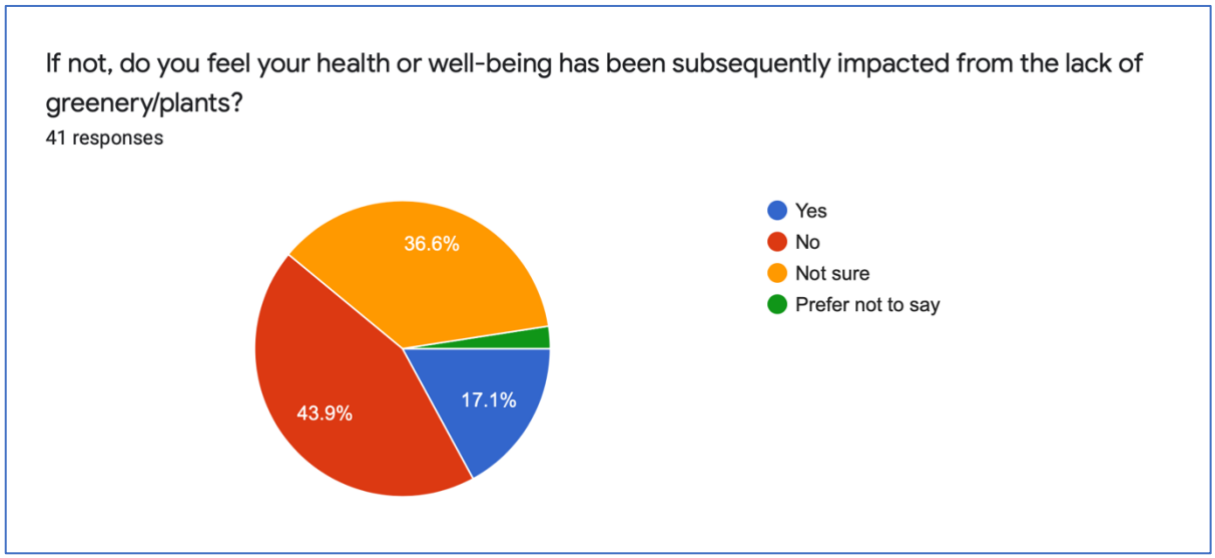
As shown in figure 15, 46.3% of respondents stated that they felt the different style of kitchen unit fascia's can affect your health and well-being differently when using the kitchen area. On the other hand, 26.8% did not agree with this and a further 26.8% were unsure about this. Further research into this result may be required to provide a more reliable statistic regarding this specific set of data.

Figure 16 - Level of greenery present in the kitchen chart



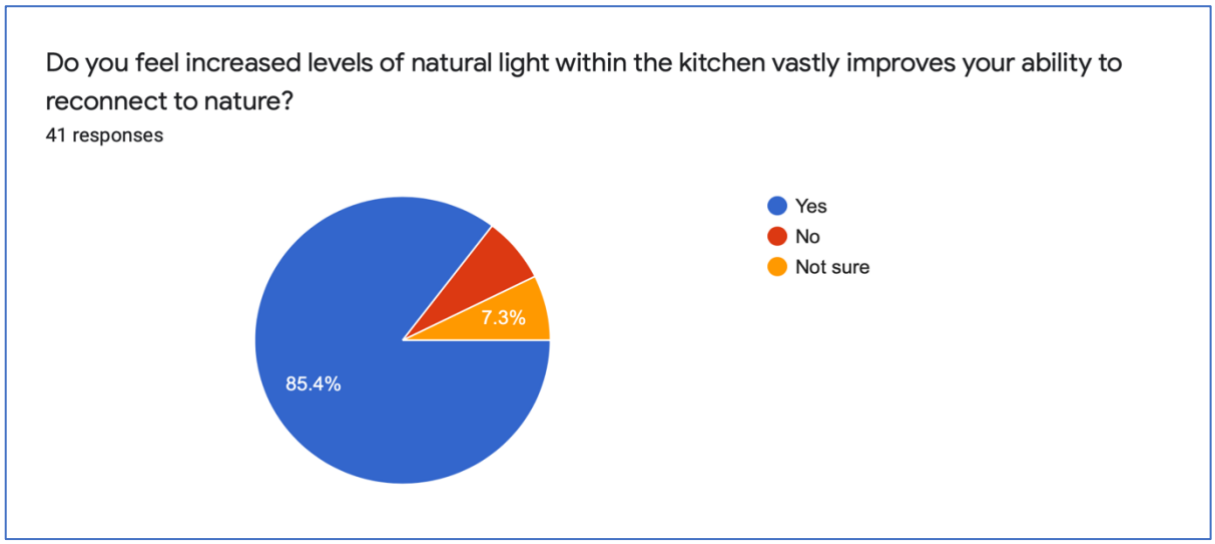
Interestingly, figure 16 clearly identifies a strong consensus that shows that a majority of respondents do not have the adequate amount of greenery in their kitchen space. 78% of respondents, accounting for 32 people, do not believe they have 12% or more greenery present whilst 14.6% of respondents have 12% or more of greenery in their space.

Figure 17 - Impacts through the lack of greenery present chart



When queried about the lack of greenery/plants and the level of impact this has on health and well-being, 17.1% of respondents agreed they believe this had an impact, whereas 43.9% of respondents disagreed with this as highlighted in figure 17. A total of 36.6% of participants felt they were unsure or believed the presence of greenery and plants does not have a significant influence on their health and wellbeing.

Figure 18 - User's perception of light providing nature connectedness chart



There is a clear pattern displayed in figure 18, which shows 85.4% of participants believe natural light significantly improves the concept of biophilia and their ability to reconnect with nature. The remaining 14.6% of were unsure or believed the natural light is not a significant aspect in improving an individual's connection to nature.

Figure 19 - Impacts biophilic design would have on average usage of the space chart

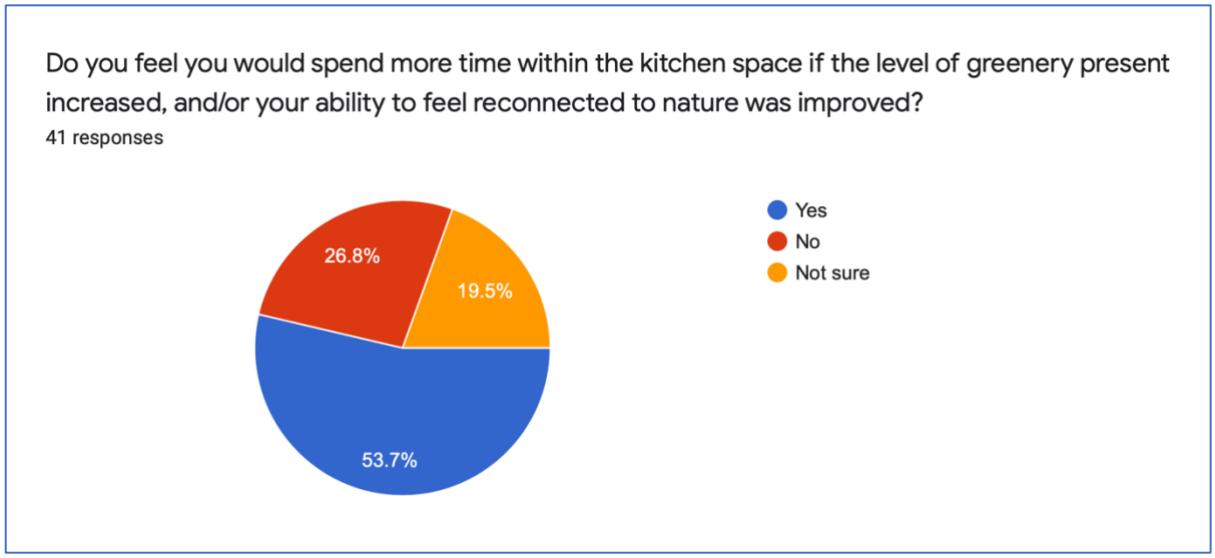


Figure 19 indicates that over half of the respondents would spend more time in the kitchen space if the levels of greenery or presence of plants was increased. However, 26.8% of people would remain indifferent about their usage of the space and their ability to reconnect to nature if the presence of greenery was improved.

Figure 20 - Awareness and implementation of biophilic design in future refurbishments chart

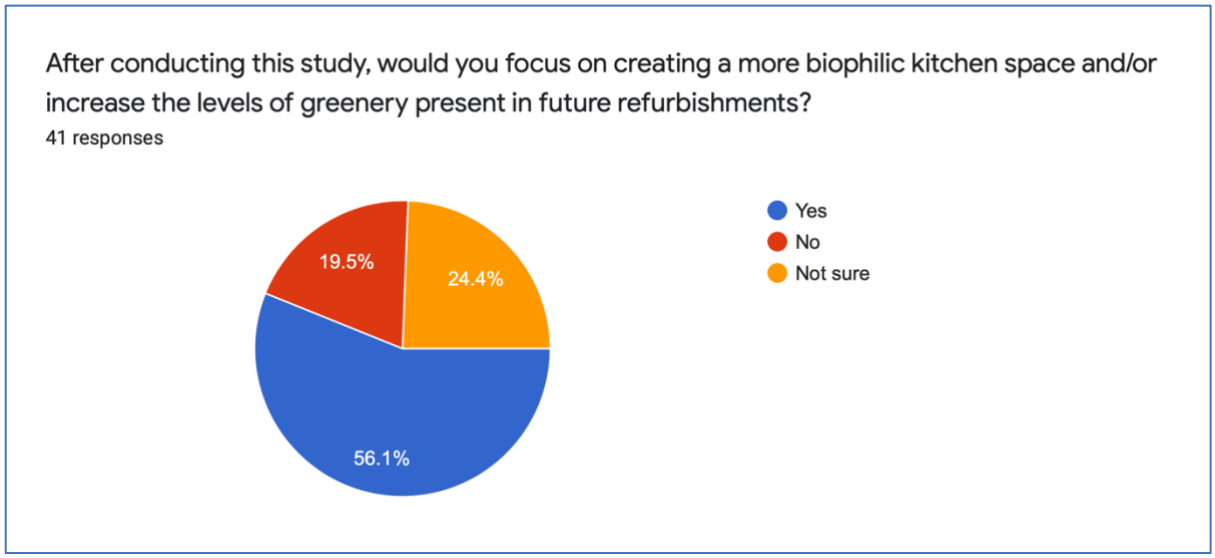


Figure 20 illustrates that on completion of the survey, 56.1% of respondents would incorporate the patterns of biophilic design into future kitchen projects. This can be through increasing the presence of greenery or creating a focused biophilic kitchen space. However, nearly one quarter of respondents were unsure as to whether they would increase biophilic aspects or greenery whilst 19.5% did not want to act on this concept in future projects.

Interview Analysis

Table 1 – Thematic analysis of interview with subject A

Theme	Reference quotation	Count
Practicality	"key attributes would be practicality, obviously you've got to meet the customer's requirements" "it was like three massive doors that all slid open, then when you're sat at the island you're practically sat outside" "talk about their lifestyle you know who's using the room? Who lives there?"	12
Aesthetics	"the styles they already have in their home" "the navy and the bottle greens are very much on trend, they are very much on trend, but I think whites and greys are always going to be safe colours" "a very traditional looking kitchen with knurled handles and you know a very country cottage look"	16
Natural Light	"Velux is always popular, roof lanterns, you know if someone's having an extension, a single-story extension you can pretty much guarantee its got a roof lantern now" "like I said most people will want to go with as much light as possible, irrespective of the styles"	4
Materials	"flat back edge but then the front edge was all sort of kept natural like it was just off the tree" "I've had customers that use live edge wood as well"	7

	"natural occurring materials like stone on the floor, I've even had someone continue their floor out into their patio which was very nice"	
Presence of greenery	"she had one wall that was all sort of wire, metal framed shelving and she just filled it with plants" "It softens the lines by having some foliage in there" "obviously you do get some people who want to bring the outside in"	8
Well-being	"it is going to help with your wellbeing, of course it is, it's a nicer environment to be in"	2

Evaluating the thematic analysis of the interview

Table 1 shows the various themes that reoccurred throughout the interview with Subject A. Clearly, table 1 shows that the theme of aesthetics which entails colour, style and overall look of the kitchen is a key attribute for user's when designing the kitchen space. Although this theme covers a broad spectrum of biophilic patterns, the theme of practicality follows closely behind with a total of 12 recurring points within the interview. This theme varies significantly from the topic of aesthetics as it focuses on a new design approach that conventionally sacrifices aesthetics for function and reliability. Moreover, it is evident from table 1, that the theme of practicality is not considered as important as aesthetics within the space since the theme appeared 12 times in contrast to the 16 counts for aesthetics.

Table 1 also indicates that the theme 'presence of greenery' appeared 8 times in the interview whilst the theme surrounding well-being only appeared 2 times. Prior to the collection of this interview, the topic of well-being was expected to appear in more instances. Interestingly, the theme of materials appeared three and a half times more than the topic of well-being indicating that subject A's clients focus on the materials and products within the kitchen moreover their expected well-being benefits. Lastly, the theme surrounding natural light reoccurred 4 times within the interview. This is 50% less than the

topic of greenery indicating that the presence of plants and foliage is more apparent and resourceful than natural light.

Summary

In summary to the data collected, it is clear that the result of the questionnaire is representative of a fair sample of users. Furthermore, this reinforces the reliability and credibility of specific results that illustrate a clear pattern and overall thought amongst the sample of data. For example, figure 18 provides the clearest result with 85.4% of user's agreeing that natural light vastly improves an individual's ability to reconnect with nature. The key objective that the questionnaire aimed to complete was to ascertain the key biophilic attributes within a kitchen space and the level in which the user's health and well-being has been impacted. It is evident from figure 12 that materials, lighting, textures and aesthetics are the crucial attributes that user's pay attention to when creating their kitchen space. In addition to this, figure 15 clearly indicates that the style of panels or fascia's can significantly affect the user's health and well-being with over 46% of respondents agreeing with this design attribute. Conversely, figure 17 illustrated an unexpected outcome since 43.9% of respondents believe that the lack of nature established in figure 16 has no noticeable impact on their health or well-being.

The interview provided a reliable source of qualitative data and highlighted key themes that were not apparent whilst exploring current literature. The main unexpected outcome was the reoccurring theme surrounding practicality since kitchen design is inherently focused around aesthetics and style rather than practical solutions to issues. Furthermore, the lack of well-being acknowledgement in subject A's response is a second unexpected outcome after conducting wider research on the importance of well-being within the home. On the other hand, the theme surrounding the presence of greenery appeared in numerous points across the interview further reinforcing the idea that biophilia is becoming an increasingly acknowledged concept as explored in the literature review. Conclusively, the interviews provided key insights into which themes are apparent within the space and what design attributes play a key role in a user's reconnection to nature thus resolving two of the three outlined objectives.

Discussion

Introduction

To determine the impact biophilic design has on the users of a kitchen space, themes such as the biophilic design patterns and the mental restorative theories will be discussed against the analysed results of the data collection section. This section will also refer to any key attributes or impacts to health and well-being in relation to the aims of this study.

Content

The survey findings indicated that participants mutually agreed that natural light significantly improves their ability to connect to nature, as exhibited in figure 18. This may be influenced by the ’14 Patterns of Biophilic Design’ which includes the pattern of dynamic and diffuse lighting as a biophilic design method to connect humans to nature (Browning et al., 2014). The findings are also supported by a report on the Stanford campus restoration projects which focused heavily on introducing dynamic lighting into the public gallery. The integration of natural light positively impacted their physiological and cognitive functions whilst also providing increased visual comfort. In addition to natural lighting, figure 8 suggests that users instinctively prefer naturally occurring materials as opposed to simulated or constructed materials. This can also be linked to the ‘14 patterns of Biophilic Design’, namely natural analogues, which is primarily concerned with non-living, organic, and indirect representations of nature. Subject A reinforces this outcome present in figure 8 since the theme of materials occurred in 7 points throughout the interview with numerous real-life examples provided for context. In one instance, Subject A referred to when a client used ‘live edge wood’ which involves keeping the front edge of the work top rough and exposed which can be perceived as the client’s resolution to the inherent lack of connection to nature. Furthermore, subject A also mentions that the majority of individuals will want to allow as much natural light in irrespective of the style or aesthetic of the kitchen. In complement to this finding, figure 12 suggests that natural textures and aesthetics are also considered to be a fundamental focal point when creating a kitchen space although is not considered crucial in comparison to natural materials and light as highlighted. It is clear that materials and lighting are the key attributes that contribute to an individual’s reconnectedness which will therefore positively impacts their wellbeing.

An unexpected outcome of the research findings was the differentiating results between subject A and the survey participants in relation to the topic of colour. Both datasets verifies that earth like tones or colour themes such as navy or greens are popular amongst kitchen designs. However, subject A believes that cream or beige tones have been replaced by white and grey tones of scale whereas figure 9 illustrates that this is not the case with 22% of respondents having cream tones in their kitchen. This could be linked to Ecological Valence Theory which explains why humans are attracted to particular colours as they may relate to a feeling or place that brings them pleasure (Heath, 2015). For example, earthly tones such as green have calming and restorative effects. This theory potentially highlights why a significant proportion of survey respondents are in favour of cream but from a design and selling perspective it may be seen as outdated.

Figure 8 discloses that over 50% of respondents have laminate worktops in their current kitchen setup which foreshadows the results found in figure 13 highlighting that over 50% believe their kitchen does not encourage their reconnection to nature. Furthermore, figure 16 illustrates that a majority do not have the optimum ratio of plants present in the kitchen space which further alienates the user from nature. Although, unexpectedly figure 17 shows that 43% of individuals do not feel impacted by their disconnect from nature through the lack of natural materials or plants. This links back to Kellert (2002) who argues that ornamented forms and materials are derivative of nature and merely provide a second-hand experience hence the reduced impacts and effects on the user's mental health and well-being. Additionally, Bixler and Floyd (1997) state that not all human beings have an in-born need to reconnect to nature and in most circumstances are indifferent to the lack of nature. This could explain the results found in figure 16 since the sample of data implies that their connectedness to nature is not imperative within their kitchen space hence the lack of natural materials and optimum presence of greenery.

In figure 19, over half of respondents claimed they would spend more time in their kitchen space if the presence of greenery and plants was increased. In addition, figure 10 highlighted that 75% of respondents have visual access to their garden from their kitchen

space. The concept of ART and SRT can be assumed in this scenario, suggesting that the respondents with visual access to nature or the desired implementation of plants and greenery would replenish their psychological and cognitive systems. This would result in an improved attention and concentration span which has the potential to replenish rather than deplete within the kitchen space. Kaplan and Kaplan (1989) further reinforce this idea through proclaiming that natural environments are a prime example of nurturing psychological restoration as they allow individuals to escape daily routines and energy intensive tasks in everyday life. With reference to the findings of figure 19 and figure 10, respondents may perceive their kitchen space to be a natural environment as it boasts key attributes such as touches of greenery and the views over nature. This incorporation of nature produces many beneficial stimuli and essentially allows the individual to seek refuge and restore their mind-body systems. Öhman's (1986) results regarding the neurological impacts when presented with images of nature further strengthens the idea that increasing the level of greenery and access to natural views will dramatically increase the pleasure responses in an individual's neurological receptors. Subsequently, this will lead to an improved state of well-being and calmness.

Summary

The results of the conducted research study indicate that biophilic design is evolving to be a wider acknowledged concept and through the discussion of the data collected, this study adds to the effects that can be assumed within a kitchen space. Multiple key theories have been drawn upon to support the findings derived from the research study such as ART, SRT, and the aforementioned patterns of biophilic design. It is evident from the existing literature and supported data that users can expect improved behaviour, increased concentration, improved cardiovascular health as well as attention span. It is crucial to make it apparent that this list is not exhaustive but provides the fundamental impacts that can be statistically proven in future research within this field.

Conclusion

In conclusion, this dissertation sought to bridge the literature gap between the application of biophilic design and the implications it has on the user's health and their ability to reconnect to nature within their kitchen space. From this study, it has been deduced that the key attributes that implicate a user's well-being and connection to nature is through introducing natural materials and dynamic lighting into this space where possible. Additionally, the desire to have a more biophilic kitchen space emphasises the importance of disclosing the key attributes which affect the success of this. Through the use of natural materials and lighting, the users innate connection to nature and state of well-being has been restored.

It is transparent from existing literature that two well-developed theories have been created for the field of biophilic design. These theories are the '14 Patterns of Biophilic Design' and the ART which seek to collate features of biophilic design and the influences on health and well-being. The cognitive and psychological benefits of introducing biophilic design in the kitchen will most likely restore and improve the user's concentration, attention and memory, but will also have positive physiological effects such as reduced blood pressure, increased comfort and cardiovascular health. Furthermore, the exploration of existing literature also highlighted that users with health concerns such as dementia would benefit from the wider application of biophilia design in interior spaces. Similarly, these individuals will experience significant cognitive and psychological impacts such as memory and attention restoration. Conclusively, this study obtained a representative sample of data providing credible findings which entails the substantial positive impacts on both a user's health and well-being by utilising a biophilic kitchen space. Therefore, the thesis statement regarding the positive impacts on health and wellbeing within the kitchen space through incorporating natural connotations of nature can be approved and is well supported by this study.

Limitations of study

The appropriate methods were used to collect a sufficient amount of qualitative and quantative data: however, it did come with some external limitations. The main obstacle to

retrieving qualitative data was obtaining two in-depth interviews with local professionals provided their availability permits. As reflected in the methodology, this unpredictable external factor forced the interview stage to take place in the last remaining quarter of this semester which caused severe time delays on the following chapters.

Secondly, limited resources were available to gather scientific and statistical evidence on the cognitive and psychological impacts of biophilic design. For this reason, questionnaires and interviews were proposed, however, had the resources been available a focus group would have been the favoured method. In addition to this, time scale was also a constraint since other submissions ran alongside this study and were required to be submitted within the same period.

Reference List

Ardiani, Y. M., Prawata, A. G., and Sholihin, A. (2020) Application of biophilic architecture in apartment design. *IOP Conference Series: Earth and Environmental Science* 426 1-9. https://doi.org/10.1088/1755-1315/426/1/012105

Baden-Powell, C. (2005) *Architect's Pocket Book of Kitchen Design*. *Z-Library*. Architectural Press Available at: https://b-ok.cc/book/1000132/149698.

Biederman, I., and Vessel, E. (2006) Perceptual Pleasure and the Brain. *American Scientist* 94, (3) 247–253. https://doi.org/10.1511/2006.59.247

Bixler, R. D., and Floyd, M. F. (1997) Nature is Scary, Disgusting, and Uncomfortable. *Environment and Behavior* 29, (4) 443–467. https://doi.org/10.1177/001391659702900401

Browning, W. D., Ryan, C. O., and DeMarco, C. (2022) *The Nature of Wood, an Exploration of the Science on Biophilic Responses to Wood*. New York: Terrapin Bright Green Available at: http://www.terrapinbrightgreen.com/wp-content/uploads/2022/01/The-Nature-of-Wood_Terrapin_2022-01.pdf

Browning, W. D., Ryan, C. O., and Heatherwick, T. (2020) *Nature inside. A biophilic design guide*. London: RIBA Publishing Available at: https://books.google.co.uk/books?hl=en&lr=&id=7QcCEAAAQBAJ&oi=fnd&pg=PT6&dq=nature+inside&ots=cU9HQaK6Dn&sig=QXA7MUxKdGQXgIyYrxPv6yate0Q&redir_esc=y#v=onepage&q=nature%20inside&f=false

Browning, W., Ryan, C., and Clancy, J. (2014) 14 Patterns of Biophilic Design. *Terrapin Bright Green*. Available at: https://www.terrapinbrightgreen.com/wp-content/uploads/2020/05/14-Patterns-of-Biophilic-Design-Terrapin-2014e.pdf

Capaldi, C. A., Dopko, R. L., and Zelenski, J. M. (2014) The relationship between nature connectedness and happiness: a meta-analysis. *Frontiers in Psychology* 5, (976) 1-72. https://doi.org/10.3389/fpsyg.2014.00976

Caruth Chalfont (2007) *Design for nature in dementia care*. London: Jessica Kingsley

Engelen, L., Rahmann, M., and de Jong, E. (2021) Design for healthy ageing – the relationship between design, well-being, and quality of life: a review. *Building Research & Information* 50, (1-2) 19–35. https://doi.org/10.1080/09613218.2021.1984867

Gillis, K., and Gatersleben, B. (2015) A Review of Psychological Literature on the Health and Wellbeing Benefits of Biophilic Design. *Buildings* 5, (3) 948–963. https://doi.org/10.3390/buildings5030948

Gray, T., and Birrell, C. (2014) Are Biophilic-Designed Site Office Buildings Linked to Health Benefits and High Performing Occupants? *International Journal of Environmental Research and Public Health* 11, (12) 12204–12222. https://doi.org/10.3390/ijerph111212204

Heath, O. (2015/23/December) Ecological Valence Theory and the Use of Colour in Design. *Human Spaces*. Available at: https://blog.interface.com/ecological-valence-theory/.

Heath, O., Jackson, V., and Goode, E. (2018) *Creating Positive Spaces Using Biophilic Design*. *Global Wellness Institute*. Available at: https://globalwellnessinstitute.org/wp-content/uploads/2018/12/biophilicdesignguide-en.pdf

Interface (2015) *Human Spaces: The Global Impact of Biophilic Design in the Workplace*. *Interface*. Available at: http://interfaceinc.scene7.com/is/content/InterfaceInc/Interface/EMEA/eCatalogs/Brochures/Human%20Spaces%20report/English/ec_eu-globalhumanspacesreport-enpdf.pdf

Interface (2017) *Human Spaces 2.0: Biophilic Design in Hospitality*. *Interface*. Available at: http://interfaceinc.scene7.com/is/content/InterfaceInc/Interface/EMEA/eCatalogs/Brochur

es/Human%20Spaces%20Hospitality%20Report/EN/ec_eu-humanspaceshospitalityreport-en.pdf

Kaplan, R., and Kaplan, S. (1989) *The experience of nature : a psychological perspective*. Cambridge ; New York: Cambridge University Press Available at: https://books.google.co.uk/books?hl=en&lr=&id=7l80AAAAIAAJ&oi=fnd&pg=PR7&dq=The+experience+of+nature+:+a+psychological+perspective&ots=TqMXQHo62j&sig=Qo-zhJ2KFhN1t1pYP6cj6BeY3c8&redir_esc=y#v=onepage&q=The%20experience%20of%20nature%20%3A%20a%20psychological%20perspective&f=false.

Kaplan, S. (1995) The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology* 15, (3) 169–182. https://doi.org/10.1016/0272-4944(95)90001-2

Kellert, S. R. (2002) *Children and nature : psychological, sociocultural, and evolutionary investigations*. Ed. by Kahn, P. H. Estados Unidos: The Mit Press

Kellert, S. R. (2012) *Birthright: people and nature in the modern world*. New Haven: Yale University Press

Kellert, S. R., Heerwagen, J. H., and Mador, M. L. (2008) *Biophilic Design: the theory, science, and practice of bringing buildings to life*. *Choice Reviews Online*. John Wiley & Sons, Inc Available at: https://b-ok.cc/book/3600058/ede228

Kellert, S., and Calabrese, E. (2015) The Practice of Biophilic Design. Available at: https://www.biophilic-design.com

Klepeis, N. E., Nelson, W. C., Ott, W. R., Robinson, J. P., Tsang, A. M., Switzer, P., Bear, J. V., Hern, S. C., and Engelmann, W. H. (2001) The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants. *Journal of Exposure Science & Environmental Epidemiology* 11, (3) 231–252. https://doi.org/10.1038/sj.jea.7500165

Lei, Q., Yuan, C., and Lau, S. S. Y. (2021) A quantitative study for indoor workplace biophilic design to improve health and productivity performance. *Journal of Cleaner Production* 324 1-15. https://doi.org/10.1016/j.jclepro.2021.129168

Meltzer, N. W., Bobilya, A. J., Faircloth, W. B., Mitten, D., and Chandler, R. M. (2018) The effect of an outdoor orientation program on participants' biophilic expressions. *Journal of Outdoor and Environmental Education* 21, (2) 187–205. https://doi.org/10.1007/s42322-018-0013-x

Nestor, C., and Terrapin Bright Green (2015) *Windhover Contemplative Center & Art Gallery*. *Terrapin Bright Green*. Available at: https://www.terrapinbrightgreen.com/wp-content/uploads/2015/11/Windhover_CaseStudy_Fall15.pdf

Nestor, C., and Terrapin Bright Green (2016) *Kickstarter Commercial Headquarters*. *Terrapin Bright Green*. Available at: https://www.terrapinbrightgreen.com/wp-content/uploads/2015/11/Kickstarter-Spring-16F.pdf

Öhman, A. (1986) Face the Beast and Fear the Face: Animal and Social Fears as Prototypes for Evolutionary Analyses of Emotion. *Psychophysiology* 23, (2) 123–145. https://doi.org/10.1111/j.1469-8986.1986.tb00608.x

Pawlyn, M. (2016) *Biomimicry in Architecture*. 2nd Edn. Newcastle Upon Tyne: RIBA Publishing Available at: https://b-ok.cc/book/5335560/0e37a7

Peters, T., and Verderber, S. (2021) Biophilic Design Strategies in Long-Term Residential Care Environments for Persons with Dementia. *Journal of Aging and Environment* 1–29. https://doi.org/10.1080/26892618.2021.1918815

Richardson, M., and Butler, C. W. (2021) Nature connectedness and biophilic design. *Building Research & Information*50, (1-2) 36–42. https://doi.org/10.1080/09613218.2021.2006594

Riemersma-van der Lek, R. F., Swaab, D. F., Twisk, J., Hol, E. M., Hoogendijk, W. J. G., and Van Someren, E. J. W. (2008) Effect of Bright Light and Melatonin on Cognitive and Noncognitive Function in Elderly Residents of Group Care Facilities. *JAMA* 299, (22) 2642-2655. https://doi.org/10.1001/jama.299.22.2642

Rutberg, S., and Bouikidis, C. D. (2018) Focusing on the Fundamentals: A Simplistic Differentiation Between Qualitative and Quantitative Research. *Continuing Nursing Education* 45, (2) 209–210

Stewart-Pollack, J. (2006) Biophilic Design: For The First Optimum Performance Home. *Green Build* (04). Available at: https://www.ultimatehomedesign.com/oph/uhd04gb02.pdf

United Nations (2015) Transforming our world: the 2030 Agenda for Sustainable Development. *United Nations*. United Nations Available at: https://sdgs.un.org/2030agenda

Van den Berg, A. E., Hartig, T., and Staats, H. (2007) Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability. *Journal of Social Issues* 63, (1) 79–96. https://doi.org/10.1111/j.1540-4560.2007.00497.x

Wijesooriya, N., and Brambilla, A. (2021) Bridging biophilic design and environmentally sustainable design: A critical review. *Journal of Cleaner Production* 283 1-16. https://doi.org/10.1016/j.jclepro.2020.124591

Yin, J., Zhu, S., MacNaughton, P., Allen, J. G., and Spengler, J. D. (2018) Physiological and cognitive performance of exposure to biophilic indoor environment. *Building and Environment* 132 255–262. https://doi.org/10.1016/j.buildenv.2018.01.006

Bibliography

Amjad Almusaed (2018) Landscape architecture : the sense of places, models and applications. London: Intechopen

Beatley, T. (2016) Handbook of biophilic city planning and design. Washington, Dc: Island Press

Beatley, T. (2017) Biophilic Cities and Healthy Societies. Urban Planning 2, (4) 1–4. https://doi.org/10.17645/up.v2i4.1054

Bringslimark, T., Hartig, T., and Patil, G. G. (2009) The psychological benefits of indoor plants: A critical review of the experimental literature. *Journal of Environmental Psychology* 29, (4) 422–433. https://doi.org/10.1016/j.jenvp.2009.05.001

Dannenberg, A. L., Frumkin, H., and Jackson, R. J. (2011) *'Making healthy places : designing and building for health, well-being, and sustainability'*. Island Press Available at: https://books.google.co.uk/books?hl=en&lr=&id=ITbVtSBwmM8C&oi=fnd&pg=PR2&dq=making+healthy+places&ots=YQU4r2fhq6&sig=od73gos7nHkLTfJySSSjcbWk6DU&redir_esc=y#v=onepage&q=making%20healthy%20places&f=false.

Downton, P., Jones, D., Zeunert, J., and Roös, P. (2017) Biophilic Design Applications: Putting Theory and Patterns into Built Environment Practice. KnE Engineering 2, (2) 59. https://doi.org/10.18502/keg.v2i2.596

Hähn, N., Essah, E., and Blanusa, T. (2020) Biophilic design and office planting: a case study of effects on perceived health, well-being and performance metrics in the workplace. Intelligent Buildings International 13, (4) 1–20. https://doi.org/10.1080/17508975.2020.1732859

Henn, R. L., Hoffman, A. J., and Nicole Woolsey Biggart (2013) Constructing Green : The Social Structures of Sustainability. Cambridge, Massachusetts: The Mit Press

Khozaei, F., Carbon, C. C., Hosseini Nia, M., and Kim, M. J. (2022) Preferences for Hotels with Biophilic Design Attributes in the Post-COVID-19 Era. Buildings 12, (4) 427. https://doi.org/10.3390/buildings12040427

Lee, H., and Park, S. (2018) Assessment of Importance and Characteristics of Biophilic Design Patterns in a Children's Library. Sustainability 10, (4) 987. https://doi.org/10.3390/su10040987

Mazuch, R. (2017) Salutogenic and Biophilic Design as Therapeutic Approaches to Sustainable Architecture. Architectural Design 87, (2) 42–47. https://doi.org/10.1002/ad.2151

McGee, B., and Park, N.-K. (2022) Colour, Light, and Materiality: Biophilic Interior Design Presence in Research and Practice. Interiority 5, (1). https://doi.org/10.7454/in.v5i1.189

Miller, E., and Burton, L. O. (2020) Redesigning aged care with a biophilic lens: a call to action. Cities & Health 1–13. https://doi.org/10.1080/23748834.2020.1772557

Mollazadeh, M., and Zhu, Y. (2021) Application of Virtual Environments for Biophilic Design: A Critical Review. Buildings 11, (4) 148. https://doi.org/10.3390/buildings11040148

Nasr Aly Tahoun, Z. (2019) Awareness assessment of biophilic design principles application. IOP Conference Series: Earth and Environmental Science 329. https://doi.org/10.1088/1755-1315/329/1/012044

Newman, P., and Soderlund, J. (2015) Biophilic architecture: a review of the rationale and outcomes. AIMS Environmental Science 2, (4) 950–969. https://doi.org/10.3934/environsci.2015.4.950

Nitu, M. A., Gocer, O., Wijesooriya, N., Vijapur, D., and Candido, C. (2022) A Biophilic Design Approach for Improved Energy Performance in Retrofitting Residential Projects. Sustainability 14, (7) 1-22. https://doi.org/10.3390/su14073776

Noone, S., Innes, A., Kelly, F., and Mayers, A. (2015) 'The nourishing soil of the soul': The role of horticultural therapy in promoting well-being in community-dwelling people with dementia. *Dementia* 16, (7) 897–910. https://doi.org/10.1177/1471301215623889

Nyrud, A. Q., Bringslimark, T., and Bysheim, K. (2013) Benefits from wood interior in a hospital room: a preference study. Architectural Science Review 57, (2) 125–131. https://doi.org/10.1080/00038628.2013.816933

Olsen, M., and Walsh, J. (2022/29/March) Biophilic Design and the Human Habitat with Dr. Judith Heerwagen. Spotify Podcast Available at: https://open.spotify.com/episode/6EOLcg4HlNxvabCiVxVI56.

Peters, T., and D'Penna, K. (2020) Biophilic Design for Restorative University Learning Environments: A Critical Review of Literature and Design Recommendations. Sustainability 12, (17) 7064. https://doi.org/10.3390/su12177064

Pomponi, F., and Moncaster, A. (2017) Circular economy for the built environment: A research framework. Journal of Cleaner Production 143 710–718. https://doi.org/10.1016/j.jclepro.2016.12.055

Sderlund, J. (2020) Emergence Of Biophilic Design.. S.L.: Springer

Totaforti, S. (2018) Applying the benefits of biophilic theory to hospital design. City, Territory and Architecture 5, (1). https://doi.org/10.1186/s40410-018-0077-5

Wallmann-Sperlich, B., Hoffmann, S., Salditt, A., Bipp, T., and Froboese, I. (2019) Moving to an 'Active' Biophilic Designed Office Workplace: A Pilot Study about the Effects on Sitting

Time and Sitting Habits of Office-Based Workers. International Journal of Environmental Research and Public Health 16, (9) 1559. https://doi.org/10.3390/ijerph16091559

Xue, F., Lau, S. S., Gou, Z., Song, Y., and Jiang, B. (2019) Incorporating biophilia into green building rating tools for promoting health and wellbeing. Environmental Impact Assessment Review 76 98–112. https://doi.org/10.1016/j.eiar.2019.02.004

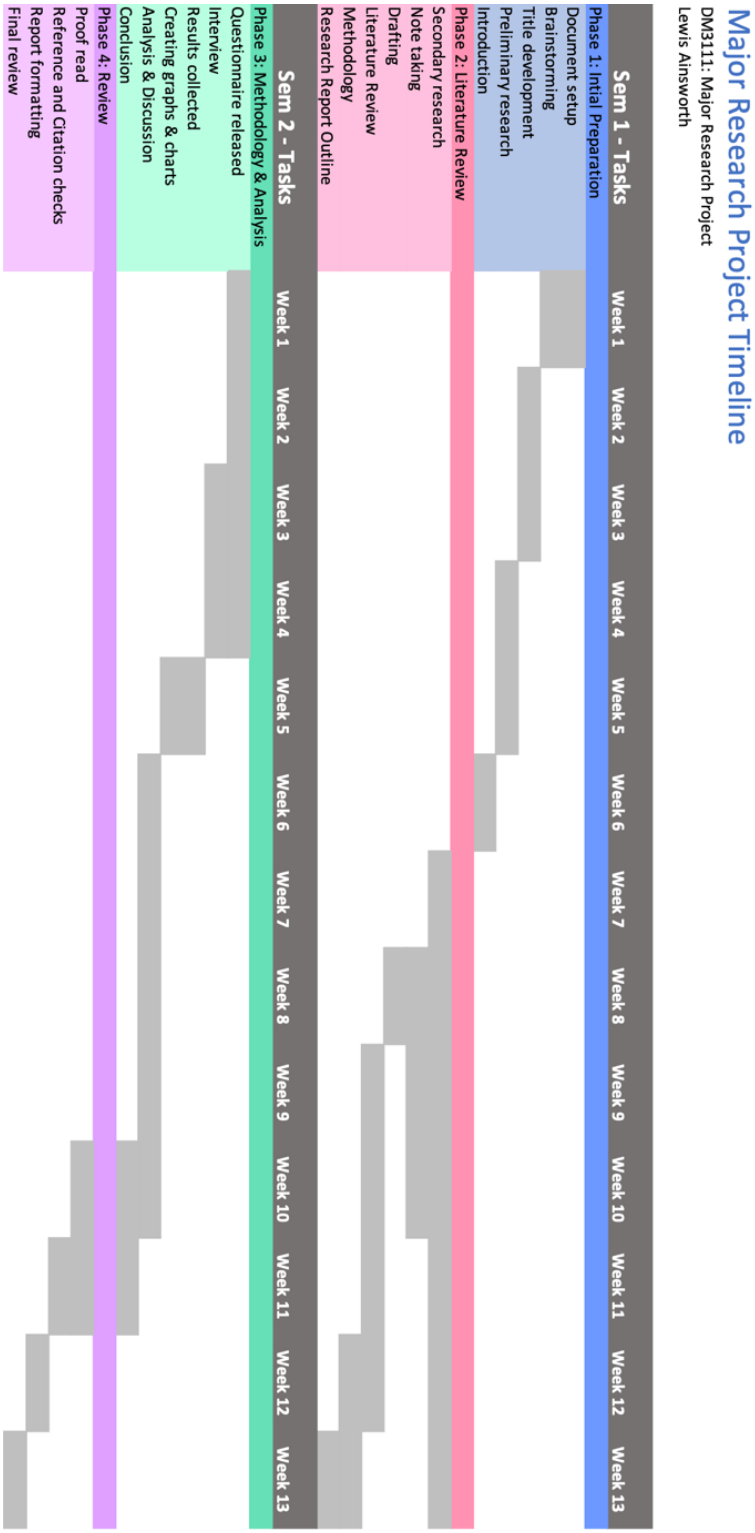
Young, R. F. (2016) The biophilic city and the quest for paradise. Ed. by Desha, Angela Chenoweth Reeve, Pete, C.Smart and Sustainable Built Environment 5, (1) 25–46. https://doi.org/10.1108/sasbe-07-2015-0016

Zare, G., Faizi, M., Baharvand, M., and Masnavi, M. (2021) A Review of Biophilic Design Conception Implementation in Architecture. Journal of Design and Built Environment 21, (3) 16–36. https://doi.org/10.22452/jdbe.vol21no3.2

Zhong, W., Schröder, T., and Bekkering, J. (2021) Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. Frontiers of Architectural Research 11, (1). https://doi.org/10.1016/j.foar.2021.07.006

Appendices

Appendix 1 –Gannt charts



Major Research Project Timeline

DM3111: Major Research Project
Lewis Ainsworth

Appendix 2 – Questionnaire

Biophilic Kitchen Design Survey

Hi there!

Thank you for participating in my dissertation survey which should take less than 10 minutes of your time.

The purpose of this survey is to collect data on a user's current kitchen space and how the user's well-being is affected through the various design layouts and features. This survey will also look at the concept of Biophilic Design and analyse how different kitchen styles affect a users reconnection to nature.

If you are unsure of any question/section within this survey or have any questions, please email me at:
l.ainsworth.19@unimail.winchester.ac.uk

Ethics & Data Protection:
All responses will be recorded anonymously. Data and privacy will kept secure on a password protected device. The data collected in this study will be stored until October 2022. However, if this data is published, the files will remain secure for up to 4 years. After this period, the files will be permanently deleted. If an individual or interviewee would like to withdraw from the study, they will have the right to request withdrawal and all data will be immediately deleted.

Do you give consent for your responses to be used in this study? *

- ○ Yes
- ○ No

What age bracket do you fall into? *

- ○ 18 - 24
- ○ 25 - 34
- ○ 35 - 44
- ○ 45 - 54
- ○ 55 - 64
- ○ 65 - 74
- ○ 75+

Section 2 of 3

Kitchen styles and layouts

This section is designed to gain an insight into your kitchen space and how often you use the space.

On average, how many hours do you spend in your kitchen per week? *

- ○ 0 - 2 hours
- ○ 2 - 4 hours
- ○ 4 - 6 hours
- ○ 6 - 8 hours
- ○ 8 - 10 hours
- ○ 10+ hours

How old is your current kitchen layout/style? *

- ○ 0 - 5 years
- ○ 5 - 10 years
- ○ 10 - 15 years
- ○ 15 - 20 years
- ○ 20+ years
- ○ Not sure

What style of kitchen unit doors do you currently have? *

- ○ Shaker panels (framed panel)
- ○ Modern shaker panels (slimline framed panel)
- ○ Slab/Grooved panels (flat panels or flat panels with J-shaped groove handle built-in)
- ○ Bespoke panels
- ○ Other
- ○ Not sure

What worktop material do you have in your kitchen?

- ○ Laminate (chipboard core worktops)
- ○ Compact Laminate (<18mm)
- ○ Ceramic
- ○ Natural Solid Surface (Marble, Granite, Oak etc)
- ○ Engineered Solid Surface (Quartz, Slabtech, Silestone etc)
- ○ Not sure

What colour theme have you used within the kitchen space? *

- ○ Monochrome/Greyscale
- ○ Pastel tones
- ○ Neutral/Earth tones
- ○ Bright tones
- ○ Dark tones
- ○ Cream/Beige/Off-white
- ○ Pure white
- ○ Other

What size kitchen do you currently have?

- ○ Small (>12 units)
- ○ Medium (12 - 15 units)
- ○ Large (16 - 19 units)
- ○ Extra large (20+ units)

What type of layout does your kitchen follow?

- ○ One wall
- ○ Galley/Corridor
- ○ L-shaped
- ○ U-shaped
- ○ G-shaped
- ○ L-shaped with Island
- ○ U-shaped with Island
- ○ Other...

Does your kitchen have any windows or glass exterior doors overlooking your garden? *

- ○ Yes
- ○ No

After section 2 Go to section 3 (Biophilic Design i...the kitchen space)

Section 3 of 3

Biophilic Design in the kitchen space

The term 'Biophilic Design' is defined as the process of adapting and improving our built environment by turning to nature for a resolution to a particular problem or space. For example, the integration of natural patterns, shapes and forms found in nature within a human built environment improves our health and well-being and allow humans to feel more interconnected with nature.

Have you heard of the term biophilic design prior to this study? *

- ○ Yes
- ○ No

In your opinion, to what extent does your kitchen space incorporate aspects of nature? For example you may consider the following features: materials used, layouts, textures, scenery, colour themes, the presence of plants etc. *

	1	2	3	4	5	6	7	8	9	10	
Small extent	○	○	○	○	○	○	○	○	○	○	Large extent

If you were in the position to replace your kitchen, would natural materials/lighting/textures/aesthetics be a key focal point when creating your space? *

- ○ Yes
- ○ No
- ○ Not sure

Do you feel your current kitchen space supports your reconnection to nature? *

- ○ Yes
- ○ No
- ○ Not sure
- ○ Prefer not to say

If so, why do you feel your current kitchen supports your ability to reconnect with nature?

Long answer text

Do you feel natural solid worktops such as oak or granite is more effective at improving your reconnection to nature compared to laminate or engineered solid worktops which are designed to look similar but feel more more man-made?

- ○ Yes
- ○ No
- ○ Not sure

Do you feel the different style of kitchen unit fascias (shaker, slab panels etc) can affect your health and well-being differently when utilising the kitchen area?

- ○ Yes
- ○ No
- ○ Not sure

A study conducted by Lei et al. (2015) indicates that 12% greenery was the optimum ratio within a workspace to improve a user's physical and mental health. Do you feel your current kitchen space has a similar level or more of greenery/plants? *

- ○ Yes
- ○ No
- ○ Not sure

If not, do you feel your health or well-being has been subsequently impacted from the lack of greenery/plants? *

- ○ Yes
- ○ No
- ○ Not sure
- ○ Prefer not to say

Do you feel increased levels of natural light within the kitchen vastly improves your ability to reconnect to nature? *

- ○ Yes
- ○ No
- ○ Not sure

Do you feel you would spend more time within the kitchen space if the level of greenery present increased, and/or your ability to feel reconnected to nature was improved? *

- ○ Yes
- ○ No
- ○ Not sure

After conducting this study, would you focus on creating a more biophilic kitchen space and/or increase the levels of greenery present in future refurbishments? *

- ○ Yes
- ○ No
- ○ Not sure

Appendix 3 - Questionnaire results

Biophilic Kitchen Areas

Timestamp	Do you give consent for your responses to be used in this study?	What age bracket do you fall into?	On average, how many hours do you spend in your kitchen per week?	How old is your current kitchen layout/style?	What style of kitchen unit doors do you currently have?	What worktop material do you have in your kitchen?	What colour theme have you used within the kitchen space?	What size kitchen do you currently have?	What type of layout does your kitchen follow?	Does your kitchen have any windows or glass exterior doors overlooking your garden?	Have you heard of the term biophilic design prior to this study?	In your opinion, to what extent does your kitchen space incorporate aspects of nature? For example you may consider the following features: materials used, layouts, textures, scenery, colour themes, the presence of plants etc.
2022/04/04 10:24:14 AM GMT+1	Yes	18 - 24	2 - 4 hours	0 - 5 years	Not sure	Laminate (chipboard core worktops)	Dark tones	Large (16 - 19 units)	L-shaped	Yes	No	8
2022/04/04 9:03:40 PM GMT+1	Yes	18 - 24	2 - 4 hours	Not sure	Other	Laminate (chipboard core worktops)	Other	Medium (12 - 15 units)	U-shaped	Yes	Yes	2
2022/04/04 10:53:51 PM GMT+1	Yes	18 - 24	10+ hours	5 - 10 years	Shaker panels (framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Cream/Beige/ Off-white	Small (>12 units)	G-shaped	Yes	No	4
2022/04/05 7:19:17 PM GMT+1	Yes	18 - 24	10+ hours	Not sure	Not sure	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Cream/Beige/ Off-white	Small (>12 units)	U-shaped	No	Yes	1
2022/04/05 10:36:03 PM GMT+1	Yes	35 - 44	0 - 2 hours	15 - 20 years	Other	Laminate (chipboard core worktops)	Neutral/Earth tones	Small (>12 units)	One wall	Yes	No	1
2022/04/05 11:47:56 PM GMT+1	Yes	18 - 24	6 - 8 hours	0 - 5 years	Slab/Grooved panels (flat panels or flat panels with J-shaped groove handle built-in)	Laminate (chipboard core worktops)	Neutral/Earth tones	Small (>12 units)	U-shaped	No	Yes	2
2022/04/05 11:49:24 PM GMT+1	Yes	55 - 64	0 - 2 hours	0 - 5 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Monochrome/ Greyscale	Large (16 - 19 units)	G-shaped	Yes	No	2
2022/04/05 11:50:38 PM GMT+1	Yes	55 - 64	10+ hours	0 - 5 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Monochrome/ Greyscale	Large (16 - 19 units)	G-shaped	Yes	No	2
2022/04/05 11:54:01 PM GMT+1	Yes	45 - 54	10+ hours	0 - 5 years	Slab/Grooved panels (flat panels or flat panels with J-shaped groove handle built-in)	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Monochrome/ Greyscale	Small (>12 units)	U-shaped	Yes	No	5
2022/04/06 12:28:06 AM GMT+1	Yes	25 - 34	2 - 4 hours	0 - 5 years	Slab/Grooved panels (flat panels or flat panels with J-shaped groove handle built-in)	Laminate (chipboard core worktops)	Neutral/Earth tones	Small (>12 units)	U-shaped	No	No	5
2022/04/06 1:08:11 PM GMT+1	Yes	45 - 54	10+ hours	5 - 10 years	Not sure	Laminate (chipboard core worktops)	Pure white	Small (>12 units)	U-shaped	No	No	5
2022/04/06 2:54:04 PM GMT+1	Yes	65 - 74	10+ hours	5 - 10 years	Slab/Grooved panels (flat panels or flat panels with J-shaped groove handle built-in)	Laminate (chipboard core worktops)	Pure white	Small (>12 units)	Galley/ Corridor	Yes	No	8
2022/04/06 3:01:46 PM GMT+1	Yes	55 - 64	6 - 8 hours	0 - 5 years	Other	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Pure white	Medium (12 - 15 units)	U-shaped	Yes	No	3
2022/04/06 3:07:09 PM GMT+1	Yes	65 - 74	8 - 10 hours	0 - 5 years	Shaker panels (framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Bright tones	Medium (12 - 15 units)	U-shaped	Yes	No	4
2022/04/06 3:07:44 PM GMT+1	Yes	55 - 64	4 - 6 hours	20+ years	Not sure	Laminate (chipboard core worktops)	Neutral/Earth tones	Medium (12 - 15 units)	Galley/ Corridor	Yes	No	1
2022/04/06 3:08:08 PM GMT+1	Yes	45 - 54	4 - 6 hours	15 - 20 years	Other	Laminate (chipboard core worktops)	Cream/Beige/ Off-white	Small (>12 units)	Galley/ Corridor	Yes	No	1
2022/04/06 3:09:25 PM GMT+1	Yes	65 - 74	10+ hours	15 - 20 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Neutral/Earth tones	Extra large (20+ units)	U-shaped	Yes	No	4
2022/04/06 3:12:23 PM GMT+1	Yes	65 - 74	4 - 6 hours	20+ years	Slab/Grooved panels (flat panels or flat panels with J-shaped groove handle built-in)	Laminate (chipboard core worktops)	Pure white	Large (16 - 19 units)	L-shaped	Yes	No	3
2022/04/06 3:49:21 PM GMT+1	Yes	65 - 74	10+ hours	10 - 15 years	Shaker panels (framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Cream/Beige/ Off-white	Medium (12 - 15 units)	Oblong with units on 2 walls	Yes	No	5
2022/04/06 4:05:11 PM GMT+1	Yes	55 - 64	2 - 4 hours	0 - 5 years	Not sure	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Monochrome/ Greyscale	Small (>12 units)	L-shaped	Yes	No	1
2022/04/06 5:37:43 PM GMT+1	Yes	55 - 64	10+ hours	10 - 15 years	Modern shaker panels (slimline framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Neutral/Earth tones	Medium (12 - 15 units)	Galley with l shaped breakfast bar	Yes	No	8
2022/04/06 5:44:40 PM GMT+1	Yes	25 - 34	10+ hours	Not sure	Shaker panels (framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Cream/Beige/ Off-white	Small (>12 units)	U-shaped	No	Yes	1
2022/04/06 7:20:58 PM GMT+1	Yes	55 - 64	4 - 6 hours	10 - 15 years	Not sure	Natural Solid Surface (Marble, Granite, Oak etc)	Monochrome/ Greyscale	Medium (12 - 15 units)	Galley/ Corridor	No	No	1
2022/04/06 8:09:16 PM GMT+1	Yes	35 - 44	6 - 8 hours	0 - 5 years	Not sure	Laminate (chipboard core worktops)	Cream/Beige/ Off-white	Medium (12 - 15 units)	U-shaped	Yes	No	4
2022/04/07 8:35:27 AM GMT+1	Yes	25 - 34	4 - 6 hours	5 - 10 years	Not sure	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Cream/Beige/ Off-white	Small (>12 units)	U-shaped	Yes	No	5
2022/04/07 4:04:00 PM GMT+1	Yes	55 - 64	4 - 6 hours	5 - 10 years	Not sure	Natural Solid Surface (Marble, Granite, Oak etc)	Cream/Beige/ Off-white	Medium (12 - 15 units)	Galley/ Corridor	Yes	No	8
2022/04/07 8:52:02 PM GMT+1	Yes	35 - 44	8 - 10 hours	0 - 5 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Monochrome/ Greyscale	Large (16 - 19 units)	G-shaped	Yes	Yes	4
2022/04/08 9:35:31 AM GMT+1	Yes	25 - 34	8 - 10 hours	0 - 5 years	Modern shaker panels (slimline framed panel)	Laminate (chipboard core worktops)	Neutral/Earth tones	Small (>12 units)	U-shaped	Yes	No	5
2022/04/11 2:49:44 AM GMT+1	Yes	45 - 54	6 - 8 hours	10 - 15 years	Other	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Pastel tones	Medium (12 - 15 units)	U-shaped with Island	Yes	No	2
2022/04/12 8:52:18 PM GMT+1	Yes	55 - 64	4 - 6 hours	5 - 10 years	Other	Laminate (chipboard core worktops)	Pure white	Small (>12 units)	One wall	Yes	No	2
2022/04/13 9:34:36 AM GMT+1	Yes	45 - 54	10+ hours	0 - 5 years	Modern shaker panels (slimline framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Neutral/Earth tones	Large (16 - 19 units)	L-shaped with Island	Yes	No	8
2022/04/15 11:45:30 AM GMT+1	Yes	65 - 74	10+ hours	5 - 10 years	Other	Laminate (chipboard core worktops)	Neutral/Earth tones	Small (>12 units)	U-shaped	Yes	No	9
2022/04/15 11:51:13 AM GMT+1	Yes	35 - 44	8 - 10 hours	0 - 5 years	Other	Natural Solid Surface (Marble, Granite, Oak etc)	Neutral/Earth tones	Medium (12 - 15 units)	U-shaped	Yes	No	6
2022/04/15 2:00:42 PM GMT+1	Yes	55 - 64	10+ hours	20+ years	Shaker panels (framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Other	Large (16 - 19 units)	L-shaped	Yes	No	10
2022/04/15 2:54:49 PM GMT+1	Yes	35 - 44	6 - 8 hours	0 - 5 years	Not sure	Not sure	Monochrome/ Greyscale	Medium (12 - 15 units)	U-shaped	Yes	No	5
2022/04/15 6:18:04 PM GMT+1	Yes	35 - 44	10+ hours	0 - 5 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Monochrome/ Greyscale	Medium (12 - 15 units)	L-shaped	Yes	No	8
2022/04/17 5:06:00 PM GMT+1	Yes	35 - 44	10+ hours	0 - 5 years	Bespoke panels	Engineered Solid Surface (Quartz, Slabtech, Silestone etc)	Monochrome/ Greyscale	Extra large (20+ units)	U-shaped	Yes	No	3
2022/04/17 8:39:29 PM GMT+1	Yes	35 - 44	6 - 8 hours	20+ years	Bespoke panels	Ceramic	Pastel tones	Small (>12 units)	One wall	No	Yes	5
2022/04/18 8:35:09 AM GMT+1	Yes	18 - 24	0 - 2 hours	5 - 10 years	Shaker panels (framed panel)	Natural Solid Surface (Marble, Granite, Oak etc)	Dark tones	Medium (12 - 15 units)	L-shaped	No	No	6
2022/04/19 11:18:50 AM GMT+1	Yes	18 - 24	6 - 8 hours	5 - 10 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Cream/Beige/ Off-white	Large (16 - 19 units)	U-shaped with Island	No	Yes	1
2022/04/19 12:29:45 PM GMT+1	Yes	25 - 34	6 - 8 hours	15 - 20 years	Shaker panels (framed panel)	Laminate (chipboard core worktops)	Monochrome/ Greyscale	Small (>12 units)	L-shaped	No	No	9

Timestamp	If you were in the position to replace your kitchen, would natural materials/lighting/ textures/aesthetics be a key focal point when creating your space?	Do you feel your current kitchen space supports your reconnection to nature?	If so, why do you feel your current kitchen supports your ability to reconnect with nature?	Do you feel natural solid worktops such as oak or granite is more effective at improving your reconnection to nature compared to laminate or engineered solid worktops which are designed to look similar but feel more more man-made?	Do you feel the different style of kitchen unit fascias (shaker, slab panels etc) can affect your health and well-being differently when utilising the kitchen area?	A study conducted by Lei et al. (2015) indicates that 12% greenery was the optimum ratio within a workspace to improve a user's physical and mental health. Do you feel your current kitchen space has a similar level or more of greenery/plants?	If not, do you feel your health or well-being has been subsequently impacted from the lack of greenery/plants?	Do you feel increased levels of natural light within the kitchen vastly improves your ability to reconnect to nature?	Do you feel you would spend more time within the kitchen space if the level of greenery present increased, and/or your ability to feel reconnected to nature was improved?	After conducting this study, would you focus on creating a more biophilic kitchen space and/or increase the levels of greenery present in future refurbishments?
2022/04/04 10:24:14 AM GMT+1	Yes	No		No	Yes	No	Not sure	Not sure	Not sure	Yes
2022/04/04 9:03:40 PM GMT+1	No	No		Yes	Yes	No	No	Yes	No	No
2022/04/04 10:53:51 PM GMT+1	Yes	No		Yes	Not sure	No	Yes	Yes	Yes	Yes
2022/04/05 7:19:17 PM GMT+1	Yes	No		Yes	Yes	No	Not sure	Yes	Yes	Yes
2022/04/05 10:36:03 PM GMT+1	Yes	No		Not sure	Not sure	No	No	No	No	No
2022/04/05 11:47:56 PM GMT+1	Yes	No		Yes	No	No	Not sure	Yes	Yes	Yes
2022/04/05 11:49:24 PM GMT+1	Not sure	No		Yes	Not sure	No	Not sure	Yes	Yes	Yes
2022/04/05 11:50:38 PM GMT+1	No	No		Yes	Yes	No	Not sure	Yes	Yes	Yes
2022/04/05 11:54:01 PM GMT+1	Yes	Yes	Sink overlooking the courtyard garden, use of yellow accent colour in accessories to bring in connection with sunshine and colourful flowers, plants on windowsill	Not sure	No	No	No	Yes	Not sure	Yes
2022/04/06 12:28:06 AM GMT+1	Yes	No		Not sure	No	No	Not sure	Yes	Yes	Yes
2022/04/06 1:08:11 PM GMT+1	Yes	No		Yes	Yes	Yes	No	Yes	Yes	Not sure
2022/04/06 2:54:04 PM GMT+1	Yes	No		Yes	Yes	Yes	No	Yes	Yes	Yes
2022/04/06 3:01:46 PM GMT+1	Not sure	Not sure		Yes	Yes	No	Not sure	Yes	Yes	Yes
2022/04/06 3:07:09 PM GMT+1	Yes	Not sure		Yes	No	No	No	Yes	Yes	Yes
2022/04/06 3:07:44 PM GMT+1	Yes	No		Yes	Yes	No	No	No	No	No
2022/04/06 3:08:08 PM GMT+1	Not sure	Yes	Kitchen window looks out onto my garden and bird feeders. I often get lots of activity.	Yes	No	No	No	Yes	No	No
2022/04/06 3:09:25 PM GMT+1	Yes	Not sure		Yes	Not sure	No	No	Yes	Not sure	Not sure
2022/04/06 3:12:23 PM GMT+1	Not sure	Not sure		Not sure	Not sure	No	No	Yes	No	Not sure
2022/04/06 3:49:21 PM GMT+1	Yes	No		Not sure	Not sure	No	No	Yes	Not sure	Yes
2022/04/06 4:05:11 PM GMT+1	Yes	Not sure		Not sure	Not sure	No	No	Yes	No	Not sure
2022/04/06 5:37:43 PM GMT+1	Yes	Not sure		Not sure	Yes	No	No	Yes	No	No
2022/04/06 5:44:40 PM GMT+1	Yes	No		No	Yes	No	Not sure	Yes	Yes	Yes
2022/04/06 7:20:58 PM GMT+1	Yes	No		No	No	No	No	Not sure	Not sure	Not sure
2022/04/06 8:09:16 PM GMT+1	Yes	Yes	Light colours, including some browns- including plants.	No	Yes	No	Yes	Yes	Yes	Yes
2022/04/07 8:35:27 AM GMT+1	No	Not sure		Not sure	Yes	Not sure	Not sure	Yes	No	Not sure
2022/04/07 4:04:00 PM GMT+1	Not sure	Not sure		Not sure	Not sure	Yes	Yes	Yes	Yes	Yes
2022/04/07 8:52:02 PM GMT+1	Not sure	Yes	Window onto garden and plants on window sill	Not sure	No	No	Not sure	Yes	No	Not sure
2022/04/08 9:35:31 AM GMT+1	Not sure	Not sure		Yes	Not sure	No	Not sure	Yes	Not sure	Yes
2022/04/11 2:49:44 AM GMT+1	Yes	No		Yes	No	No	Not sure	Yes	Yes	Not sure
2022/04/12 8:52:18 PM GMT+1	Yes	No		Yes	Yes	No	No	Yes	Not sure	Yes
2022/04/13 9:34:38 AM GMT+1	Yes	Yes	We have a lot of windows in our kitchen as we wanted to bring have a lot of light and help bring the outside in	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2022/04/15 11:45:30 AM GMT+1	Yes	No	It doesnt	Yes	Yes	No	Yes	Yes	Yes	Yes
2022/04/15 11:51:13 AM GMT+1	Yes	Not sure		Not sure	Not sure	Not sure	Not sure	Not sure	Yes	Yes
2022/04/15 2:00:42 PM GMT+1	Yes	Yes	I've always loved bringing the outside in and as I spend so much time in the kitchen it's important not to feel "hemmed in".	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2022/04/15 2:54:49 PM GMT+1	Yes	No		Not sure	Not sure	No	No	Yes	Not sure	Not sure
2022/04/15 6:18:04 PM GMT+1	Yes	Yes	We have a large window overlooking a field and bi fold doors to garden	Yes	No	Yes	Prefer not to say	Yes	Yes	No
2022/04/17 5:06:00 PM GMT+1	Yes	Not sure		Not sure	No	No	No	No	No	No
2022/04/17 8:39:29 PM GMT+1	Yes	No	N/A	Yes	Yes	Not sure	Yes	Yes	Yes	Yes
2022/04/18 8:35:09 AM GMT+1	Not sure	No		Yes	No	No	No	Yes	No	Not sure
2022/04/19 11:18:50 AM GMT+1	Yes	No	N/A	Yes	Yes	No	Not sure	Yes	Yes	Yes
2022/04/19 12:29:45 PM GMT+1	Not sure	Not sure		Yes	Yes	No	Not sure	Yes	Yes	No

Appendix 4 – Interview transcript with Subject A

– 28/04/22 at 9:18am

LA: Right so, should only take 10 to 20 minutes, it's only 6 or 7 questions here I've got so not too long so hopefully doesn't take too much of your time up, happy to get started?

SUBJECT A: Yeah, that's okay no worries at all

LA: Lovely, no problem, so I will be recording this as well just for the transcript just to let you know.

SUBJECT A: Yeah

LA: Lovely, right, we will start off with an easy one so what do you think are the key attributes when designing a kitchen space?

SUBJECT A: well, the key attributes would be practicality, obviously you've got to meet the customer's requirements in terms of what they want in there, but also you've got to be able to advise them if their ideas aren't going to work.

LA: Yeah lovely, and the second question, so would you be able to discuss how you as the kitchen designer designs the space from lead taking to the reveal and close stage?

SUBJECT A: Oh, blimey.

LA: How do you take it from lead taking to the reveal and close, how do you sort of work?

SUBJECT A: what do you want the process you mean?

LA: yeah, so where do you sort of start?

SUBJECT A: well, obviously from the initial meet, you would discuss their brief requirements, you know any ideas they may have, you also talk about their lifestyle you know who's using the room? Who lives there? what they like as well is also a good factor. You obviously arrange a home survey, and on that survey, you get to know their requirements, you know you could also have a look around what they, the styles they already have in their home, you can, sorry Lewis, I'm designing as well.

LA: No problem, no problem.

SUBJECT A: Yeah, you always have a look around and have an idea of their kind of styles and their likes as well, and you can factor that into your designs as well, you know if they've got a certain colour scheme they like to look at or pets, they love that, from the initial, off the home survey, obviously you know, just like it is you do, you take it all back, and put it all together your design, invite them back into the showroom and go through it and obviously take them around the showroom once they're with you, show them the product, give them

some demonstration, little bits and pieces, the pull out and appliances and bits and pieces like that. Obviously, talk to them about any amendments they want to make, you can make that with them or arrange a second appointment with them for them to come back if its lots of amendments and you need some extra time just to get it all right, but if it's just a few amendments you can sit them down and do that with them and then the cost and then present them with the cost.

LA: Yeah.

SUBJECT A: Obviously, yeah and try and close it there and talk about finance as well if that's an option, at the moment it's not an option for us but we are working on that but most of our customers don't want finance anyway.

LA: Right, yeah, lovely, yeah that makes all sense, yeah.

SUBJECT A: Is that alright?

LA: Yeah that's perfect, so we will move onto the next question, so do you believe your clients focus is on bringing aspects of nature inside and/or improving the levels of natural light? So for example if they've got the option to put Velux windows in do they look at that or do they prefer to look at more solid or natural sort of occurring materials so like do they use granite or oak sort of worktops etcetera.

SUBJECT A: Yeah, so obviously you do get some people who want to bring the outside in, and obviously some key bits and pieces you can do to help that is like you said natural occurring materials like stone on the floor, I've even had someone continue their floor out into their patio which was very nice, so obviously you know once the bifold are open, it's all one floor. You can use wood obviously a natural, another natural occurring material. I've had customers that use live edge wood as well, where it's you know where one side is just kept natural on their worktops.

La: Oh, right yeah.

SUBJECT A: So on balance that looked absolutely stunning, so he had it as a breakfast bar, it has a flat back edge but then the front edge was all sort of kept natural like it was just off the tree, that was really nice.

LA: Wow.

SUBJECT A: You know, I've had one customer that wanted an island right up, pretty much right up against their sliding patio doors, and I was like "are you sure?" but yeah, the idea

was once the patio doors were all slid open, it was like three massive doors that all slid open, then when you're sat at the island you're practically sat outside.

LA: Wow, yeah that's lovely.

SUBJECT A: while the doors were shut it didn't work to get round the island at all, and I was like "oo, alright, okay, are you sure this is the way you want to go?" but yeah soon as they open the doors, it all absolutely worked

LA: Wow, lovely.

SUBJECT A: so yeah that was one example I can think off?

LA: is natural light also a focus of theirs?

SUBJECT A: Natural light, yeah like I said these customers had massive grey patio doors that slid completely open pretty much. Velux is always popular, roof lanterns, you know if someone's having an extension, a single-story extension you can pretty much guarantee its got a roof lantern now.

LA: Right yeah.

SUBJECT A: Yeah, I've had a customer who wanted one, at the compromise of storage, she had one wall that was all sort of wire, metal framed shelving and she just filled it with plants

LA: Right, wow.

SUBJECT A: She's obviously bringing in the nature aspect there.

LA: bringing the nature inside, perfect.

SUBJECT A: Yeah, you know just loads and loads of plants just all on these wire, metal framed shelving units that we do.

LA: Lovely, perfect, I'll move onto question 4 now so.

SUBJECT A: Ok

LA: There's a lot of research surrounding sort of colours and how we sort of perceive colours and obviously with the kitchen ranges there's a whole, you could have hundreds of different colours.

SUBJECT A: Yeah

LA: Do you feel your sort of earth like tones and more your navy's your darker sort of colours and your creamer colours, do you feel like they contribute more to a client's interconnectedness to nature than sort of your whites and grey tones, more of your monochromatic?

SUBJECT A: yes, absolutely. You've got your indigos, your navy and your bottle greens have become really really popular now and once you combine that with your brass or your copper even, almost gives a, it's a look that ties in with more with nature rather than your like your monotones like you said. Cream I don't think is that popular at the moment.
LA: No
SUBJECT A: I don't know if it will become popular, I don't know if you've found that at all but not many people are going for ivory or cream anymore but you know it will come around again and you know some of the painted, some of the painted woods with the grain, the natural woods are very popular as well so they're obviously you know, another natural material.
LA: Yeah, lovely, perfect. Again there's lots of research sort of showing that biophilic design itself which is about sort of including aspects of nature in the home, does significantly improve a person's cognitive and productivity in the workspace. To what extent do you agree with this research that it improves cognitive function and productivity and how do you feel kitchen spaces perhaps traditional and focuses on natural colours, shapes and textures so is quite heavily designed with biophilia in mind, how do you feel it could impact a user's health or wellbeing?
SUBJECT A: Sorry, I only got the first part of that.
LA: Yeah, that's no worries so.
SUBJECT A: if you incorporate you know plants and natural light into your room, it is going to help with your wellbeing, of course it is, it's a nicer environment to be in isn't it. It softens the lines by having some foliage in there, doesn't make it such a harsh environment. What was the last part of that?
LA: A kitchen that's perhaps more traditional and focused on natural colours, shapes, forms, textures, you know you can get these milled handles now and brushed effects, it's a lot softer on people's vision of the kitchen. How do you feel that sort of impacts their health or wellbeing, like you said obviously definitely changes their wellbeing
SUBJECT A: I think the style of the kitchen would depend on the persons taste really. If I had a very traditional looking kitchen with knurled handles and you know a very country cottage look, it's not my style at all really, it would probably put me on edge than it to be the other way around, I would want to get rid of it. It's all about taste as well, like I said most people will want to go with as much light as possible, irrespective of the style of the kitchen

LA: Yeah, obviously not everyone needs a connection to nature, there's some people that don't actually enjoy it

SUBJECT A: You don't need a traditional country cottage style of kitchen to feel connected to nature, there's other ways to do it

LA: Yeah, perfect. Do you feel an upwards trend of people that prefer the whites, the grey and sort of darker tones moreover the navy's and the greens that you previously mentioned?

SUBJECT A: Like I said, the navy and the bottle greens are very much on trend, they are very much on trend, but I think whites and greys are always going to be safe colours. Like 5 years ago no one would have wanted grey really

LA: Yeah.

SUBJECT A: It was all about cream and then cream sort of died down a bit and grey has now become, although it was kind of a niche colour at the time, has become a safe colour.

LA: Yeah.

SUBJECT A: Grey has become the new cream really.

LA: Right yeah, perfect, lovely, so we will finish off with this last one. Do you believe biophilic design could increase the amount of time an individual spends in their kitchen?

SUBJECT A: Yeah.

LA: and for it to become a prominent space for them to seek refuge from their day-to-day activities.

SUBJECT A: Yeah.

LA: Yeah, lovely, there's a lot of research showing that we as humans, spend about 90% of our time indoors, whether it will be at work or at home so obviously a kitchen space that is refurbished or updated, you can create it into a space that seeks refuge.

SUBJECT A: Yeah.

LA: but as a designer do you think when you are designing this space, 'are people going to use it more or are they going to use it to the same level as they already do'?

SUBJECT A: Again, it's going back to their initial brief as well. Some people have a very small kitchen, you know they're not going to spend all their time in there, it's just a very practical room, other spaces are really big and open planned, and you have got you know, you wouldn't compromise a unit in there for a space for a pot plant, not normally anyway. Not unless you got a really, like the women I said with the wall of plants, she was adamant that

was what she wanted, but generally people go for the practicality side and then the other bits and pieces around that. Like I said if you've got a big enough space, you know you wouldn't fill a room with units just for the sake of it, you would allow for you know, if you're going to have a seating area in there, you would allow space for bits and pieces as well.
LA: Yeah, no that makes completely sense, that's perfect. Lovely, so that will be the end of the interview and that's all I've got.
SUBJECT A: Ok
LA: happy with all we went through and sort of discussed?
SUBJECT A: yeah, no problem at all
LA: Yeah, lovely, so I will just end that recording that's perfect so I've just got to write a transcript up of what we have said and include that. Like I said if you're happy to be mentioned, I will put your name in the transcript if your happy for that
SUBJECT A: yeah, not a problem
LA: Yeah, thank you very much for doing that. It's a massive help.
Interview with Subject A ended at 9:32 (Recording time= 14 minutes and 36 seconds)

Appendix 5 - Ethics Forms 1

UNIVERSITY OF WINCHESTER

RESEARCH ETHICS FORM 1

WHAT LEVEL OF REVIEW DO I NEED?

GUIDELINES

This form is for staff and students. It will help you identify the level of review needed for your project. Before completing it, you need to:

1. Read *The University Research Ethics Policy*.
2. If you are a student, discuss the ethical aspects of your project with your supervisor.

It is your responsibility to follow the University's Policy on the ethical conduct of research and to follow any relevant academic guidelines or professional codes of practice pertaining to your study when answering these questions.

The questions and checklist in this proforma are intended to guide your reflection on the ethical implications of your research. Explanatory notes and further details can be found in the Policy document.

SECTION 1

DETERMINING WHETHER YOU REQUIRE ETHICS REVIEW

YOUR RESEARCH
Project title**: Biophilic design and the implications it has on the user's well-being and their ability to reconnect to nature within the kitchen space**
Your name**: Lewis Ainsworth**

1.	**Is the proposed activity classified as Research or Audit /Service Evaluation or similar?**	
	☒ Research	☐ Audit or Service Evaluation
	*Use the Policy to help you answer this question. If the proposed activity meets the definition of **research** (see the policy), CONTINUE.* *If the activity is an **audit** or a **service evaluation**, STOP. You do not need to seek ethics approval, but you do need to formally register your project with UREC, along with a project outline. To do this complete Form 2.* *If you are unclear what type of activity you are undertaking, please refer to the Policy for additional types.*	
2.	**Does the research involve living human participants, human samples or data derived from individuals who may be identifiable through that data?**	
	☒ Yes	☐ No
	Use the Policy to help you answer this question. *If you answer **NO**, SKIP to QUESTION 6 and CONTINUE.* *If you answer **YES**, CONTINUE.*	
3.	**Is the research being conducted for a medicinal purpose?**	
	☐ Yes	☒ No
	Use the Policy to help you answer this question. See Appendix 2 - FAQs and definitions. *If you answer **YES**, and think your research comes under the definition of 'for a medicinal purpose,' it will need to be scrutinised by the Committee. Please email the Committee Chair (ethics1@winchester.ac.uk) for further guidance on what to do.* *If you answer **NO**, CONTINUE.*	
4.	**Does your research require external ethics approval or review?**	
	☐ Yes	☒ No
	For example, from the NHS or another overseeing body. Use the Policy to help you answer this question. *If you answer **NO**, CONTINUE.* *If you answer **YES**, you need to formally register your project with UREC, along with the relevant external ethics approval. To do this complete Form 2.*	
5.	**Is the project underway and, the researcher or PI, has moved institution to Winchester?**	

	☐ Yes	☒ No
	*If you answer **YES**, please read the following:* *If the research began when the PI was employed at another institution but has subsequently moved to Winchester, and the project has previously been subjected to ethics scrutiny at that institution, then it need not go through ethics review again. The outcome of ethics review by that institution should be communicated to UREC for formal recording. To do this complete Form 2 and include evidence of the previous ethics approval.* *HOWEVER, if there have been significant changes to the original research design which have ethical implications or recruitment of a cohort of participants will be undertaken through Winchester, then the project will require ethics review and you should apply for approval, CONTINUE.* *If you answer **NO**, CONTINUE.*	
6.	**Is the research collaborative?**	
	☐ Yes	☒ No
	*If you answer **YES**:* • *where the Principal Investigator (PI) of the research is located at another institution, it is their responsibility to seek ethics approval, including partner research sites. The outcome of ethics review by that institution should be communicated to UREC for formal recording. To do this complete Form 2 and include evidence of the previous ethics approval.* • *where the PI is located at Winchester, then the project will undergo scrutiny as per Winchester's Ethics Policy, CONTINUE.* *If you answer **NO**, CONTINUE.*	
7.	**Is the research being conducted in another country?**	
	☐ Yes	☒ No
	*If you answer **YES**, please read the following:* *Where a project is conducted in another country, the researcher should consider if it is possible to obtain ethics review by a local research ethics committee or other relevant body. The outcome of such a review by that institution should be communicated to UREC for formal recording, along with a project outline. To do this complete Form 2.* *If this is not possible, the project should be reviewed by the University of Winchester, either at Faculty level or Committee depending on the nature of the proposed work, so CONTINUE.*	
8.	**Does the research involve the use of documentary material, papers, literary works or archive documents in the public domain?**	
	☐ Yes	☒ No
	Use the Policy to help you answer this question. *If you answer **NO** because the works are in a private archive or closed collection, do the following: complete Form 2, including details of the nature of the private /closed collection and provide evidence of the permission to use this material for research purposes.* *If you answer **YES**, you need to formally register your project with UREC, along with a project description. To do this complete Form 2.*	
9.	**Does the research involve the animals?**	
	☐ Yes	☒ No
	*If you answer **NO**, CONTINUE.*	

	*If you answer **YES**, you need to formally register your project with UREC, along with a copy of the relevant licence (if required). To do this complete Form 5.*	
10.	**Does the research involve environmental interventions?**	
	☐ Yes	☒ No
	*If you answer **NO**, CONTINUE.* *If you answer **YES**, you need to formally register your project with UREC, along with a copy of the relevant licence (if appropriate). To do this complete Form 2*	
11.	**Does the data you will collect contain *any* information that could be linked back to participants or that might identify them (e.g. name, address, photo, voice, email)?**	
	☒ Yes	☐ No
	*If you answer **NO**, you need to formally register your project with UREC. To do this complete Form 2.* *If you answer **YES**, CONTINUE.*	

☞ Reaching the end of these questions, **either** you will have been directed to complete a specific additional form **or** you should continue to section 2.

If you are still unsure whether you need ethics review or not, please re-read The Policy and email your query to ethics@winchester.ac.uk with details of your project.

SECTION 2

DETERMINING THE LEVEL OF ETHICS REVIEW REQUIRED

Please mark with an ☒ as appropriate	YES	NO
Does the research involve individuals who are vulnerable? *For example: vulnerable children, over-researched groups, people with learning difficulties, people with mental health problems, young offenders, people in care facilities, including prisons. For a note on research with children, see Appendix 2 of the Policy.*	☐	☒
Does the research involve individuals in unequal relationships e.g. your own students? *Please note:* 1. *students recruited via SONA are not considered 'your own students.' If you intend to recruit widely across the University or your Faculty (e.g. through snowball sampling or a mail shot) you do not need to consider such students as your own, even if some participants may be students you are directly involved with. Only tick "yes" if you are targeting your own students specifically.* 2. *if you are an undergraduate or postgraduate student carrying out research with children in either a school or early years setting, these DO NOT come under the category of your 'own students.'*	☐	☒
Will it be necessary for participants to take part in the study without their knowledge and consent at the time? *For example: covert observation of people in non-public places, use of deception. See Appendix 2 of the Policy.*	☐	☒
Will the study involve discussion of sensitive or personal topics? *For example: (but not limited to) participants' relationships, emotions, sexual behaviour, experience of violence, mental health, gender, race / ethnicity status or experience, political or religious affiliations. Please refer to the Policy.*	☐	☒
Is there a risk that the highly sensitive nature of the research topic might lead to disclosures from the participant concerning their own involvement in illegal activities or other activities that represent a threat to themselves or others which may need onward reporting? *For example: sexual activity, drug use, illegal activities or professional misconduct.*	☐	☒
Might the research involve the sharing data or confidential information beyond the initial consent given?	☐	☒
Might participant anonymity be compromised at any time during or after the study? *For example: will the research involve respondents using the internet, social media, or other visual /vocal methods where respondents may be identified?*	☐	☒
Is the study likely to induce severe physical harm or psychological distress?	☐	☒

Does your research involve tissue samples covered by the Human Tissue Act (2004)?	☐	☒
Is there a possibility that the safety of the researcher may be in question? *For example: research in high risk locations or with high risk groups.*	☐	☒
Does the research involve creating, downloading, storing or transmitting material that may be considered to be unlawful, indecent, offensive, defamatory, threatening, discriminatory or extremist? *If you answer **YES** to this question, you must also contact the Director of IT Services, who must provide approval for the use of such data.*	☐	☒

Answering **NO** to ***all*** these questions means your project is eligible for Faculty level ethics review. You now need to complete Form 3.

Answering **YES** to ***any*** of these questions means your project will require Committee ethics review. You now need to complete Form 4.

Appendix 6 - Ethics Forms 3

UNIVERSITY OF WINCHESTER

RESEARCH ETHICS FORM 3

FACULTY REVIEW

GUIDELINES

This form is for staff and students. It will help you set out the ethical aspects of your project that need to be reviewed. Before completing it, you need to:

1. Read *The University Research Ethics Policy*.
2. If you are a student, discuss the ethical aspects of your project with your supervisor.

It is your responsibility to follow the University's Policy on the ethical conduct of research and to follow any relevant academic guidelines or professional codes of practice pertaining to your study when answering these questions. This includes providing appropriate information sheets and consent forms and ensuring confidentiality in the storage and use of data.

The questions in this proforma are intended to guide your reflection on the ethical implications of your research. Explanatory notes and further details can be found in the Policy document.

If any aspect of your project changes during the course of the research, you must notify the Chair of UREC.

SECTION 1

YOUR DETAILS			
1.1.	Your name**: Lewis Ainsworth**		
1.2.	Your department: Computer-Aided Design		
1.3.	Your Faculty: Faculty of Business, Law & Technology		
1.4.	Your status**:**		
		☒ Undergraduate Student	☐ Staff (Professional Services)
		☐ Taught Master	☐ Staff (Academic)
		☐ Research Degree Student	☐ Other (please specify below)
1.5.	Your university email address**: l.ainsworth.19@unimail.winchester.ac.uk**		
1.6.	Your telephone number**: 07849139009**		
	<u>For students only</u>:		
1.7.	Your degree programme**: Computer-Aided Design**		
1.8.	Your supervisor's name**: Rhys Lockley & Marina Brkljac**		
1.9.	Your supervisor's department**: Computer-Aided Design**		
1.10.	Your supervisor's email**: Rhys.Lockley@winchester.ac.uk & Marina.Brkljac@winchester.ac.uk**		

SECTION 2

YOUR RESEARCH			
2.1.	Project title: Biophilic design and the implications it has on the user's well-being and their ability to reconnect to nature within the kitchen space		
2.2.	Start date: September 2021		
2.3.	Expected completion date: May 2022		
2.4.	Expected location of data collection: Working from home (e.g. school, workplace, public place, University premises etc.)		
2.5.	Has funding been sought for this research?		
		☐ Yes	☒ No
2.6.	If so, where have you applied for funding?		
2.7.	Has the funding been granted?		
		☐ Yes ☒ No	☐ Pending
2.8.	Is the research collaborative? (e.g. co-investigators from another institution, at or with another organisation or colleagues in another department)		
		☐ Yes	☒ No
		If yes, which?	
2.9.	Is Disclosure and Barring Service clearance required for your study? It is your responsibility to contact the Disclosure and Barring Service (DBS) to confirm whether or not clearance is needed prior to commencing recruitment or data collection. More information here		
		☐ Yes	☒ No
2.10.	Will your research be informed by guidelines from a professional association or specific, agreed standards of practice?		
		☐ Yes	☒ No
		If yes, which?	

SECTION 3

PROJECT DESCRIPTION

Please provide a brief description of your project in non-technical language (between 500-1000 words). This should include details of the research rationale, aim(s), research question(s), context (linking to some relevant literature), and methods (including details of participants, data collection (including examples /descriptions of any audio or visual stimuli to be presented to participants), data analysis) to be used. You should state any ethical issues that you have identified and how these will be dealt with. This overview should contain sufficient information to acquaint the reader with the principal features of the proposal. A copy of the full proposal may be requested if further information is deemed necessary.

Please use this section to list documentation that may be relevant to your application and append it to the submission (e.g. consent forms, information sheets, questionnaires etc.).

Research Rationale

This study proposes to investigate the concept of biophilia specifically within the kitchen space, how this has become more integrated over the years and how it affects a user's connection to nature. The purpose of the survey and interview is to collected perceptions and opinions of biophilic design both from a general public and professional outlook and identify any correlation between the two different perspectives.

Aims

- To investigate how the general public and professional designers perceive biophilia and the impacts on their health or their customers.
- Understand the impact biophilia has on users in the kitchen space.

Research Question

Biophilic Design and the implication it has on the user's well-being and their ability to reconnect to nature within the kitchen space

Context

Current literature clearly indicates the positive impacts biophilic design has on the user's psychological and physiological behaviours particularly in the office space, whereby a study indicates 12% greenery to workspace ratio was the optimum balance to achieve peak health benefits (lei et al., 2021). However, the primary issue with current literature is the lack of research surrounding the level of presence and the impact biophilia has on a user within the home and/or functional spaces. Browning et al.'s (2020) indicates how biophilic design is categorised into three key principles: 'Nature in the Space', 'Natural Analogues' and 'Nature of the Space'. Understanding and implementing the basic concept of these principles into the set of survey and interview questions will help establish any clear links or differences. Through collecting data encompassing biophilia specifically within the kitchen space, this dissertation will serve to expand upon current literature and understanding of the effects biophilia has within the home.

Method

This research aims to find correlations or links between the varying perceptions that the general public and a professional designer may have in regard to biophilia in the home. To collect the appropriate data ready for analysis, I aim to create a set of questions which will be circulated as a survey onto online platforms that will consist of numerous questions in relation to the topic of biophilic design in the kitchen space. In addition to this, I aim to interview a professional kitchen and bathroom designer to attain a source of qualitative data that can be critically analysed and compared to the collected quantitative data. Both the survey and interview will take no longer than 15 minutes and all data will be processed and presented in the appropriate formats: charts and transcripts.

The predominate type of data analyse that will be used is descriptive analysis with some diagnostics analyse to help form correlations and synthesis the two sets of data. These types of data analyse techniques will work in conjunction with each other to form a comprehensive and critical analysis of the data collected

Ethical Issues

To ensure the collection and processing of this data is GDPR compliant, I will be storing all results and transcripts on a secure and password protected device and possibly a back-up external hard drive which requires a password immediately when inserted into a device or computer to access the documents. The data will be stored on the secure devices until October 2022; however, if this data is published, the files will remain secure for up to 4 years. After this period, the files will be permanently deleted from all devices. If an individual or interviewee would like to withdraw from the study, they will have the right to request withdrawal and all data will be immediately deleted

SECTION 4

REFINING THE LEVEL OF ETHICS REVIEW REQUIRED

Please mark with an ☒ as appropriate		YES	NO
1	Does the research involve members of the public in a research capacity as co-researchers? (I.e. as in participant research where involvement extends beyond data collection)	☐	☒
2	Is there a risk of over-disclosure that may put the participants at risk or cause them any anxiety?	☐	☒
3	Will tissue samples (including blood) be obtained from participants?	☐	☒
4	Will the study require the co-operation of a gatekeeper for initial access to participants? (E.g. to students at school, to members of self-help group.)	☐	☒
5	Is the right to withdraw from the study withheld at any time, or not made explicit?	☐	☒
6	Is there any reason participants may feel obliged to participate in the study against their will?	☐	☒
8	Will the research involve administrative or secure data that requires permission from the appropriate authorities before use?	☐	☒
10	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?	☐	☒
11	Are there payments to researchers /participants that may have an impact on the objectivity of the research?	☐	☒
12	Is there any cause for uncertainty as to whether the research will fully comply with the requirements of the General Data Protection Regulation (GDPR) (2018)?	☐	☒
13	Does any part of the project breach any codes of practice for ethics in place within the organisation in which the research is taking place?	☐	☒
14	Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants? Please note: for fast track review, it is expected that the study will not involve invasive, intrusive or potentially harmful procedures of any kind.	☐	☒
15	Is pain or more than mild discomfort likely to result from the study?	☐	☒
16	Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life? (E.g. involve prolonged or repetitive testing.)	☐	☒

If you answer <u>YES</u> to *any* of these questions, please use the next section to indicate which question you have said yes to, describe the ethical issue in the context of your study and how you will address it. If you have answered <u>NO</u> to all questions, complete section 6.

SECTION 5

ADDITIONAL INFORMATION AND AMENDMENTS
Use this space to address ethical issues highlighted by the checklist in section 4, or to amend an original submission.

SECTION 6

DECLARATION	
I have read and understood the University of Winchester Research Ethics Policy and confirm that adequate safeguards in relation to the ethical issues raised by this research can and will be put in place. I am aware of and understand University procedures regarding Health and Safety. I understand that the ethical aspects of this project may be monitored by the University Research Ethics Committee. I understand my responsibilities as a researcher as described in the University of Winchester Research Ethics Policy. I declare that the answers above accurately describe the research as presently designed and that a new application will be submitted should the research design change in a way which would alter any responses given in Form 1 or here.	
☒ I confirm that if a Risk Assessment is required I will complete it and have it co-signed by my Supervisor or Head of Department before data collection takes place.	
☒ I confirm that, if DBS clearance is required for my project, then I will seek it before the start of my project.	
☒ I confirm that my research does not include risks that might cause it to be excluded from coverage by the University's insurers.	
☒ I confirm that I have appropriate insurance for this research.	
Researcher's signature: Lewis Ainsworth	Date: 31/01/2022
In addition, for **students** (undergraduates, masters, postgraduate, research): The student has the skills to carry out the proposed research. I undertake to monitor the student's adherence to the relevant research guidelines and codes of practice.	
Supervisor's signature: R.Lockley	Date: 01/03/22
2nd Supervisor's signature: Marina Brkljac, 02.03.2022	

Please submit this form along with Form 1 to your Faculty Head of RKE or nominee (staff /PGR) or your supervisor (taught postgraduate students).

Please remember to append any forms or documents that may be relevant to your application (e.g. consent form, information sheet, questionnaire(s) etc.). Your form cannot be considered unless it is submitted with the required supporting documentation. Omitting to do so will delay the ethics review process.