

Translating the Theory into Practice – the collating, comparing and synthesising of foundational recommendations and qualities for restorative garden design.

[Att översätta teori till praktik – samla, jämföra och syntetisera grundprinciper och egenskaper för restorativ trädgårdsdesign.]

SANDRA SCHWARZ



Translating the Theory into Practice – the collating, comparing and synthesising of foundational recommendations and qualities for restorative garden design.

Sandra Schwarz

Supervisors: Anna Bengtsson, *SLU, Department of Work Science, Business Economics & Environmental Psychology*
Frederik Tauchnitz, *SLU, Department of Work Science, Business Economics & Environmental Psychology*

Examiner: Anna Peterson, *SLU, Department of Landscape Architecture, Planning and Management*

Co-examiner: Linn Osvalder, *SLU, Department of Landscape Architecture, Planning and Management*

Credits: 30
Project Level: A2E
Course title: Independent Project in Landscape Architecture
Course code: EX0852

Programme: Landscape Architecture – Master's Programme
Place of publication: Alnarp
Year of publication: 2019
Cover art: Sandra Schwarz
Online publication: <http://stud.epsilon.slu.se>

Keywords: restorative; restoration; nature; green space; stress; cancer; rehabilitation; design

ACKNOWLEDGEMENTS:

I would like to take a quick moment to acknowledge people who have supported me in this Thesis:

Firstly, Thank you to Dr. Roger Ulrich for his time, wisdom and inspiration with a conversation that got this journey started.

Thank you to my Supervisors Anna & Frederik for their time and input.

*A very grateful shout-out to three friends who helped me enormously - **Christopher** for your exacting attention to detail and patience with my referencing; **Airiin** for your unique perspective and wise words; and **Kaele** who gave me such confidence and whose attention to detail in feedback have allowed me to make this work so much stronger = **THANK YOU!***

Finally, to my 'special sponsors' a.k.a. Mum & Dad, who do me great honour in travelling half-way around the world to be a physical presence and support for the conclusion of this process - I couldn't do any of this without you!

Note: Unless otherwise referenced or acknowledged, all photos are taken by the Author.

German Theorist Christian Cay Lorenz Hirschfeld (1741-1792)

“Hospitals are to be situated outside and away from cities, **to allow for garden space**. Hospitals should be located away from busy urban areas in a healthy and positive and inspiring location, not in valleys...but on **sunny, warm, hilltops protected from the wind** or on southern slopes on dry soil.

A hospital should lie open, not encased by high walls, not fenced in by looming trees. **The garden should be directly connected to the hospital, or even better, surround it**. Because a view from the window onto blooming and happy scenes will invigorate the patient, **a nearby garden also invites patients to take a walk**.

The plantings, therefore, should wind along dry paths that **offer benches and chairs**. Clusters of trees are preferred to alleys of trees, which through the years will mature and meet at the top so that air will not circulate...Sad conifers should not be used but trees with **light and coloured leaves and flowering and fragrant shrubs and flowers**. A hospital garden should have **everything to encourage the enjoyment of nature and to promote a healthy life**. It should help forget weakness and worries and encourage a positive outlook; everything in it should be serene and happy. No scene of melancholy, no memorial of mortality should be permitted to intrude. The spaces between the tree groups could have **beautiful lawns and colorful flower beds**.

Noisy brooks could run through flowering fields, and merry waterfalls could reach your ear through shady shrubbery. Many plants with fortifying fragrances could be grouped together. Numerous songbirds will be attracted by the shade, peace, and freedom. And their song will rejoice many weak hearts.”

(Gerlach-Spriggs, Enoch Kaufman & Warner Jr., 1998, p. 18).

How can we return to this ideal...?

DEFINITIONS / GLOSSARY:

In this Thesis there is no attempt to define the concepts of ‘nature’ or ‘garden’, rather using both terms loosely to describe and mean green spaces, predominantly made up of vegetation and in direct contrast to hardscape surfaces such as are common in an urban environment. The following definitions are used to clarify what is meant throughout the text, in some cases these terms can be academically, professionally or other expertise supported, but in all cases they represent, above all else, my interpretation of terms. This is provided to help clarify the present interpretation of terms that can differ in meaning depending on aspects such as professional and geographic context.

HEALING GARDEN: Spaces often connected to hospitals or healthcare facilities, open for use by anyone at their discretion and seen as a place of respite through being surrounded by greenery / vegetation. [No formal program or activity occurs here.] (Messer Diehl, 2007, American Horticultural Therapy Association). These spaces are not intended to cure someone, but rather alleviate stress, “...soothe, to calm, to rejuvenate or to restore one’s mental and emotional health”, thereby providing sanctuary and allowing for meditation (Polat, Güngör, & Demir, 2017, p. 38).

HEALING GARDEN SCHOOL: This concept proposes that user’s experiences or “...health effects are, above all, derived from the experiences of the garden room as such, its design, and its contents” (Stigsdotter & Grahn, 2002, p. 62). The reasons, both physiological and psychological, have a number of proposed explanations, some of which are linked to the main theories discussed within the Thesis. This concept is fundamental in the idea of nature or green spaces having the qualities to benefit health in humans.

HEALTH: The definition given by the World Health Organisation (WHO) in 1948 will be used: “...a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (Hartig, Van den Berg, Hagerhall, Tomalak, Bauer, Hansmann, Ojala, Syngollitou, Carrus, Van Herzele, Bell, Camilleri Podesta & Waaseth, 2011, p. 131). This constitutes a multi-dimensional view of health as being affected by physical, psychological, social and environmental factors.

HORTICULTURAL THERAPY GARDEN: Essentially this is a Healing Garden that is used specifically as part of a therapeutic program, designed to meet explicit needs of specific users and professionals through predominantly horticultural activities. (Messer Diehl, 2007, American Horticultural Therapy Association).

HORTICULTURAL THERAPY SCHOOL: This concept argues that health effects and benefits of the activities within a garden space are of most value. Garden work is here seen as particularly meaningful and enjoyable and thus therapies of this type focus on the activity, with support from the environment (Stigsdotter & Grahn, 2002, p. 63).

INSTORATIVE SCHOOL: This concept begins with a combination of the *Healing Garden School* and the *Horticultural Therapy School*, believing that health effects are a combination of the environment, the activity, plus the visitor’s background and character. It is this combination of factors that allow users to identify with and ‘belong’ within the space (Stigsdotter & Grahn, 2003, p. 39). [Also called the *Cognitive School*.]

NATURE-BASED THERAPY: This term is about therapies occurring in nature dominant spaces, such as those seen in the Nacadia Case Study. Horticultural Therapy or elements thereof make up the Nature-Based Therapy, but do not constitute it entirely. In my understanding, Nature-Based Therapy works more broadly within nature than does Horticultural Therapy.

REHABILITATIVE GARDENS: *“Gardens are programmed to parallel the treatment protocols of a target patient population for the purpose of achieving the desired medical outcomes. The primary focus tends to be physical rehabilitation; the secondary benefits are psychological and emotional.”* (Smith, 2007, p. 11). *“The term rehabilitation garden is no well-recognized concept but rather a term chosen to describe work done within the scope of the (Alnarp) garden. To be clear, concept-wise a rehabilitation garden can be said to be a health (or healing) garden, where experiences of parts of the garden are more dependent on the presence of therapists and activities, in which cases it can be said to be a therapeutic garden - while other parts of the garden are intended to give the patient opportunities for restoration by offering a restorative environment...”* (Tenngart Ivarsson, 2011, p. 36-37).

RESTORATION: *“The process of renewing, recovering, or reestablishing physical, psychological, and social resources or capabilities diminished in ongoing efforts to meet adaptive demands.”* (Hartig, 2004, p. 273). *“The term ‘restoration’ covers processes through which people recover resources that they have diminished in their efforts to meet the demands of everyday life.”* (Hartig et al, 2011, p. 148).

RESTORATIVE ENVIRONMENT: *“An environment that promotes (and not merely permits) restoration.”* (Hartig, 2004, p. 273).

RESTORATIVE GARDEN: This type of garden space may be public or private and not necessarily linked to a healthcare setting, with a focus on spaces that support psychological, physical and social needs of users. [In some literature these were also called meditative gardens.] (Messer Diehl, 2007, American Horticultural Therapy Association). *“Gardens designed for the purpose of regaining homeostasis in a patient/user group. The focus is on the psychological/emotional side of the target audience. The main purpose is to passively allow the body to regain balance after stressful events.”* (Smith, 2007, p. 11).

SALUTOGENIC: Situations, actions or environments that *“...actively promote health, rather than just being low on risk factors.”* (Antonovsky, 1996, p. 14). *“Salutogenic design, like preventive medicine, promotes health rather than trying to heal what has been broken...”* (Sachs, 2017, p. 11).

SHINRIN-YOKU: A term coined in 1982 by the Japanese Ministry of Agriculture, Forestry and Fisheries meaning *“...taking in the forest atmosphere or forest bathing...a process intended to improve an individual’s state of mental and physical relaxation”* (Park, Tsunetsugu, Kasetani, Kagawa & Miyazaki, 2010, p. 19).

STRESS: *“A process of responding to an excess of demands relative to the resources needed to cope with those demands.”* (Hartig, 2004, p. 273).

THERAPEUTIC GARDEN: Essentially a Healing Garden that is used specifically as part of a therapeutic program (this may be physical etc. without being horticultural), designed to meet explicit needs of specific users and professionals. (Messer Diehl, 2007, American Horticultural Therapy Association). Due to the connection to the garden the vast majority of the therapy is performed outdoors, allowing physical activity and connection with more of the senses (Adevi & Lieberg, 2012, p. 53).

ABSTRACT:

The catalyst for this Thesis was a recognised ‘disconnect’ between academic research and landscape architects / designers of restorative green spaces, which was validated by several experts in the field. The need for research to provide tangible recommendations and examples of best practice, in the principle of Evidence-based Design, drove this task. A literature study informs background knowledge of the main theories within this field, namely Appleton, the Kaplans, Ulrich and Grahn & Stigsdotter. Beyond these foundational theories the literature was examined and synthesised via the use of matrices to result in a set of 10 categories and their connected qualities, which benefit and support restorative green spaces. This analysis has resulted in the broad conclusion that the most ideally recommended setting for restoration is one that provides a range of spaces from which to choose, set within a lush and diverse natural landscape that encourages birdsong and other multi-sensory stimulation. The recommendations have also been visually presented through a range of case studies within both stress rehabilitation and cancer care. The recommendations resulting from this work have the potential to be used for Post-occupancy Evaluation in future, but primarily they constitute a sound practical basis for restorative green space design, onto which discussions with client, user and specific context should be built. The work thereby provides a solid foundation for informed design of restorative green spaces in future practice.

CONTENTS:

PREFACE	1
(I) INTRODUCTION	3
[Boxed - History of Healing Green Spaces]	5
(II) AIM	7
(III) METHOD	
III.1 LITERATURE STUDY	7
III.2 MAIN THEORIES MATRIX / SYNTHESIS	8
III.3 LITERATURE MATRIX / SYNTHESIS	8
III.4 CASE STUDY COMPARISON	9
III.5 PRESENTATION OF FINDINGS	9
[Boxed - Overview of user conditions]	10
(IV) MAIN UNDERLYING THEORIES within LITERATURE	
IV.1 PROSPECT & REFUGE THEORY by Dr. Jay Appleton	11
IV.2 PSYCHO-EVOLUTIONARY THEORY /	
STRESS RECOVERY THEORY by Dr. Roger Ulrich	12
IV.3 ATTENTION RESTORATION THEORY by Dr. Rachael	
& Dr. Stephen Kaplan	13
IV.4 PERCEIVED SENSORY DIMENSIONS by Dr. Patrik Grahm	
& Dr. Ulrika A. Stigsdotter	14
[Boxed Summary of Main Theory Qualities]	16
(V) PERIPHERAL THEORIES within LITERATURE	17
(VI) PRACTICAL RECOMMENDATIONS within LITERATURE	
1 - CHOICE / SOCIAL QUIETNESS	22
2 - COLOUR	23
3 - COMPOSITION / LAYOUT	24
4 - FASCINATION / SENSORY STIMULATION	24
5 - PHYSICAL COMFORT	26
6 - SEATING	27
7 - SOUNDSCAPE	28
8 - SPACE / WALKABILITY	28
9 - SPATIALITY	30
10 - VEGETATION	32
[Boxed Summary of Recommended Qualities]	36

CONTENTS continued:

(VII A) CASE STUDIES - Stress Rehabilitation	
Alnarp Rehabilitaion Garden	38
Healing Forest Garden Nacadia	41
Granliden Rehabilitation Garden	44
(VII B) CASE STUDIES - Cancer Care	
Dundee Maggie's Cancer Care Centre	48
Gartnavel Maggie's Cancer Care Centre	51
Manchester Maggie's Cancer Care Centre	54
(VIII) CASE STUDY SUMMARY	57
(IX) DISCUSSION OF FINDINGS	
IX.1 MATRIX RESULTS	59
IX.2 COLLATION & SYNTHESIS	59
IX.3 RESULTING CATEGORIES	60
IX.4 CASE STUDIES	60
IX.5 QUALITIES	60
IX.6 MATRIX THRESHOLD	62
(X) REFLECTIONS ON METHOD	
X.1 LITERATURE STUDY	63
X.2 MAIN THEORIES MATRIX / SYNTHESIS	63
X.3 LITERATURE MATRIX / SYNTHESIS	63
X.4 CASE STUDY COMPARISON	64
(XI) RESULTING GENERAL CONCLUSIONS	65
(XII) CONCLUDING SUMMARY	67
APPENDIX A - Main Theories	69
APPENDIX B - Literature Matrix General	70
APPENDIX C - Literature Matrix Stress	74
APPENDIX D - Literature Matrix Cancer	74
REFERENCES	75

PREFACE:

My interest in restorative green space design came initially from being introduced to Environmental Psychology here at SLU, and how such research is able to influence design strategies in Landscape Architecture. The best example from Sweden is the Alnarp Rehabilitation Garden, but I also connected this field with the ideas underlying the development of the Maggie's Cancer Care Centres Design Brief (United Kingdom). The brief in these cases very much told the Architect (being more focussed on the building than the garden) what the building was required to offer or provide, both in terms of physical needs and atmosphere, whilst leaving room for the proverbial creativity of the designer. Thus, the initial hypothesis was to create such a comprehensive design brief for restorative gardens. Due to the task's scope this unreasonable goal was revised to translating existing research into practice related terms and examples.

At every stage of my learning, I am constantly seeking the HOW – “How do I do that in professional practice?” – “How can I physically create a garden / green space that will help people recover their well-being and health?” – “How do I physically or practically create a restorative space?” There is a ‘disconnect’ between academic research and practitioners, which has been recognised by a number of authors in the profession, such as Sachs (2017, p. 1, 225-227, 235, 248), and this tension is a key aspect being addressed in this Thesis. I have gone in pursuit of research recommendations and findings from a broad variety of authors and theories, to piece together where researchers and others in the field agree, and to interpret what the sometimes intangible could mean in practical terms.

There is overwhelming agreement that natural environments are more restorative for psychological and physiological restoration than urban environments (Adevi, 2012; Adevi & Mårtensson, 2013; Cooper Marcus & Sachs, 2014; Grahn,

Stigsdotter & Berggren-Bärring, 2005; Grahn & Stigsdotter, 2010; Guan, Wei, He, Ren & An, 2017; Hartig, 2004; Hartig & Cooper Marcus, 2006; Hartig et al, 2011; Herzog, Maguire & Nebel, 2003; Joye & Van den Berg, 2012; Kaplan, 1992; Kaufman & Lohr, 2008; Nordh, Hartig, Hagerhall & Fry, 2009a; Park et al, 2010; Sachs, 2017; Tenngart Ivarsson & Grahn, 2012; Ulrich, 1986; Ulrich, Simons, Losito, Fiorito, Miles & Zelson, 1991; Van den Berg, Jorgensen & Wilson, 2014). Much of the research comes in the form of experiments that show specific physiological responses to prove this, particularly in the healthcare context. This has resulted in some great resources, such as Clare Cooper Marcus & Naomi Sachs' book *Therapeutic Landscapes* (2014), which is by many in this field seen as a bit of a ‘Bible’ for restorative green space design. On this occasion, however, the intention was to look more broadly and internationally at the issue.

As mentioned, an aspect of the Landscape Architecture industry that seems to be influencing the absence of the ‘practical clarity’ sought, is the lack of communication or ‘disconnect’ between academic research and design professionals. Cooper Marcus recognised this issue as being acknowledged within the industry as far back as the 1960s and it continues to make an impact, particularly for Evidence Based Design (Cooper Marcus, 2016, p. 172; Oher, 2016, p. 7f). This disconnect may occur for a variety of reasons, such as time restrictions, cost and disparate language or as Relf (2005, p. 235) mentions, the lack of public access to certain resources. There may even be a fear of ‘listing features’ as empirical solutions, rather than seeing them as opportunities for a deeper understanding of how and why certain qualities can restore a user (Tenngart Ivarsson, 2011, p. 69; Bengtsson & Grahn, 2014, p. 880). In addition to the disparate processes of research and practice, there was also recognition of a lack of training within educational institutions in this more specialised field (Stigsdotter, Pálsdóttir,

PREFACE continued:

Burls, Chermaz, Ferrini & Grahn, 2011, p. 331). The lack of training or knowledge of how to translate research and findings into the planning, design and management of restorative green spaces was also noted by Van den Berg et al (2014, p. 173). Perhaps this can be in part explained by the distinct nature of this type of design context, with designers needing to recognise their own dual purpose: to design for the healing process as well as the physical space that will support this (Polat et al, 2017, p. 38).

Twenty years ago J. William Thompson (1998, p. 72) claimed that *“There is really no data that would enable us to create therapeutic outcomes through design”* and whilst there exists much more research to provide such data today, including an increased awareness in clients, the question remains of how this knowledge can be made more accessible to practitioners. There needs to be a goal within the multi-disciplinary field of professionals who deal with restorative landscapes to share knowledge and expertise, without dictating or claiming a one-size-fits-all solution, much like the Maggie’s Centre Design Brief. By sharing opportunities for creative solutions, perhaps some of the angst and distance between research and design could be bridged (Copper Marcus, 2016, p. 173).

Within this Thesis I have chosen to begin by looking as broadly as possible, comparing different countries and theories, as well as allowing here and there for the reading to lead onto new tracks that could be worth investigating further in future. My initial aim for the case study visits was to include dementia, covering the three conditions that I felt were most prominent in the research, but as the work evolved it became clear that whilst stress and cancer had some common needs, dementia patients often required contrasting qualities. Furthermore, specific dementia gardens were quite difficult to access in the Skåne / Öresund region, as they are generally mixed-use spaces within elderly care. Overall, there is clearly more breadth than depth to

the chosen approach, predominantly due to the scope of a 20-week Project and this being the beginning of a journey towards ‘deep diving’ into the topic specifics. I have scratched the surface to open up possible new pathways for further investigation, as well as drawing conclusions that provide a sound foundation for both design and research in future.

(I) INTRODUCTION:

Healing Gardens have a long history (see boxed text): why then is the value of green spaces sometimes ignored or needing to ‘prove its worth’ so emphatically in our capitalist (western) society? This question is the moral and philosophical backbone to my interest in this topic, but the approach to this Thesis will be from a much more pragmatic and practical stance, attempting to make sense of theories and research so that this may inform future professional practice in a tangible manner. “*In nature-based therapy, the environment is never just a background; it is the catalyst for the therapeutic process...*” (Corazon, Stigsdotter, Claudi Jensen & Nilsson, 2010, p. 42) and therefore it is vital that designers approach this type of project differently, including from a more scientifically / medically informed standpoint. Thus, I will interpret and synthesise available information, provide physical / practical examples of these interpretations with the aim to being clear for others, and finally to conclude about what has been read, seen and discovered in a succinct manner.

This Thesis is written with the premise that the hypothesis of Biophilia, or a similar notion of “...*the innately emotional affiliation of human beings to other living organisms...*” as part of evolutionary theory, is a ‘given’ and thus it underlies the task as a whole (Kellert & Wilson, 1993, p. 31). It is recognised that this field of research is vast, touching on aspects of physiological and psychological recovery, aesthetic preference, urban design, the importance of the use of all our senses and much more. The primary audience for whom this research has been developed, is that of a landscape designer, but it also provides synthesis for research-based professionals. There is a focus on the aspects of restorative spaces that address factors over which designers would actually have control – the physical design. Thereby, this Thesis is removed from the context of the medical healthcare industry (Cooper Marcus & Barnes, 1999; Cooper Marcus & Sachs,

2014) and looking more specifically at the tools and language of the Landscape Architect.

Due to the breadth of health disorders that may benefit from nature-based rehabilitation, the decision was made to focus on the conditions of stress and cancer. The gardens visited showed themselves to have quite contrary foundations: the stress gardens are all heavily grounded in academic research, whilst the cancer care gardens seem at this stage to draw on other foundations. Although this was not a focus of the current work, it is an interesting factor that could be further explored and may well have indirectly impacted the results. Stress rehabilitation remains in its infancy outside of Sweden and thus, on its own, was deemed too biased or specialised. The decision was therefore made to focus on both stress and cancer, due to their similar needs, their accessibility within the research and geographically, as well as together representing a more international viewpoint.

Within the literature the concepts of ‘aesthetic preference’ and/or ‘arousal theory’ from Environmental Psychology are either connected or underlie a number of works (particularly Appleton’s and Ulrich’s Theories). These topics were not explored further, because although they are tangentially linked, they are not specifically related to restorative green spaces, as well as being broad areas of research within themselves (Dosen & Ostwald, 2016). Whilst it is quite clear that this type of connection or relationship to landscape and our environment exists – no doubt impacting our choices, tastes and experiences – there are challenges and perhaps limitations when, for example, reducing aesthetic experience to a purely biological response (Bourassa, 1988, p. 243f).

Evidence-based Design (EBD) is a term that has been used quite consistently in environmental design fields in recent times, and while some professionals would like to see its adoption occur

(I) INTRODUCTION continued:

in a more regulated manner, through methods such as accreditation, it is widely recognised as a ‘best-practice’ method (Copper Marcus, 2016, p. 173). Having its origins in Evidence-based Medicine, the term is defined by Stichler & Hamilton (2008) as: “...a process for the conscientious, explicit, and judicious use of current best evidence from research and practice in making critical decisions, together with an informed client, about the design of each individual and unique project” (p. 3). As in healthcare design in general, there is a danger within this approach for a disconnect between the scientific / academic world and that of practitioners, but there seems to be a growing awareness and crossing of disciplines in an attempt to embrace this salutogenic methodology within design (Oher, 2016, p. 1, 3). The cyclical nature of this type of design process continuously evaluates, explores and revises designs based on experiences and new knowledge gained (Sidenius, Karlsson Nyed, Linn Lygum & Stigsdotter, 2017, p. 2). In approaching this Thesis from the basis of a literature study, followed by comparison to case studies, the aim is to apply the principles of EBD, drawing on what has come before, to inform and act as a stepping stone for what is to be created in future.

Finally, there exists a slightly ambiguous range of language, even within the disciplines that have taken on research in this field. Although the common denominator is that all of these places are *enabling spaces* (Souter-Brown, 2015, p. 36) the terminology alternates between being culturally biased, legislatively prescribed and/or simply disparate through unintentional misunderstanding. The glossary at the beginning of this Thesis aims to aid in clarifying this to a certain extent and the predominant use of the word *restorative*, instead of *rehabilitative*, is conscious. As the green spaces referenced are often used by persons who may not recover from their diagnosis, or are meant for the use of friends, family and staff as much as the

patients, *restorative* is the dominant term utilised, due to some form of respite or healing being given. In this way ‘restoration’ seems to apply more to a gradient of possible improvements or relief, whereas ‘rehabilitation’ leads to connotations of some type of cure or recovery, which may not always be the case. Having read literature from a number of different continents, it should be noted that some terms can be used interchangeably, depending on their source and thus the semantics of terminology are not so strictly applied throughout. Despite this challenge, the overarching goal here is to translate the key concepts of the literature into tangible design alternatives for restorative green space creation.

HISTORY OF HEALING GREEN SPACES:

The restorative qualities of green spaces have been known and utilised for centuries. With origins in Egypt, Persia and the Orient, healing green spaces were a presence in European society, particularly in ‘healthcare’, until the Middle Ages, with a resurgence around the late 1700s -1800s. Stemming from various religions - e.g. Judaism, Christianity, Islam (Cooper Marcus & Francis, 1990, p. 9) Paradise and Cloister Gardens in monasteries are still recognised as a ‘garden’ today, and were seen to support of body, mind and soul (Butterfield, 2014, p. 26). This applied to all levels of health: Healthy people found social opportunities, contemplation and a sense of community, whilst the ill found soothing experiences, relaxing spaces and restoration here (Gerlach-Spriggs, Enoch Kaufman & Warner Jr., 1998, p. 7). Cloister gardens were used to assist the care of the sick, a Church responsibility before hospitals as such existed, with monks documented to have had quite sophisticated knowledge of plants / herbs grown here for patient care (Butterfield, 2014, p. 41).

St Bernard (1090-1153) described the courtyard gardens at Clairvaux, France, explaining how such gardens ‘restore / heal’, particularly through use of all our senses (Cooper Marcus & Sachs, 2014, p. 17) which still rings true today:

“Within this enclosure, many and various trees, prolific with every sort of fruit, make a veritable grove, which lying next to the cells of those who are ill, lightens with no little solace the infirmities of the brethren, while it offers to those who are strolling about a spacious walk, and to those overcome with the heat, a sweet place for repose. The sick man sits upon the green lawn, and while inclement Sirius burns the earth and dries the rivers, he is secure, hidden, and shaded from the heat of the day, the leaves of a tree tempering the heat...; for the comfort of his pain, all kinds of grass are fragrant in his nostrils. The lovely green of herb and tree nourishes his eyes...The choir of painted birds caress his ears with sweet modulation...the invalid himself with eyes, ears, and nostrils drinks in the delights of colors, songs, and perfumes.” (Gerlach Spriggs et al, 1998, p. 9).

These types of gardens functioned until the plague, crop failures, migration and the reformation overwhelmed many connected facilities (Cooper Marcus & Francis, 1990, p. 10f). Romanticism and medical science saw the rise of the Pavilion Hospital, which spread in horizontal wings of 2-3 storeys, with gardens in the surrounds providing patients with access to the fresh air and sunlight (Cooper Marcus & Francis, 1990, p. 12f). Medical developments - and the use of gardens within treatment - allowed Hospitals to replace the homecare of illness common until around the 1850s. Until then, hospitals had been predominantly places of care for the dying, easing their final days.

It is only around the time of Florence Nightingale that hospitals became able to, and focussed on, returning someone to a normal state of health (Paine & Francis, 1990, p. 263) with hospitals moving from ‘care’ to ‘treatment’ (Cooper Marcus & Francis, 1990, p. 24). Until World War 1 ‘fresh air’ treatments and access to sunlight were a norm, with beds being wheeled out onto terraces / sun decks (see *Figure 1*). Once the theory of germs / bacteria was discovered, however, hospitals could be engineered for mass use and thereby required less physical space (Gerlach Spriggs et al, 1998, p. 23f). Such

‘progress’ includes the invention of the elevator, which allowed hospitals to spread vertically. This major development in medical care led to an unfortunate consequence: the dehumanising of healthcare by over-dominance of disease treatment, at the detriment of care / comfort for the person, in the guise of ‘efficiency’.

The 19th Century saw the beginning of the use of Horticultural or Occupational Therapy for mental health patients. This type of therapy also became a way to guide World War 1 veterans “*from destruction to creation*” (Gerlach Spriggs et al, 1998, p. 29) with many of these concepts remaining until today. Officially named Horticultural Therapy in the 1940-50s in the United States (Gerlach Spriggs et al, 1998, p. 30f) it seems to be the only therapy that has consistently maintained recognition of the value of green spaces to their treatment (Cooper Marcus & Francis, 1990, p. 14).

The loss of green space support within healthcare has clearly occurred within the past century, as seen in a 1918 quote by Edward Stevens, who visited Hospitals as part of a study across Europe:

“Wherever one goes in any of the larger institutions of Europe, one will see the convalescent patients walking or being wheeled along the shady paths, sitting under special arbors or awnings, enjoying the green grass and the flowers, and chatting with one another. Comfortable benches and easy seats, splashing fountains, and simple forms of amusement, all add to the pleasure, and shorten the convalescence.” (Cooper Marcus & Francis, 1990, p. 16).

A similar type report from 1990 states “...only those dealing with emotional and psychological issues need access to the outdoors...” (Cooper Marcus & Francis, 1990, p. 16f), which raises the issue of lost knowledge. Roger Ulrich’s 1984 study was the first to empirically prove that nature (views of) did indeed have a physical impact on patient hospital visits. Adrian Burton states it in terms that institutions may most appreciate “...if they (gardens) can be shown to shorten hospital stays, reduce the need for pain medication or other drugs, hasten (and therefore reduce the cost of) the rehabilitation process, or reduce staff stress and burnout (as initial research suggests), financing bodies might look on them favourably...the day may yet come when prescribing time in the garden might be nothing unusual at all.” (Burton, 2014, p. 448). Finally, the recent shift in focus is perhaps most aptly demonstrated by Tenngart Ivarsson quoting in her PhD Thesis (2011, p. 12):

“...within medical/health geography there is an ongoing transformation from space as a container to space as an active agent in the shaping of human health...transformation from disease to health, from cure to prevention, and from patient to person (Nettleton, 1995, in Kearns & Gesler, 1998).”



Figure 1: 1937 Polio patients at the Childrens Hospital Colorado - beds on sun terrace.
Source: www.childrenscolorado.org/about/history

(II) AIM:

The focus of this work will be on advice and recommendations posed by scientific research in relation to the design of restorative green spaces, based on underlying theories, but somewhat aside from more psychological and healthcare related positions. Broad literature will be compared with case studies in the northern hemisphere (Scandinavia and the United Kingdom), that treat persons with stress related conditions or cancer. The conclusions drawn will focus on physical examples of practical advice for designers.

The conclusions drawn from the literature will present physical qualities that act as a foundational basis for restorative green space design, upon which discussion with the users, clients and contextual impacts should be built to inform a designer's proposal. These conclusions are aimed to inform my own professional practice, as well as those of other students, therapeutic landscape researchers and perhaps working Landscape Architects new to this specific field.

(III) METHOD:

III.1 LITERATURE STUDY:

Having been introduced to aspects of this topic during prior learning, the literature study began with familiar articles and authors, such as Appleton, the Kaplans, Ulrich, Grahn, Stigsdotter and Pálsdóttir. These authors' reference lists guided further reading, with an attempt to 'fill the gaps' through later database searches. I also attended the 2018 International Association of People-Environment Studies (IAPS) Conference in Rome and here looked into the work of several speakers such as Hartig and Ratcliffe. The more reading was completed, the broader the work initially became, as each article or book would raise several new issues to investigate, such as the role of soundscape or colour, that could impact designers' decisions. It soon became clear that the process, both in terms of the literature study and the task as a whole, would entail the 'funnelling' of information gleaned from the many sources (see *Figure 2*).

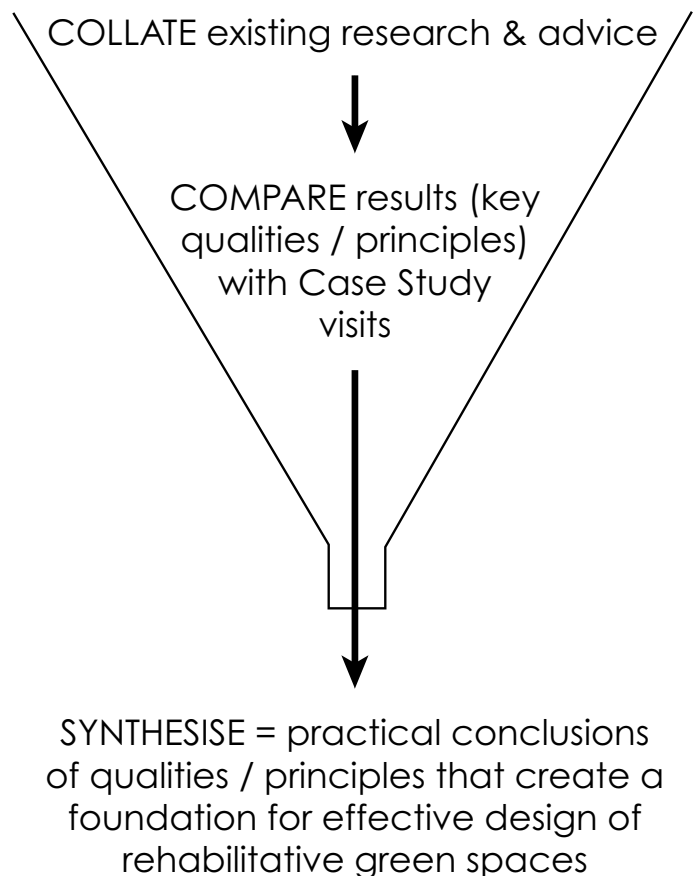


Figure 2: Explanatory Diagram of Thesis Process

(III) METHOD continued:

The qualitative nature of the method of literature study and beyond is recognised, as in this case it was inherently connected to the need of subjective, designer focussed interpretation within the literature. Therefore, this Thesis is a clear starting point for further research, interpretation, analysis and hypothesising of design principles that would then allow for diving more deeply into quantitative methods in future.

III.2 MAIN THEORIES MATRIX / SYNTHESIS:

The ‘funnelling’ strategy was utilised to understand and express the main underlying theories of the literature, which come from the 1970s through to the present. Having examined each of the key authors that consistently form the basis of further articles – Appleton; Ulrich; Kaplan & Kaplan and Grahn & Stigsdotter - certain overlaps or parallels were found within their ideas. These overlaps were synthesised through the creation of a matrix (see *Appendix A*) with a self-designed categorisation of: vaguely linked; clear connection / similarity; being a sub-category of another theory; essentially being the ‘same’. The matrix allowed the collation of the information as an overview, thereby reducing the resulting knowledge into a more digestible size by omitting redundant values. This in turn made it easier to apply them to the case studies when looking for physical examples of the given theories. The peripheral theories were not so closely connected with possible physical qualities of restorative spaces and so these have not been applied to the case studies.

III.3 LITERATURE MATRIX / SYNTHESIS:

Once a firm grasp of the 4 main theories were established and discussed, work continued through the literature to identify and glean physical qualities recommended within research. During the reading of the literature, recommendations were interpreted as ‘general’ if they were referred to as such by the Author, if they were not linked to a specific health condition, or if they appeared in texts for both stress and cancer. The resulting references were collated in

the form a new matrix (see *Appendix B-D*) and given a score related to the general amount of reference or discussion of each recommendation. Thereby a single mention within an article, for example, received 1 point, whilst repeated mention or longer discussion over several pages was allocated 2 points. The aim of this method was to create a level of objective evaluation rather than personal bias, although it is acknowledged that this technique could be more rigorous and detailed with more time. A more scaled scoring process seemed redundant, due mainly to the time limitations of the task, and therefore no single source received more than 2 points.

The references were thus collated, scored and categorised within an allocated threshold or cut off in each of the recommendation groups (General; Stress; Cancer). In the case of the general group, where the majority of recommendations reside, only recommendations that scored 6 or higher were chosen to be discussed after analysing the overall trend of scores. Reasoning for this was that each recommendation was guaranteed of having been mentioned in at least 3 references. The same strategy was applied to the readings regarding stress and cancer care. Due to the smaller nature of literature that was condition specific and thereby lower overall point scores, a lower threshold of 5 points or more was chosen here, addressing at least 2 references. This threshold method allowed the distilling of recommendations to be explained in detail to be reduced in the ‘general’ group 27/41, in the stress specific group 2/9 and in the cancer specific group 2/10. The overall reduction from 60 to 31 points total was seen as reasonable, particularly within the overall aim of producing a concise and tangible ‘list’ for practical use.

The categorisation of the resulting recommendations was completed somewhat intuitively, with notes being made during the process and adjusted when the matrix was complete. Allowing the findings to guide the category titles was again seen to be a more objective strategy. It was also felt that a set of 10 categories, to

(III) METHOD continued:

be described in more detailed design-based terminology, was an effective and reasonable amount of information. In summary, the more agreement that was seen amongst the authors, the stronger the support for each of the concluding recommendations was felt to be and thus only those qualities were chosen to present and discuss in detail.

III.4 CASE STUDY COMPARISON:

The scope of this Thesis did not allow for a Post-Occupancy Evaluation (POE) of the sites visited, instead allowing retrospectively, ‘only’ the identification of tangible, specific and practical examples of the qualities and principles discussed in the literature. The case study site visits were predominantly approached early in the process, in order to allow for a less biased perspective in relation to the reading completed. Sites were extensively photographed and walked thoroughly, with notes taken, so as to capture all areas and opportunities. This method could perhaps be seen as linked to ‘autophotography’ from the Social Sciences, where the images are allowed to become a form of data, in their being an interpretation of the site. Essentially the visits were aiming to be as objective as possible, allowing photos to later reveal examples of interpretations based on the literature, rather than specifically looking for certain qualities and thereby conceivably missing others. All areas were photographed, as the recommendations or qualities had not been discovered at that time. Site visits were at a later stage followed up by website and literature searches, to look into statistical information of construction and the likes, as well as searches for plans, sketches and other evidence of design processes.

In each of the case study visits, due to the sites being actively used for patient care / participant treatment, it was necessary to visit outside of business hours to allow for the ethical privacy of participants. This means that in almost no photos will one find a person, even as a reference scale, and anecdotal feedback was minimal in the form of limited conversations with only some centre staff.

The worth of understanding participant use and perception at such sites is invaluable, but was simply not feasible in this instance. There is potential to use the recommendations as qualities within a Post-Occupancy Evaluation Tool in future, but it is not in any way the intent at present to function as thus.

III. 5 PRESENTATION OF FINDINGS:

Following the synthesising and comparing of both the literature and the case study examples, discussion and reflection occurred. Reflections will be presented on the challenges of the methods used and on the nature of the task in general. This Thesis is written with a practical focus, this being one of the predominant reasons for the choice of methods. The written structure is based on what was deemed to be a logical flow of information, providing additional background information within boxed texts to illustrate ‘how we got here’ (*History*) and ‘what do users need’ (*User conditions*) near the beginning of the task. Summaries of findings are provided intermittently at the end of the more detailed presentation of the findings. After the comparison of the literature findings to physical examples in the case studies, visualised through photographs to help clarify interpretations, discussion of results and the chosen methods are presented.

Throughout the task the ‘funnelling’ of information was utilised as an overall process. Starting with broad ideas and theories that underlie much of the research, progresses to focus on the more specific recommendations found in the literature, with specific reference to the conditions of stress and cancer. The final set or ‘list’ of conclusions and recommendations that are suggested should form the foundation of any restorative green space. These thereby constitute an evidence-based, best-practice foundational set of principles that could in future be turned into a Toolkit or inform the starting point of a restorative green space design.

OVERVIEW OF USER CONDITIONS (STRESS & CANCER):

The key components that the two conditions of stress and cancer have in common, were found to be similar when it comes to supportive and restorative environments. The impacts on the physical body and emotional state also have certain parallels, whilst differing in some symptoms and expressions of these. The scope of this task allowed for a high-level view of these similarities rather than going into detail on the underpinning characteristics. These key components were seen as considerations that should inform all design decisions at some level, and thus should be researched further by designers when dealing with their specific target audience / user.

STRESS:

It is widely recognised that stress is not a health condition in itself, as this can be managed in individual instances or in the short term. The resonant health problems arise when stress reaches chronic levels over the long term, alongside an inability to be restored from it, at which point its accumulated impact becomes damaging for human health (Grahn & Stigsdotter, 2010, p. 266). Stress of a prolonged or chronic nature, without restoration can result in depression, burnout, anxiety syndrome, schizophrenia, as well as affecting vital organs, including the heart and blood vessels, causing diabetes, heart attack and other cardiovascular diseases (Stigsdotter et al, 2011, p. 310).

“Prolonged stress may lead to impaired resources for concentration, learning, and knowledge recall... as well as impaired body awareness and sensory experiences...accompanied by feelings of anxiety, lack of energy, bad mood, and even depression” (Corazon et al, 2010, p. 39). On a physiological level, chronic stress can lead to cardiovascular imbalances, lack of sleep, a weakened immune system and physical condition (Adevi, 2012, p. 42). Additional symptoms also include irritation and tiredness (Grahn, Tenngart Ivarsson, Stigsdotter & Bengtsson, 2010, p. 123), as well as dizziness, physical aches, heart palpitations, stomach troubles and sensitivity to noise (Nordh, Grahn & Währborg, 2009b, p. 208). These symptoms are often the reasons behind recommendations within the literature, helping to explain why certain spatialities or qualities are necessary in restorative gardens or green spaces (e.g. supporting structures to support physical weakness when walking).

Within stress rehabilitation research, it has been quite firmly established that the most complex relationships people have is with other people, whilst the least complex relationships are those with inanimate objects such as stones, and those with plants and animals sitting in between (Grahn & Stigsdotter, 2010, p. 265). There will be further mention of a ‘gradient of demand’ within restorative environments related to stress sufferers and designers should consider this when creating spaces.

CANCER:

In much of the cancer related literature it was clear that a cancer diagnosis has an impact on two important levels – the emotional impact of loss of control due to ‘cells gone wrong’ in one’s own body and the physical impact of cancer treatments. Cancer treatments such as chemotherapy, radiation, surgery and more, can cause *“...fatigue, dizziness, loss of strength and stamina, reduced mobility and a sense of loss of control...”* (Flemming & Figueiredo, 2013, p. 13). Designers need to cater for these physical impacts, be they temporary or permanent. Design strategies and features can deal with the physical impacts quite directly, whilst the psychosocial effects are more difficult, but these can be indirectly supported. Anxiety, fear, depression, anger and resentment are often connected to the disease due to loss of control, both of the body and the treatment in many ways (Block et al, 2004, p. S-158-S-159). For this condition in particular, restorative environments need to offer alternatives to the *“...constant immersion in emotional heaviness and clinical detail...”* which is *“unhealthy and unproductive”* for everyone (Block, Block & Gyllenhaal, 2004, p. S-160). Within cancer care, anxiety and depression were noted as the most undiagnosed yet common consequences of a cancer diagnosis (Butterfield, 2014, p. 127), which is perhaps what also most closely links it to stress rehabilitation.

When dealing with either of these conditions and their connected restorative environments it might be helpful to consider Keniger’s three levels of nature-based intervention: 1) indirect engagement (views); 2) incidental engagement (walking and resting outdoors); 3) intentional engagement (outdoor therapy). Restoration for both stress and cancer should ideally aim to offer a mix of the three, but the third is the most significant and beneficial in terms of restoration (Keniger, L., Gaston, K.J., Irvine, K.N. & Fuller, R.A, 2013, p. 916f).

(IV) MAIN UNDERLYING THEORIES within LITERATURE:

Research has shown that experiences with non-threatening nature environments can support the automatic relaxation of the nervous system as well as the restoration of cognitive resources (Corazon et al, 2010, p. 41). In investigating this automatic effect, there are a number of restoration theories that consistently underlie the greater literature, with their overarching principles being built upon, explored or analysed in specific contexts. In order therefore, to comprehend the research conducted, it is important to understand the theories that underpin the vast majority of the literature. Each of these theories produced a set of principles or qualities that consistently act as a framework for understanding a physical space, generally seen to achieve a state of well-being in the user. These theories are presented here as an overview and in chronological order of publishing.

IV.1 PROSPECT & REFUGE THEORY by Dr. Jay Appleton (1975):

Jay Appleton (1919-2015) developed his theory from the discipline of Geography and built on foundations of aesthetic preference of landscape, as well as evolutionary theory. He accepts that there is an innate connection between humans and nature, whilst acknowledging that culture, learning and experience also impacts how one relates to their immediate environment. His research has been supported over a wide variety of different countries / cultures (Cooper Marcus & Sachs, 2014, p. 23).

The dominant foundation of Appleton's theory is 'Habitat Theory' (an extension of Evolutionary Theory) which he explains as: "...*they (humans) experience pleasure and satisfaction from such an environment when it seems to be conducive to the realization of their biological needs and a sense of anxiety and dissatisfaction when it does not...*" (Appleton, 1975, p. 68). While Appleton agrees with the premise of Evolutionary / Habitat Theory, there is also recognition of the fact that in today's world (both when Appleton wrote his theory and now) people hardly need to understand their immediate landscape for base survival strategies.

Appleton (1975) explains this as thus: "*The removal of urgent necessity does not put an end to the machinery which evolved to cope with it...*" (p. 169).

Appleton's Theory has a number of methods and terms used to understand the perception and preference of landscape, pertaining to the interpretation or response to attributes such as volume, access and configuration (Dosen & Ostwald, 2013, p. 10). The overarching concept that unites the various terms (such as hazards, vistas, panoramas, shelter, surfaces) are the terms *Prospect & Refuge*, into which the other terms can be categorised or connected. These two terms are not dichotomous, in fact they should be seen as a complimentary pairing through whose balance a satisfying, pleasant or comfortable environment can be achieved. The most commonly used, single description for Appleton's Theory is "*to see (prospect) without being seen (refuge)*" (Appleton, 1975, p. 73), which is in itself a survival strategy for both 'hunter' and 'hunted' and therefore perhaps sits so firmly in our psyche.

1) PROSPECT – a view out or over a scene, landscape or environment in which ones finds oneself, that provides choice to remove oneself ('flee') from the situation. One can detect a 'threat' with enough notice to react and therefore feels a sense of safety. The view may be open and simple, or framed and deflected, while indicating there is further depth or space in the scene to explore. Appleton also uses descriptions such as 'secondary views', 'peepholes' and 'panoramas' to explain how the level, type and quality of Prospect may differ (Appleton, 1975, p. 88).

2) REFUGE – spaces that allow the user to find shelter and/or hide, providing a feeling of or actual physical protection from 'threat' (be that in the form of a wall, hedge, canopy vegetation or more), which could be seen as an embrace, protection or safety. The prominent functions of hiding or finding shelter are supported by examples of types, materials and substances that may provide this refuge, such as caves, hollows, vegetation, rocks and even nebulous options such as mist or smoke (Appleton, 1975, p. 102).

(IV) MAIN THEORIES continued:

While Appleton writes of landscape and aesthetic preference as part of his theory, the reason it is so relevant to rehabilitative green space design is its provision of a feeling of ‘safety’. He states that when a perception (real or not) of safety is achieved “...*anxiety is set aside and relaxation is possible...*” (Appleton, 1975, p. 71). Once a user is able to relax in a space, they have the further possibility to restore their energy and capabilities to deal with stressors. The key to this remains that there should be a balance of the two qualities, as environments that are too filled with Refuge OR Prospect, in turn become unsettling (Gatersleben & Andrews, 2013, p. 92; Van den Berg et al, 2014, p. 174; Dosen & Ostwald, 2013, p. 14, 17; Dosen & Ostwald, 2016).

IV.2 PSYCHO-EVOLUTIONARY THEORY / STRESS RECOVERY THEORY by Dr. Roger Ulrich (1983; 1993):

Roger Ulrich is now a retired University Lecturer / Researcher and Environmental Psychologist in the field of Healthcare Architecture, and the producer of the seminal work *View through a Window May Influence Recovery from Surgery* (1984), which has been a foundation for much research since, particularly when empirical in nature. Shortly prior to this important article, Ulrich explored affective and aesthetic responses to discuss visual properties in natural landscapes that seemed to be linked to “...*more positively toned emotional reactions...*” (Ulrich, 1983, p. 116), particularly in stressed individuals.

Ulrich’s theory is evolutionary / biologically based, with the assumption that humans are “*innately predisposed*” to react positively towards natural versus urban scenes (Ulrich, 1983, p. 115). His original theory seems to take much inspiration in its description of visual properties from Appleton and specifically recognises the lowering of arousal (or stress) in people who are feeling stressed (Ulrich, 1983, p. 116). Ulrich’s Theory also emphasises the notion of an initial emotional (affordance) reaction pre-empting a cognitive one, whilst adaptive behaviour is then based on a combination of the

two (Ulrich, 1986, p. 31). The six visual properties discussed in his original 1983 Chapter, were found to be somewhat rarely mentioned by contemporary authors, including Ulrich himself. The suggested spatial qualities were strongly connected, if not entirely based, on qualities discussed by Appleton (1975) as part of Prospect & Refuge Theory, which may be a reason for their not being developed further. Overall, Ulrich’s Theory is possibly the least firmly linked to physical qualities or features in the literature, although some more often cited qualities are offered in 1993, perhaps as a revision / development of his theory. In comparing Biophobia and Biophilia, Ulrich established the evolutionary / biological basis of much research that had been produced by the early to mid 1990s. It is clear in his chapter in *The Biophilia Hypothesis* (Kellert & Wilson, 1993) that preference and the restorative quality of natural over urban / built environments had been firmly established (Ulrich, 1993, p. 94; 101f). The qualities offered as being conducive to restoration in this 1993 text are more practical and perhaps thus cited more often by other researchers.

- 1) VERDANT VEGETATION – the reference to green vegetation is linked to typical signs / symbols of nature, while denoting a contrast between lush and arid environments (Ulrich, 1993, p. 90; 119). Lush vegetation is noted as supporting or providing feelings of tranquillity and serenity (Ulrich, 1993, p. 101).
- 2) WATER – whilst water bodies and features of many types seem to provide fascination for humans, Ulrich notes that research has shown a particular preference for the ‘glossiness’ of calm or slow-moving water (Ulrich, 1993, p. 90ff). Water was also specifically mentioned in reference to research on stress recovery, which occurred more quickly in natural environments that included water (Ulrich, 1993, p. 104).
- 3) FLOWERS – these are seen as part of the evolutionary / biological connection, in that they were in the past a signal for food and thereby remain a positive preference (Ulrich, 1993, p. 90; 119).

(IV) MAIN THEORIES continued:

4) SAVANNAH-LIKE LANDSCAPES – spatially open landscapes featuring scattered groups of lower stemmed trees with reasonably uniform grassy vegetation underneath, allowing vistas through, over or amongst vegetation to take in fuller scenes (Ulrich, 1993, p. 89). The evolutionary connection of such landscapes being easier to overview and thus harbouring less risk is a possible reason for preference (Ulrich, 1993, p. 82). This type of landscape is also noted as providing a ‘peaceful’ quality in certain research results (Ulrich, 1993, p. 101).

5) UNTHREATENING WILDLIFE – birds and smaller, perhaps common and/or domesticated, creatures including insects are seen as unthreatening and certainly familiar (Ulrich, 1993, p. 113; 119).

6) LOW RISK – a sense of security and safety, or simply ‘non-threat’ is seen to be an innate quality in natural environments (generally non-man-made landscapes) throughout varied research studies (Ulrich, 1993, p. 113). This links particularly to park or savannah-like landscapes, which are on an evolutionary level seen as lower-risk due to their visual openness and opportunities to escape (Ulrich, 1993, p. 82; 89).

Various authors have noted a number of parallels between Ulrich’s Theory and that of the Kaplans to follow, but an important distinction is the factor of ‘stress’ that is the basis of Ulrich’s research. Stress is defined as a situation that is perceived as demanding or threatening to well-being, which the Kaplan Theory does not consistently see as a factor (Hartig et al, 2011, p. 152; Kaplan, 1995, p. 169; Gatersleben & Andrews, 2013, p. 91f).

IV.3 ATTENTION RESTORATION THEORY by Dr. Rachael & Dr. Stephen Kaplan (1989; 1995):

Rachael and Stephen Kaplan (1936-2018) approach the field of restorative spaces and landscape preference from the discipline of Psychology. Through their work with wilderness experiences and contact with other disciplines, the creation of Attention Restoration Theory (ART)

has built on the theories of William James (1892). James’ theory hypothesised two distinct types of attention: *involuntary* (renamed fascination by the Kaplans, 1995) and *voluntary* (renamed directed attention by the Kaplans, 1989) and the effect these two types of attention have on people, particularly when they suffer from fatigue connected to these mental capacities (Kaplan & Kaplan, 1989, p. 179; Kaplan, 1995, p. 169). The premise of these two distinct types of attention is that directed attention, which is focussed and concentrated (higher mental processes), can lead to mental fatigue (‘directed attention fatigue’), whilst indirect attention is instinctive, unforced and could often be seen as a ‘distraction’ or curiosity, thereby requiring little focus or effort and thus becoming in fact a respite from ‘directed attention fatigue’ (Kaplan & Kaplan, 1989, p. 180; Kaplan, 1992, p. 135). The danger for individuals with ‘directed attention fatigue’ is the consequence on behaviour, which has been cited through various studies as: difficulty concentrating and making decisions, impatience and irritability, as well as being less likely to help someone else in distress (Kaplan, 1992, p. 136).

In recognising the fatigue possible from directed attention, the Kaplans explored qualities and opportunities for recovery in various environments. The type of environments that were most clearly and dominantly shown to allow for restoration, were outdoor, natural spaces with vegetation (Kaplan & Kaplan, 1989, p. 1; p. 189). This type of space also has the highest scope for attending to the 4 key components that can support restoration in ART.

1) BEING AWAY – being either physically and/or figuratively removed (‘away’) from every day activities and stressors (Kaplan & Kaplan, 1989, p. 183). This perception could even be internalised through ‘introverted’ or reflective activities that allow one to be ‘away’ from the immediate surroundings or situations (Tenngart Ivarsson, 2011, p. 71). This component primarily aims to seek change from the situation causing stress or directed attention fatigue, perhaps similar to evolutionary instincts to flee from danger.

(IV) MAIN THEORIES continued:

2) EXTENT – having the scope, in terms of scale, to feel that there is enough space to remain ‘distracted / fascinated’, whilst understanding the space and being able to read it as part of a legible ‘whole’. This quality is also often described as being in a ‘whole other world’ and does not necessarily relate to physical size of a space, which has by other authors (e.g. Herzog et al, 2003, p. 160) been connected to the likes of Japanese Gardens being small but having extent (Kaplan & Kaplan, 1989, p. 183f; Kaplan, 1995, p. 173; Kaplan, 2001, p. 488).

3) FASCINATION – finding distraction and effortless interest that allows a person to follow their curiosity or engage in a sense of mystery (Kaplan & Kaplan, 1989, p. 184f). This component may today be seen as linked to mindfulness, in that distraction from the every-day is found through noticing things in the ‘here and now’. Nature can often inspire interest through ‘awe’, but also has the scope to provide a particular type of distraction, which the Kaplans have named ‘soft fascination’ and that allows this type of environment to “...hold the attention but often in an undramatic fashion...” (Kaplan & Kaplan, 1989, p. 192).

4) COMPATIBILITY – the sense that the environment / space is providing what one needs at that moment, be it quiet, space or social interaction (Kaplan & Kaplan, 1989, p. 185f). This can clearly be very individual, as well as influenced by past experience, culture and specific context. Familiarity and legibility of the environment can also feed into this component, allowing a certain degree of comfort as a starting point.

As with most of the theories discussed here, the premise is that an environment that contains most or all of these components would be ‘most’ restorative. In the case of the Kaplans, they readily discuss that these components are found in many varied spaces, however, they seem to be most easily and commonly found in natural green spaces.

IV.4 PERCEIVED SENSORY DIMENSIONS by Dr. Patrik Grahn & Dr. Ulrika A. Stigsdotter (2010):

The Perceived Sensory Dimensions (PSDs) were originally created as a set of characteristics in relation to preference for urban green spaces, in a Swedish paper by Berggren-Bärring & Grahn (1995). The research was based on the hypothesis that certain urban parks and green spaces had more visitors than others and through the interpretation of park or garden room qualities this preference could be predicted. The green spaces that provided more of these 8 characteristics were generally more popular and allowed for a broader range of user, whilst all the characteristics required a natural setting to work best (Stigsdotter & Grahn, 2002). These original characteristics were also used to inform the Alnarp Rehabilitation Garden in southern Sweden, a design which Patrik Grahn lead as a Landscape Architect, specialising in Environmental Psychology.

In later collaboration with Stigsdotter, Grahn (2002) applied the characteristics to the context of restorative / healing spaces (with slightly different original titles), but the focus here is on the latest revised version from their 2010 article, where these characteristics have become most clear within the context of stress restoration. It should be noted that within the setting of stress rehabilitation, it could be proposed that some of the dimensions could be removed altogether from the list, as a clear hierarchy of preference emerges for stressed individuals (Grahn & Stigsdotter, 2010, p. 272f; Stigsdotter & Grahn, 2002, p. 66; Bengtsson, 2015, p. 18). The first 4 dimensions are the most important or preferred by stressed individuals within restorative designs, with the following description presenting the dimensions within this ‘restorative preference hierarchy’ (Grahn & Stigsdotter, 2010, p. 272).

1) REFUGE – this dimension is essentially the same as Appleton’s Theory, though more specifically it is described as being in a safe and enclosed environment where people feel able, or safe, to play or watch others who are active (Grahn & Stigsdotter, 2010, p. 270). Thus, in the way of Appleton, it

(IV) MAIN THEORIES continued:

features elements that make the user feel safe and protected.

2) NATURE (formerly called ‘wild’) – being in an unambiguously natural (‘wilder’) environment compared to a man-made or urban space, where the power or cycles of nature are evident and expressed “on nature’s terms” (Ibid).

3) RICH IN SPECIES – this dimension essentially means biodiversity (flora & fauna) where varied species and types of life such as flowers, birds, insects and more are evident. Signs of life, seasonal change and succession can provide fascination / interest, particularly through their diversity (Ibid).

4) SERENE – spaces in which to be calm and quiet, undisturbed and even (but not necessarily) silent. This can also be seen as peacefulness or quietness in both a literal and/or figurative manner (Grahn & Stigsdotter, 2010, p. 271).

5) SPACE – having the scope and freedom to ‘be’, explore and move around a landscape, both visually and physically. Spaciousness can be both literal and/or figurative, often compared to Japanese Gardens for example, which are small in size but feel spacious. Just as in the Kaplans quality ‘Extent’, the environment should also be legible as belonging to a larger whole (Grahn & Stigsdotter, 2010, p. 270).

6) PROSPECT (formerly called the ‘common’) – this dimension is again essentially the same as Appleton’s Theory and links to Ulrich’s mention of the preference for savannah-like landscapes. It refers to open spaces with vistas over the surroundings, which through gaining surveillance and thus control over possible threats, provides a sense of safety (Ibid).

7) CULTURE – reading signs of care and human influence or history, that one can connect with or recognise and identify with. It allows a familiar understanding of the environment, often through symbology or ornamentation (Ibid).

8) SOCIAL (formerly called ‘festive’) – provision of spaces and opportunities for socially connecting, celebrating and interacting both passively and/or actively with others (Ibid). This

quality reflects more on the needs of urban green spaces than restorative spaces, as this dimension is least preferred by stressed persons, to the point where it can cause stress in itself – it would therefore be possible to drop this dimension when planning restorative spaces, particularly in terms of larger social gatherings (Grahn & Stigsdotter, 2010, p. 272; Tenngart Ivarsson, 2011, p. 39). ‘Culture’ has a similar connection for stressed individuals due to the perceived demands often linked to other people.

The above restoration theories have been explained as they form the underlying knowledge of the vast majority, if not all, of the literature read for this Thesis. In order to understand the standpoints or foundations of the texts, it was important to establish a firm grasp of the types of qualities or principles the main theories for restoration support. Whilst this will form a basis for comparison later in the Thesis, it is also important to recognise that the ambiguous form of the resulting qualities requires further interpretation. The fact that many of the qualities essentially refer to an ambience or a feeling within a space makes them subjective and therefore it is even more appropriate to provide physical examples of these within the Case Studies.

As the above explanations indicate, there is some overlap in the main 4 theories described. In order to approach the topic in a comprehensive way, it was therefore necessary to clarify these overlaps and thereby reduce the original 26 resulting ‘principles / qualities’ through the use of a matrix (see *Appendix A*). This method of comparing and representing the similarities allowed me to understand and reduce the ‘qualities’ from 26 down to 16, which are then identified and depicted within the Case Studies.

- The original 6 qualities discussed in Roger Ulrich’s 1983 Chapter were one of the main reasons for using the matrix as a method – however, their essential overlap with the theory of Appleton and

(IV) MAIN THEORIES continued:

therefore complete omission from the Case Studies made them redundant within the discussion. They were thus removed from the description of his Theory, but remain in the matrix (see *Appendix A*).

- The PSDs *Prospect* and *Refuge* were so clearly covered by, if not identical to Appleton's, that they will only be discussed in reference to his original theory; whilst *Culture* and *Social* were omitted from further mention due to the findings by Stigsdotter & Grahn (2002, p. 65) that these could have adverse effects on stressed individuals. It is recognised that they are valuable in urban green space design, but less so for restorative green spaces.

These 4 main theories are not only cited by other authors, they have become almost stand-alone concepts that are frequently discussed and used to describe qualities within the wider research. In particular, there is frequent use of the terms *Being Away* and *Fascination* by the Kaplans; *Refuge* by Appleton; *Nature* and to some extent *Serene* by Grahn & Stigsdotter; and references to *Verdant Vegetation* and *Water* by Ulrich. These terms are, I would suggest, less used to represent the theories themselves, having in many cases rather become adjectives for environments found and desired within restorative garden design. This demonstrates that the theories are not only highly relevant, but able to be easily integrated into research and design thinking. In understanding the background of these theories and their connected research, the qualities that result from the literature become more firmly grounded and clear.

The final 16 qualities to be applied to the Case Studies:

Appleton's "Prospect & Refuge Theory"

- *Prospect* (views, overviews...)
- *Refuge* (physical or perceived shelter...)

Ulrich's "Stress Recovery Theory"

- *Verdant Vegetation* (greenery...)
- *Water* (water bodies...)
- *Flowers* (flowering plants...)
- *Savannah-like landscape* (low grass with groups of trees)
- *Unthreatening Wildlife* (domesticated or familiar animals...)
- *Low-Risk* (perception of safety, E.g. fenced area...)

Kaplan & Kaplan "Attention Restoration Theory"

- *Being Away* (clear contrast of environment, E.g. entry gate...)
- *Extent* (legible spaces - difficult to define in practical terms, more of an atmosphere)
- *Fascination* (scenes or objects of interest that arouse curiosity...)
- *Compatibility* (overall having a variety of choices for spaces in which to be...)

Grahn & Stigsdotter "Perceived Sensory Dimensions"

- *Nature* (wilder, non-man-made landscapes...)
- *Rich in species* (biodiversity...)
- *Serene* (calm, quiet spaces...)
- *Space* (distance of perceived and true possible movement...)

(V) PERIPHERAL THEORIES within LITERATURE:

Throughout the literature search, a number of alternative, peripheral or progressive theories also became prominent, although not in the same manner as the theories discussed above. Whilst seen as fundamental to this topic, the following theories are less connected to physical qualities of green spaces and therefore will not be as specifically used within the case studies. They were, however, felt to be important in building a stronger foundational knowledge with which to approach both the remainder of this task and professional practice. They inform about therapeutic systems and/or processes that are highly useful to consider when designing and in this manner can create a type of 'framework of understanding' from which to approach the design of restorative green spaces.

Patrik Grahn's Supportive Environment Theory (SET) is perhaps most integrated into my thinking

and knowledge of the requirements of restorative environments, due to close proximity to the Alnarp Rehabilitation Garden and its treatments of stress. Grahn's psychiatry-based SET is often explained through the help of a pyramid diagram, demonstrating the change in personal capacity and need for support within the stressed individual as they move through their treatment. This diagram was first presented in 1991 in relation to parks in urban environments, explaining people's behaviour within a spectrum from Asocial – Social (Grahn, 1991, p. 124). The pyramid, used in various publications, demonstrates the level of capacity of the individual to cope with stress or day-to-day activities. The larger the section of the pyramid, the more need of support is required from the environment in which they find themselves. This diagram has been re-interpreted (see *Figure 3*) to depict both sides of the process, in this case green representing the

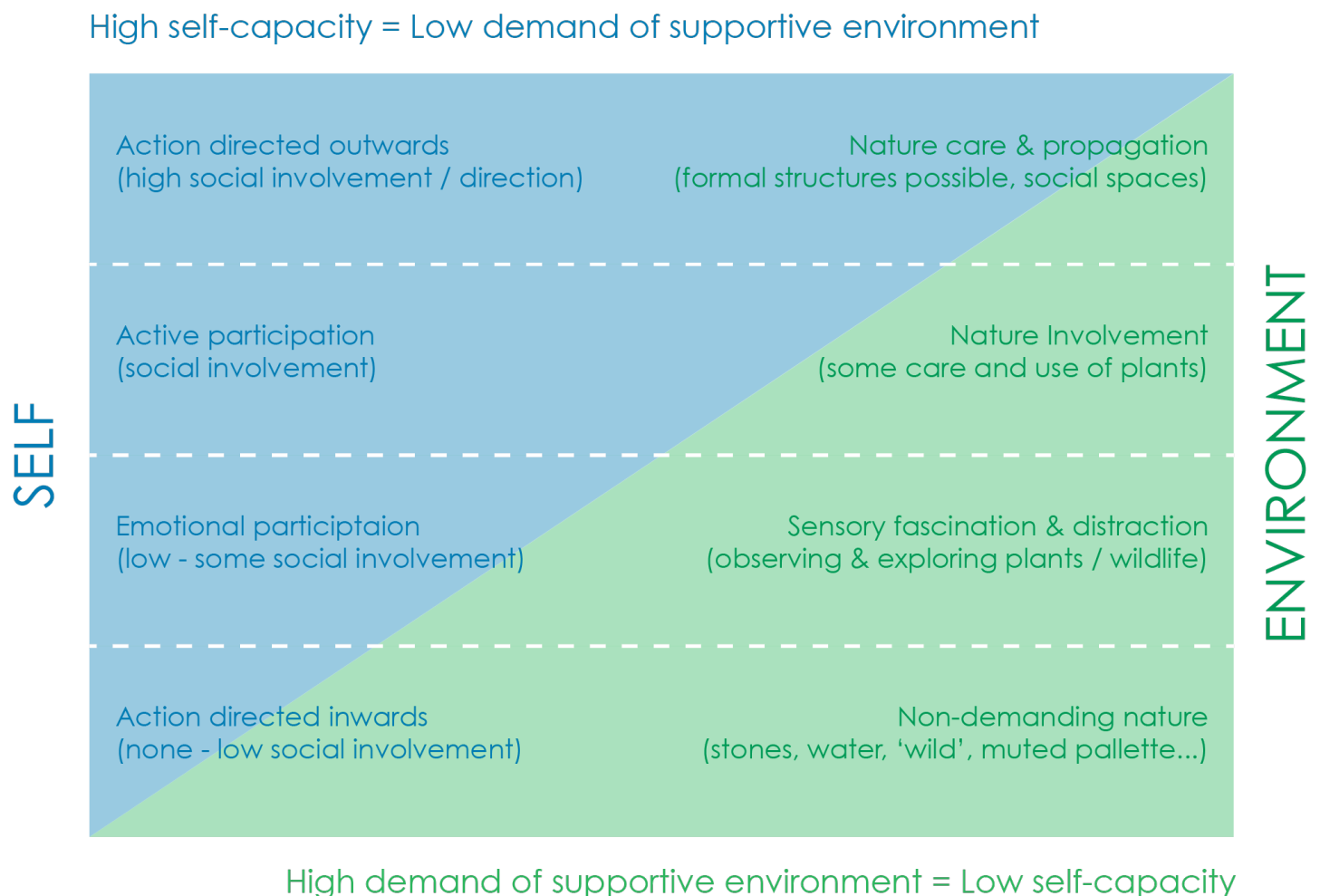


Figure 3: Balance of personal & environmental needs / capacity - interpretation based on Pyramid / Triangle from Supportive Environments by Grahn et al (2010).

(V) PERIPHERAL THEORIES

continued:

environment in its supporting role, and blue the individual's personal capacity to manage their situation. The captions explain the capabilities of the person and the types of activities or contact suited to each stage of their rehabilitation (Stigsdotter & Grahn, 2002, p. 66).

The theory of a supportive environment being a requirement of rehabilitation, particularly for stress, has been expressed by numerous authors (E.g. Bengtsson, Stigsdotter, Pálsdóttir, Tenngart Ivarsson) and thereby integrates effectively into recommendations about qualities that are of benefit for restoration. The descriptions included in the revised diagram have come from overall readings / findings and are an interpretation and suggestion based on my readings as a whole. For example, in the first stage of treatment when the participant has little personal capacity to relate or participate outwardly, and requires much support from the surrounding environment, this may be achieved by being alone with non-demanding stones and plants and reflecting inwardly (Stigsdotter et al, 2011, p. 319). This theory has become a fundamental foundation of approaching restorative green spaces within this Thesis.

Anna Maria Pálsdóttir re-examined and adapted the process of recovery (and SET) for stress related illnesses through her work at Alnarp Rehabilitation Garden in her 2014 PhD Thesis. In the beginning phases of participant treatment the possibility to reflect inwardly and without demands by other people was seen to be paramount. This was echoed in the work of Korpela & Staats (2014) as well as Tenngart Ivarsson (2011). Pálsdóttir has named this quality *social quietness* and it is an important consideration for designers of green spaces. It is explained by Pálsdóttir (2014) as “...participants had a strong need to be alone with nature, in a self-chosen supportive location in the rehabilitation garden, undisturbed by the presence of others when resting or handling all the emotions evoked in the rehabilitation” (p. 61).

Although it is not entirely clear as yet whether such social quietness is required ‘only’ or perhaps more by stressed individuals, the readings tend to

lean towards the benefit of such environments on a universal level. This particular affordance has also been included to emphasise the importance of designing opportunities for serenity, solitude and inner reflection without the company or social pressures of others within a green space proposal, particularly for stress rehabilitation.

In contributing to Cooper Marcus & Barnes’ book *Healing Gardens* (1999), Roger Ulrich added a further revision or interpretation of his ideas above, in the form of needs for ‘Supportive Gardens’ (p. 37; 72ff). These needs could be described as affordances of restorative gardens, and while broad in their definition, they address some key aspects that users require for restoration:

- SENSE OF CONTROL (privacy)
- SOCIAL SUPPORT
- PHYSICAL MOVEMENT / EXERCISE
- ACCESS TO NATURE (positive distractions)
- SENSE OF SAFETY

These needs fit well with other advice throughout the literature, perhaps being able to act as umbrella terms due to their remaining quite general regarding physical design. In certain respects, these needs were more clear and easy to interpret than Ulrich’s previous theories, however, fewer authors referenced this theory specifically, compared to those discussed previously.

The next theory that was felt to be of use for designers as an overall approach, is the *4 Zones of Contact with the Outdoors* by Anna Bengtsson (2015, p. 25f). Whilst the approach has been predominantly used within healthcare and elderly care environments, it is the holistic view that is of interest and therefore could be applied to other restorative green spaces. Bengtsson notes that considerable research focuses on views from inside healthcare settings to the outdoors and the wider literature agrees that, whilst views of nature are indeed healing or restorative, being outside and having access to nature with all of our senses is even more effective (Cooper Marcus & Sachs, 2014, p.

(V) PERIPHERAL THEORIES

continued:

17), which is where the '4 Zones' can be applied.

As shown in *Figure 4*, the first and often central zone comprises of views of nature from inside a building (via windows and doors). Zone 2 then becomes more of a transition zone, which is also discussed by Butterfield (2014) and looks at thresholds between the indoors and outdoors (E.g. balconies, patios, conservatories). Zone 3 encompasses the immediate surroundings of the building(s), whilst Zone 4 spreads into the surrounding neighbourhood and community with possible further outdoor experiences. This idea of looking beyond the site itself, much as park designers of the past have done by including 'borrowed landscapes', could allow restorative green spaces to be better integrated into their respective contexts and communities. It also prompts deeper connection to and thinking about cultural and local identities within which a garden may be set, providing what must surely be a stronger basis for design.

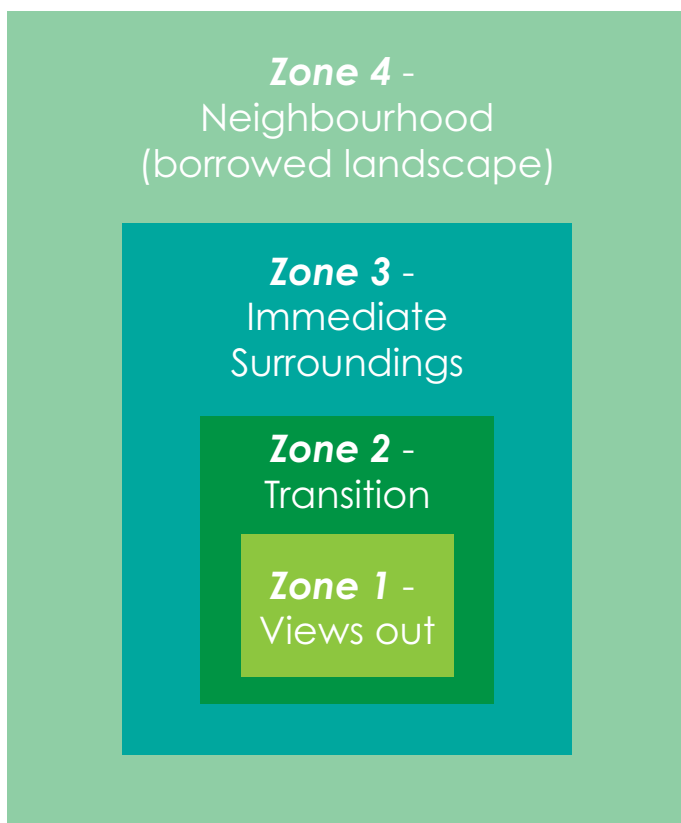


Figure 4: Diagram interpreted & redrawn based on Bengtsson (2015).

The previously mentioned *Biophilia Hypothesis* makes an interesting connection to the main theories discussed earlier, within it's 9 dimensions of *Human Values of Nature*. The dimensions are offered as categories that define "...human evolutionary dependence on nature as a basis for survival and personal fulfillment" (Kellert & Wilson, 1993, p. 44). Interpreting these dimensions as 'lenses' through which people see value in nature could enrich green space designs and strengthen connections made with the eventual users of the gardens. The key components of relevance are explained below, demonstrating the various viewpoints people may have towards nature and intimating how these may influence their behaviours (p. 44ff).

- UTILITARIAN: Nature provides sustenance, protection and security.
- NATURALISTIC: Nature provides fascination, wonder and awe (both mental and physical).
- ECOLOGISTIC-SCIENTIFIC: Nature is understood and respected through empirical study.
- AESTHETIC: Nature provides beauty, physical appeal and awe (often through patterns).
- SYMBOLIC: Nature facilitates communication and thought (including abstract ideas).
- HUMANISTIC: Nature evokes deep emotional attachments.
- MORALISTIC: Nature evokes ethical responsibilities, reverence and affinity.
- DOMINIONISTIC: A desire to master the natural world.
- NEGATIVISTIC: Nature evokes fear, aversion and antipathy.

A number of these dimensions can be seen reflected in the theories discussed previously, particularly those of Kaplan & Kaplan and Appleton. Although other authors do not often specifically discuss these values, they are in fact integrated in many works within the literature. The emotional connections, physical appeal and reverence (just to name a few) that nature provokes in humans are

(V) PERIPHERAL THEORIES

continued:

discussed by many authors, simply using other terms than those provided here by Kellert & Wilson.

Finally, the 2014 PhD Thesis of Angela Butterfield raises a slightly different perception of qualities required within cancer care, which could also be useful as an overview for restorative green spaces, regardless of health condition being treated. Butterfield (2014) introduces what she titles *Garden Essences* (p. 359ff) with which she essentially re-writes the building dominated Design Brief of the Maggie's Centres:

- **THRESHOLDS** – gardens should provide transition zones or buffers between the ‘outside world’ and the treatment centres, providing a specific type of sanctuary through their support of ‘way-finding’. Similar sanctuary can be provided by garden spaces inside the centre premises / surrounds. This is inline with the Kaplan’s ART, Appleton’s Theory and the PSDs by Grahn, whilst perhaps being a little more tangible in its terminology.
- **SENSORY RICHNESS** – provision of a calm, ‘soft’ space that caters for aspects such as sound, colour, fragrance, texture and touch. It aims to make garden spaces accessible throughout the seasons and in all conditions, allowing for choice and variety, including edible plants. This is again in line with ART, Ulrich’s Theory and the PSDs.
- **DENSITY OF TIME** – opportunities that allow reflection and observation of garden changes over seasons and other increments of time. Whilst there should not be strong symbology or memorialisation in this sense, seeing that nature has cycles and processes that are independent of human influence and are part of a greater whole have been mentioned as meaningful in many of the publications.
- **HOMELINESS** – design at a more domestic (and specifically non-institutional) scale that provides opportunities of comfort and intimacy. It reflects previous notions within the main theories of a landscape being legible, familiar and chances for Pálsdóttir’s ‘social quietness’.
- **CARE** – signs of human care are noted as being vital in such environments that offer restoration,

as they are often, if not always, connected to caregiving for the participants / users. By ensuring that a garden is perceived as being loved, feelings of security and care are implied to the user, creating an indirect sense of well-being. This care also promotes ownership and connection to nature and set spaces (Cooper Marcus & Sachs, 2014, p. 31, 58).

Butterfield was one of few authors (along with Cooper Marcus) to specifically address a sense of the domestic and follow up maintenance as vital qualities within green space design. ‘Signs of care’ do not mean highly manicured gardens, but simply signals that human care and time is being invested on behalf of those that do not have the energy to do so. Another reason to highlight these ‘essences’ is the recurring idea within the readings, that designers work creatively yet not too abstractly on green spaces, understanding that their trained aesthetics (particularly when being modern, strict, abstract or symbolic) are not always suitable for the users of such spaces (Tenngart Ivarsson, 2011, p. 25f; Cooper Marcus & Sachs, 2014, p. 15). In this way, Butterfield’s *Garden Essences* can help to remind designers to focus on the user of the space as a priority over their personal aesthetics. To paraphrase Cooper Marcus & Barnes (1999), it is important that designers remain focussed on the fact that when designing a restorative space they are both “*creating a place but also facilitating a process*” (p. 87).

The peripheral theories discussed above offer different perspectives or frameworks from which to approach this topic. Whilst their content is not as specifically related to qualities or physical features, they offer alternate lenses and viewpoints that inform designers in a more general or foundational manner. Their connection and integration into the main theories and design qualities is demonstrated throughout the resulting recommendations.

(VI) PRACTICAL RECOMMENDATIONS within LITERATURE:

Why then, is there a need to pick apart or pin-down the physical qualities for restorative spaces? Fundamentally, the issue is one of translating the research into practice so that the values, benefits and support that restorative green spaces can offer people, can be executed in reality for all those in need. As in the case of the Maggie's Centres, the whole approach recognises the influence an environment can have on a person, be it through domestic and natural style, signs of care or otherwise – “...*impressions we receive from our environment will influence how we feel...*” (Annemans, Van Audenhove, Vermolen & Heylighen, 2012, p. 2) and this needs to be the starting point for restorative treatments. Possibly the main point that all of the literature agrees on is the restorative qualities of nature and how this can have a salutogenic effect on our health and well-being. In order to harness such potential as a designer, it is vital to have some common reference precedents or prototypes of what such environments could look like or contain.

The next section will discuss and present the findings of specific physical qualities, features and principles from throughout the literature. The resulting recommendations were much larger than expected, particularly when seen as conducive to both conditions of stress and cancer (thereby ‘general’). The final results consisted of 60 potential qualities and recommendations, 41 of which were ‘general’; 9 specific to Stress and 10 specific to Cancer. The compiled matrix results (see *Appendix B-D*) were funnelled via a threshold to arrive at the 31/60 most relevant qualities, which will be discussed below. These qualities were categorised into 10 umbrella terms, which will then be identified within the Case Studies, to provide visual examples of how they may be interpreted.

In the attempt to synthesise the large number of recommendations found, the 10 ‘umbrella’ categories emerged quite intuitively. These categories were based on terminology that was felt to be more related to ‘design’ than some of that seen in the literature, based on my previous education in design from Australia. (This interpretation could be further tested in future through, for example, feedback by professionals in practice.) The final 10 Categories are:

1. Choice / Social Quietness
2. Colour
3. Composition / Layout
4. Fascination / Sensory Stimulation
5. Physical Comfort
6. Seating
7. Soundscape
8. Space / Walkability
9. Spatiality
10. Vegetation

The categories and their relevant qualities are explained in detail below, with many, but not all of the contributing authors cited. [The full lists of authors who agree with or discussed the category qualities are shown in *Appendix B-D*.] Provided at the end of each description is also a connection to the previous theories discussed, both the 4 Main theories* and the Peripheral theories** as some overlap or influence could be deciphered. The categories themselves are presented alphabetically, as once the information was synthesised they were deemed to be of equal importance.

(VI) PRACTICAL RECOMMENDATIONS continued:

RESULTING RECOMMENDATIONS and QUALITIES:

1 - CHOICE / SOCIAL QUIETNESS =

1A: Space to be alone with nature (privacy) - space to “just be” and/or express strong emotions.

Throughout the literature it was evident that in times of high stress, people benefitted from time alone within a natural environment (Cooper Marcus & Sachs, 2014, p. 25). The important distinction here is that this quality has a focus on privacy, not isolation (Butterfield, 2015, p. 99). It requires the design of spaces to be alone in and with nature, to be truly ‘away’ from everyday pressures and situations and restore peace within oneself. Being alone to contemplate, reflect or express strong emotions, away from other people and the demands of such relationships was highly preferred by many people in various studies. Such spaces offer solitude, an opportunity to perhaps temporarily forget or set aside worries, as well as space for inner reflection (Korpela & Staats, 2014, p. 352, 357, 363). Whilst human company was often preferred in urban environments, this was not the case for natural areas, where company was seen as a possible distraction from restoration (Korpela & Staats, 2014, p. 359). This quality could be interpreted as that which Pálsdóttir calls *Social Quietness* (2016, p. 117f) and was described by Adevi & Lieberg as an opportunity to *just be* (2012, p. 55f).

Within the research of Pálsdóttir (2014) this was specifically described in a spatial manner as people requiring physical distance or space for themselves, including between them and others, such as a perennial bed at Alnarp that is situated between a path and a garden swing often used to be alone (Paper 3 Draft, p. 9).

* This quality can be connected to the Main Theories as: *Being Away* in the Kaplans’ ART; *Low Risk* of Ulrich’s Stress Recovery Theory and *Serene* for Grahn & Stigsdotter’s PSDs.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* in Ulrich’s Supportive Gardens; *Humanistic* and *Symbolic Values* in Kellert & Wilson’s Biophilia Hypothesis and clearly as Pálsdóttir’s *Social Quietness*. It also links to Grahn’s Supportive Environment pyramid as social interactions can be unsettling when personal capacity is low, such as at the beginning of Therapy.

1B: Choice of variety of spaces to suit mood / capacity - particularly choice between private or social spaces, passive or active.

In various guises, the importance of *choice* was evident throughout the literature, perhaps overridingly provided through the offer of a variety of physical settings and conditions, which can suit the mood, capacity or condition of the user at that particular time. Through provision of a variety of spaces, and thereby choice, a site can become useful for more people at more times, which in turn also allows for a greater variety of interactions (Cooper Marcus & Sachs, 2014, p. 25f; Tenngart Ivarsson & Grahn, 2010, p. 109).

It was also agreed in the literature that natural spaces allow for *self-determined levels* of privacy or interaction, which in the case of a cancer diagnosis can assist in regaining some of the autonomy and control that is often seen to be taken away from people (Blaschke, O’Callaghan & Schofield, 2018, p. 50; Keswick Jencks, 1995, p. 33). Due to individual variations of the users of restorative gardens, it seems logical to provide equally varied areas for them to occupy. This diversity should be enhanced, however, through variations of aspects such as sensory stimulation, providing some areas where there is, for example, little colour and fragrance and other areas that offer more of each, thereby allowing for compatibility within the different stages of treatment (Grahn et al, 2010, p. 123). This provision of choice has also been named as “*flexibility of function*” (Butterfield & Martin,

(VI) PRACTICAL RECOMMENDATIONS continued:

2016, p. 704), a “*demand gradient*” (Tenngart Ivarsson & Grahn, 2010, p. 112) and simply as offering “*various levels of demand*” (Stigsdotter & Grahn, 2003, p. 42).

A key factor in recovering from highly stressful situations was to feel a certain perception of *control*, as noted by Ulrich’s Supportive Gardens and others (Sachs, 2017, p. 7). Choice is a means of regaining a sense of control and empowerment (Adevi & Lieberg, 2012, p. 55; Grahn et al, 2010, p. 155). A particular example was seen in some benches at Nacadia Healing Garden, which are slightly narrower than ‘usual’, allowing a person to indicate their choice of accepting company or not. By sitting in the middle of the bench, there is not room for a second person, thus indicating in a subtle fashion to others whether a social interaction is desired or rather a moment of solitude sought (Pantelidou, 2013, p. 24).

* This quality can be connected to the Main Theories as: *Compatibility* in particular, by the Kaplans’ ART.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* in Ulrich’s Supportive Gardens; Pálsdóttir’s *Social Quietness* is part of this quality and, as the previous quality, it can be linked to Grahn’s Supportive Environment pyramid as social interactions can be unsettling when personal capacity is low.

2 - COLOUR =

2: “Softer colour palette” of blues and greens is more calming / restorative than more stimulating reds and yellows.

With up to 80% of information intake by humans being visual (Thorpert & Busse Nielsen, 2014, p. 60), it is not surprising that this sense has dominated the research methodology in this field, and leads to the recognition that colour is a very important aspect in design. Apparently colour is also interpreted

more quickly than form when reading spaces (Ibid). Whilst we shouldn’t forget about the other senses to complement and enrich experience, research at Alnarp Rehabilitation Garden has found certain colour palettes more appropriate for various stages of Therapy. Findings indicate that at the beginning of treatment, softer palettes such as blues / purples / white provide calmer areas and bolder palettes of reds, yellows and oranges are accessed in later stages when they provide interest or energise people (Pálsdóttir, 2014, Paper 3 Draft, p. 5, 20; Butterfield, 2014, p. 245). This ‘softness’ of colour is explained by Nicholson-Lord (2003) when he states, “...unlike reds or yellows, blue and green are long wavelength ‘low arousal’ colours known to relieve muscle tension and produce pleasurable moods...” (p. 19). This preference for blues and greens seems to be quite general in people, regardless of whether a space is focussed on restoration. One study showed that green, yellow and red are all seen as positive, as well as being linked in some way to nature for many people, with brighter or saturated colours being the more preferred in everyday settings (Kaufman & Lohr, 2008, p. 180). According to other studies, a preference for green increases with age, while the opposite is true of a preference for yellow (Kaufman & Lohr, 2004, p. 230), which is perhaps evident in the often more mature-aged interest that is common for gardening.

In the case of cancer care, there seemed to be an accepted and slightly stricter palette for interior spaces, that could also be considered for the outdoors: “...warm tones should not be bright or dominant (e.g., red), which appear to be anxiety-provoking. Drab or gray colors, associated with depression, should be avoided. Avocado and yellow-green tones are associated with nausea and typically banned from aircraft interiors and boats, and thus should be avoided in chemotherapy, surgery, or radiation units” (Block et al, 2004, p. S-163). When applied to the outdoors more directly, brighter colours for fascination were mentioned. In the case of tree canopy, people felt calmer when having seen green canopy than red, orange or yellow canopy (Kaufman & Lohr, 2008, p. 182).

(VI) PRACTICAL RECOMMENDATIONS continued:

** Connection to Peripheral Theories can be found as: *Sensory Richness* in Butterfield's Garden Essences, and it can be linked to Grahn's Supportive Environment pyramid in the need for less demanding colour palettes when personal capacity is low.

3 - COMPOSITION / LAYOUT =

3: Legible layout (overview) to allow easy way-finding.

This quality can at times be perhaps more closely linked to user groups such as the elderly or those with dementia, but it applies to spaces in a more general manner also. Spaces that provide an easily legible layout, which allow for an understandable overview of site upon entry were seen to provide a sense of safety and calm (Cooper Marcus & Sachs, 2014, p. 68). Well-defined areas with a combination of fences or borders, circuitous paths and entrance gates enabled a feeling of trust that one won't get lost when being focussed on the self more than on the surroundings. In such an environment paths could, for example, be used as a means to avoid or seek social interaction with their intersections or nodes seen as potential social contact points (Tenngart Ivarsson & Grahn, 2012, p. 529, 533f).

* This quality can be connected to the Main Theories as: *Extent* in the Kaplans' ART; *Prospect* by both Appleton and Grahn & Stigsdotter's PSDs; *Low Risk* in Ulrich's Stress Recovery Theory.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* in Ulrich Supportive Gardens; a slight link could be seen to the *Utilitarian* Values in Kellert & Wilson's Biophilia Hypothesis; some connection could also be seen with *Homeliness* in that a space is inherently familiar and legible within Butterfield's Garden Essences and it can be linked to Grahn's Supportive Environment pyramid, in that being able to read a site easily makes less demands of a person.

4 - FASCINATION / SENSORY STIMULATION =

4A: "Fascination" - escape from everyday demands through multi-sensory distraction in nature.

The inherent fascination or 'biophilic positive distraction' of plantings, natural materials, nature sounds and the presence of water were recognised throughout the literature and seen as 'emotionally uplifting' (Cooper Marcus & Sachs, 2014, p. 58, 118; Blaschke, 2017, p. 5, 7). One of the most vital aspects of this, I would suggest, is that when humans are outdoors, we experience the space in a more consciously multi-sensory manner than we perhaps perceive in other environments. For example, in summer when transpiration cools plant leaves it makes them pleasant to touch (Cooper Marcus & Sachs, 2014, p. 275). Therefore, when designing with plants in particular, it is useful to consider various senses, choosing for appearance, fragrance and sounds made by wind moving through them. In terms of touch, one could consider pliable vegetation, which is not liable to snap easily, perhaps producing multiple flowerings and including sensitive parts (E.g. that curl up when touched) and interesting seedpods or forms in various seasons (Cooper Marcus & Sachs, 2014, p. 277).

* This quality can be connected to the Main Theories as: *Fascination* in the Kaplans' ART; *Nature* and possibly *Rich in Species* in Grahn & Stigsdotter's PSDs.

** Connection to Peripheral Theories can be found as: *Access to nature* in Ulrich's Supportive Gardens; *Sensory richness* in Butterfield's Garden Essences and the *Naturalistic* plus perhaps *Aesthetic* Values in Kellert & Wilson's Biophilia Hypothesis.

4B: Water bodies as a source of "fascination"; distraction and tranquillity.

Water and shelter (refuge) are an overwhelmingly general preference for people in nature, quite possibly on an intrinsic evolutionary level as a

(VI) PRACTICAL RECOMMENDATIONS continued:

basic need (Cooper Marcus & Sachs, 2014, p. 24; Pálsdóttir, Persson, Persson & Grahn, 2014, p. 7103). Water also seems to have an inherent level of fascination for humans, particularly water that reflects the sky and trees (Polat et al, 2017, p. 39). Ponds and other water bodies also support personal inner reflection and fascination through changes in their surface, fish, insects and plants, or by having large stones on which to sit and watch natural activity, all of which are non-demanding and therefore preferred for contemplation (Pálsdóttir, 2014, Paper 3 Draft, p. 12). Water was also specifically mentioned as a beneficial or preferred natural design feature by patients in cancer care studies (Blaschke et al, 2018, p. 49). Similarly to dealing with allergies, however, in relation to cancer care, caution must be taken when dealing with water-borne risks such as toxicity and bacteria, particularly where people have a compromised immune system (Blaschke et al, 2018, p. 51).

* This quality can be connected to the Main Theories as: *Water* is one of Ulrich's key qualities for restoration in his Stress Recovery Theory; *Fascination* in the Kaplans' ART; *Nature*, *Serene* and possibly *Rich in Species* in Grahn & Stigsdotter's PSDs.

** Connection to Peripheral Theories can be found as: *Access to nature* in Ulrich's Supportive Gardens; *Sensory richness* in Butterfield's Garden Essences and the *Naturalistic* Values in Kellert & Wilson's Biophilia Hypothesis.

4C: Triggering of memory through senses / plants (not always positive).

Although not always connected to entirely positive experiences, the importance of memories being triggered through natural experiences was noted as beneficial by various authors. This seems most often to occur through the sense of smell, but has also been linked to familiar plants or other experiences in nature (Butterfield, 2014, p. 240, 254, 285).

** Connection to Peripheral Theories can be found as: *Access to nature* in Ulrich's Supportive Gardens; *Density of Time* and possibly *Sensory richness* in Butterfield's Garden Essences and the *Humanistic* Values in Kellert & Wilson's Biophilia Hypothesis.

4D: *CANCER specific* - Avoid sensory overload by reducing strong smelling plants - particularly after chemotherapy and similar treatments.

The key for cancer care was to be mindful of 'over' stimulation and whilst there was some contradiction within the literature regarding scented plants, it would be advisable to provide scent in areas that could be avoided if necessary. Hypersensitivity seemed particularly linked to chemotherapy, whilst apparently lavender, rosemary, oregano, sage, thyme, mint / peppermint and lemon verbena were not seen as a problem by patients themselves (Cooper Marcus & Sachs, 2014, p. 56, 117f; Jencks, 2017, p. 3). This type of sensitivity seemed to be more often connected to smell, but other senses could be hindered also and should be researched further to cater for such impacts, for example, after bone marrow transplants bacteria in soil and water need to be eliminated (Cooper Marcus & Sachs, 2014, p. 117; Flemming & Figueiredo, 2013, p. 14). The other consideration here was the deliberate use of sensory stimulation for distraction, including covering the smell from a hospital for restoration (Blaschke et al, 2018, p. 50; Paine & Francis, 1990, p. 279).

** Connection to Peripheral Theories can be found as: *Sensory richness* in Butterfield's Garden Essences in the creation of a balance simulation and this could also be linked to Grahn's Supportive Environment pyramid in that a patient's physical capacity changes during their treatment.

(VI) PRACTICAL RECOMMENDATIONS continued:

5 - PHYSICAL COMFORT =

5A: Provision of Shade / Sunny areas.

People in pain and using certain medications can suffer from sunlight sensitivity, which makes the provision of shade an important design consideration for healthcare and restorative gardens (Cooper Marcus & Sachs, 2014, p. 67; Flahive DiNardo, DePrado, Polanin & Flagler, 2013, p. 2; Stigsdotter & Grahn, 2003, p. 41). Seating in particular should be available in both shade and sunny positions to provide choice and comfort. Provision of shade and thereby cooling, as well as sun and its connected warmth, should be part of a flexible and varied design (Butterfield, 2014, p. 253).

* This quality can be connected to the Main Theories as: *Compatibility* in the Kaplans' ART.

** Connection to Peripheral Theories can be found as: *Sense of Control* in Ulrich's Supportive Gardens.

5B: Natural Materials - avoid man-made materials (e.g. steel, concrete, plastic...).

Natural materials such as timber, amongst plantings and other natural features, were seen throughout as a gentler alternative for spatial design (Blaschke et al, 2018, p. 53; Cooper Marcus & Sachs, 2014, p. 58, 118). Additionally, natural colours on walls, fish tanks and natural objects were seen as restorative. Softer, more natural materials for walking paths were also preferred and through their sound underfoot can signal someone else approaching in a warning manner and therefore add a sense of safety (Cerwén, Pedersen & Pálsdóttir, 2016, p. 7).

** Connection to Peripheral Theories can be found as: *Sense of Safety* in Ulrich's Supportive Gardens; Butterfield's *Homeliness* Garden Essence.

5C: Provision for bad weather (seasonal shelter) including Greenhouses for all season access to daylight and greenery.

Provision for bad weather or colder seasons through shelter such as greenhouses can extend the use of the garden throughout the year, to at least some extent regardless of climate (Blaschke et al, 2018, p. 54; Cooper Marcus & Sachs, 2014, p. 70). Greenhouses / Glasshouses work particularly well by allowing people to spend colder seasons outside, providing lots of visual access to the outdoors whilst being sheltered from the elements (Pálsdóttir, 2014, Paper 3 Draft, p. 14). A further consideration for inclement weather would be non-slip surface materials, again to extend the outdoor use of a site as much as possible (Blaschke et al, 2018, p. 54).

* This quality can be connected to the Main Theories as: *Compatibility* in the Kaplans' ART; *Low Risk* in Ulrich's Stress Recovery Theory; *Refuge* by Appleton and as Grahn & Stigsdotter's PSD, in terms of literal shelter.

** Connection to Peripheral Theories can be found as: *Access to Nature*, *Sense of Safety* and *Sense of Control* in Ulrich's Supportive Gardens; Butterfield's *Thresholds* and *Homeliness* Garden Essences and the *Utilitarian* Values in Kellert & Wilson's Biophilia Hypothesis.

5D: Signs of Care / Maintenance (reflects care of person on site).

Signs of human care and maintenance were important once the design has been constructed, as in some cases these can mitigate feelings of insecurity, even for example, from dense vegetation (Van den Berg et al, 2014, p. 174). Clear evidence of maintenance showing the space was cared for helps with the health of plants and does not mean highly manicured treatments, simply signs of human attention (Polat et al, 2017, p. 39). In settings connected to healthcare and therapy, such signs can be even more valuable as they indirectly show the level or type of care that will be provided for the user of the space.

(VI) PRACTICAL RECOMMENDATIONS continued:

* This quality can be connected to the Main Theories as: *Low Risk* in Ulrich's Stress Recovery Theory; and whilst not normally seen as 'restorative' it links to Grahn & Stigsdotter's PSD *Culture*.

** Connection to Peripheral Theories can be found as: *Social Support*, *Sense of Safety* in Ulrich's Supportive Gardens; Butterfield's *Care* and *Homeliness* Garden Essences.

6 - SEATING =

6A: Raised planters as physical support for walking and seating.

The use of raised planters and walls can provide support for moments of rest as well as flexible and/or casual seating (Flahive DiNardo et al, 2013, p. 3; William Thompson, 1998, p. 71). With physical pain, decreased bodily awareness and impaired physical strength, all symptoms of treatments and chronic health conditions such as stress and cancer, the physical structures of raised beds can aid both mobility and respite (Cooper Marcus & Sachs, 2014, p. 76). Additionally, they also raise the level of plants for easy access and "*spontaneous harvesting*", allowing them to stimulate all the senses (Pálsdóttir, 2014, Paper 3 Draft, p. 12; William Thompson, 1998, p. 90).

* This quality can be connected to the Main Theories as: *Compatibility* of physical strength in the Kaplans' ART; *Low Risk* in Ulrich's Stress Recovery Theory.

** Connection to Peripheral Theories can be found as: *Sense of Control*, *Sense of Safety* and to some degree *Physical Movement* in Ulrich's Supportive Gardens; *Care* in Butterfield's Garden Essences; the *Utilitarian* Values in Kellert & Wilson's Biophilia Hypothesis and it can be linked to Grahn's Supportive Environment pyramid in that it allows for varying levels of physical capacity.

6B: Seating options - variety of grouped / single seating, with backs and armrests, moveable, opportunity to lie down.

Provision of frequent and comfortable seating that is varied, moveable and caters for varying sizes of groups or individuals, preferably with backs / arms for support, is vital in a restorative space. Further consideration should be given to the materials of furniture, which should avoid glare and heating up in the sun, as well as avoid the pooling of water after rain (Cooper Marcus & Sachs, 2014, p. 79f).

"Indoors the standard seat depth is 400mm; outdoors we need to allow 500mm so people can perhaps fit a cushion at their back, sprawl a little, tuck up their feet and get comfortable" (Souter-Brown, 2015, p. 131). Such additions as cushions must be considered both in regard to comfort for people affected by lost muscle mass and for maintenance and weather, as generally seats should be comfortable for at least an hour or more and thereby also available at all times of site access (Valente & Cooper Marcus, 2015, p. 187).

Seating should also aim to be positioned at angles that encourage conversation, and face activities so that people can passively participate if not strong enough to be physically active (Paine & Francis, 1990, p. 279f; Mumcu, Düzenli & Özbilen, 2010, p. 1225). Providing space and/or furniture for people to lie down to rest, such as a lawn, longer benches, or even lounges allows for a further level of rest and respite (Cooper Marcus & Sachs, 2014, p. 70).

* This quality can be connected to the Main Theories as: *Compatibility* of physical strength in the Kaplans' ART; *Low Risk* in Ulrich's Stress Recovery Theory; this could also be seen as *Refuge* by Appleton.

** Connection to Peripheral Theories can be found as: *Sense of Control*, *Sense of Safety* and to some degree *Physical Movement* in Ulrich's Supportive Gardens; *Care* in Butterfield's Garden Essences; the *Utilitarian* Values in Kellert & Wilson's Biophilia Hypothesis and it can be linked

(VI) PRACTICAL RECOMMENDATIONS continued:

to Grahn's Supportive Environment pyramid in that it allows for varying levels of physical capacity.

7 - SOUNDSCAPE =

7: Nature sounds (such as birdsong and water) are more restorative than urban (man-made) sounds.

It was broadly acknowledged by various authors that nature sounds are perceived as restorative, while urban (man-made) sounds are often perceived as disturbing (Cooper Marcus & Sachs, 2014, p. 21; Sidenius et al, 2017, p. 18; Van den Berg et al, 2014, p. 174). Siting and design should enhance and support sounds from water and wildlife (which can in some cases be used to camouflage or cover disturbing noise), whilst simultaneously aiming to reduce urban sounds such as air conditioners and traffic as much as possible (Pálsdóttir et al, 2014, p. 7102). Birdsong was specifically found to be a preferred natural sound and conducive to stress recovery in several studies, seen as a symbol of nature, and thus should be catered for or supported in restorative spaces by plantings that encourage bird nesting and habitat (Ratcliffe, Gatersleben & Sowdon, 2013, p. 4, 6f).

Cerwén et al (2016) investigated the concept of “sonic themes”, resulting in three categories and their perception: *Natural* (positive = birds, wind, water and silence); *Technological* (negative = cars, computers, fans); *Human* (mixed preference depending on stage of rehabilitation = talking, someone walking on gravel as warning of approach, social interaction / demands). These themes and their related perceptions could also inform siting and layout for soundscape (p. 5ff). In a similar way that some people become hyper-sensitive to smell, others become sensitive to noise when ill - “...patients frequently referred to ‘quietness’ as an ideal state to aid the recovery process” (Cerwén et al, 2016, p. 9). A suggested approach when designing relates back to salutogenic methods of healthcare, working to create a *Soundscape* (positive / ‘offensive sound

encouragement’) rather than reacting as *Noise Control* (negative / ‘defensive noise abatement’) when deciding on materials, features and plants (Aletta, F., Kang, J., Astolfi, A. & Fuda, S, 2016, p. 367; Cerwén et al, 2016, p. 1).

Natural sounds could also be deemed positive when seen as signs of a “*living or vital environment*”, which is an aspect of research that is missing from those studies that only use imagery of natural environments (both photos and film) rather than addressing the impact of other senses for restoration (Ratcliffe et al, 2013, p. 7).

* This quality can be connected to the Main Theories as: *Being Away* and *Fascination* in the Kaplans’ ART; *Low Risk* and *Unthreatening Wildlife* in Ulrich’s Stress Recovery Theory; *Nature* and to some degree *Rich in Species* and *Serene* from Grahn & Stigsdotter’s PSDs.

** Connection to Peripheral Theories can be found as: *Access to Nature* and to some degree *Sense of Safety* in Ulrich’s Supportive Gardens; *Sensory Richness* in Butterfield’s Garden Essences; possibly connected to Pálsdóttir’s *Social Quietness* if surrounded by nature rather than people; there is also some link to Grahn’s Supportive Environment pyramid in that it attempts to deal with the demands and sensitivity (capacity) to noise.

8 - SPACE / WALKABILITY =

8A: Possibility to move, predominantly walk - gentle, compatible levels of exercise.

Physical movement / exercise releases endorphins and thus is very important as part of therapy and restoration (Cooper Marcus & Sachs, 2014, p. 26). However, this needs to be supported in a natural and gentle context. [This was witnessed at the Maggie’s Centre Newcastle, where work out equipment was not used at all, despite good intentions.] The greatest benefit seems to be found in walking, with varying degrees of distance, difficulty, destination

(VI) PRACTICAL RECOMMENDATIONS continued:

and interest along the way (such as walking loops) and including easy way-finding (Ulrich, 1999, p. 48; William Thompson, 1998, p. 71). Walks should be supported as both a solitary and accompanied activity (Introvert & Extrovert) with longer and more outward looking destinations a preferable alternative if possible. Seen as an explicit part of Shinrin-yoku (Forest-bathing in Japan), overall it could be stated that the more stressed / in crisis a person finds themselves, the more beneficial walking in the outdoors becomes as part of restoration (Tenngart Ivarsson & Grahn, 2012, p. 526ff; Park et al, 2010, p. 21).

The emphasis on provision for movement or walking is that the form of physical activity remains safe and compatible (Blaschke et al, 2018, p. 50). In some cases it can even be a relief agent “...*chemotherapy induced nausea can sometimes be relieved with mild exercise before chemotherapy treatment. With portable chemotherapy pumps, patients may be able to walk outside and exercise through the chemotherapy infusion, so access to safe out of doors areas and/or walking paths is beneficial...*” (Block et al, 2004, p. S-163).

An additional benefit of walking in particular, is that it becomes an activity of contemplation and reflection. This is especially the case if one has the possibility to *meander* (Cooper Marcus & Barnes, 1995, p. 61), and includes opportunities such as Labyrinths to become a form of meditative walk or circuit (Butterfield, 2014, p. 271; Corazon et al, 2010, p. 44).

* This quality can be connected to the Main Theories as: *Being Away* and *Extent* in the Kaplans’ ART as well as providing a form of *Compatibility*; there is some degree of connection to *Savannah-like landscapes* in Ulrich’s Stress Recovery Theory due to the space they provide for movement; *Space* from Grahn & Stigsdotter’s PSDs.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Physical Movement* with some degree of connection to *Access to Nature* and *Sense of Safety* in Ulrich’s Supportive Gardens;

there is some link to *Thresholds* in Butterfield’s Garden Essences and connection to Grahn’s Supportive Environment pyramid in the provision of space for choice and release.

8B: Wheelchair (wheeled aids) accessible surfaces.

Although this may be more applicable to healthcare facilities, it should in the sense of ‘universal’ design be considered regardless of context. The inclusion of smooth, level and firm path surfaces that are accessible to wheelchairs and wheeled walking aids, with a slope of less than 5% and reduced glare material, should also consider surface drainage and maintenance (Flahive DiNardo et al, 2013, p. 2f). Path aspects to avoid include grills, cobbles, loose aggregates like larger gravel and wood chips, whilst the colour should be distinct from the indoors to emphasise transition thresholds (Cooper Marcus & Sachs, 2014, p. 74, 76; Paine & Francis, 1990, p. 275).

* This quality can be connected to the Main Theories as: *Being Away* and *Extent* in the Kaplans’ ART as well as providing a form of *Compatibility*; *Space* from Grahn & Stigsdotter’s PSDs.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Physical Movement* with some degree of connection to *Access to Nature* and *Sense of Safety* in Ulrich’s Supportive Gardens; there is some link to *Thresholds* in Butterfield’s Garden Essences and connection to Grahn’s Supportive Environment pyramid in the provision of space for choice and release.

8C: STRESS specific - Possibility of “escape” - two routes in / out of any space.

In the specific case of stress recovery, studies at Alnarp Rehabilitation Garden found the need for ‘escape’ from human company through multiple exits and paths. Particularly required at the beginning of therapy, when people have a low capacity to interact with others, it was also helpful

(VI) PRACTICAL RECOMMENDATIONS continued:

to have paths whose materials allow approaching persons to be heard as a ‘warning’ (Pálsdóttir, 2014, Paper 3 Draft, p. 9ff).

* This quality can be connected to the Main Theories as: *Compatibility* in the Kaplans’ ART; *Low Risk* from Ulrich’s Stress Recovery Theory; linked to both *Prospect & Refuge* by Appleton, as in Grahn & Stigsdotter’s PSDs, which also sees *Space* addressed.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* with some degree of connection to *Physical Movement* in Ulrich’s Supportive Gardens; there is some link to *Care* in Butterfield’s Garden Essences; there is quite clear connection to Pálsdóttir’s *Social Quietness* and thereby also to Grahn’s Supportive Environment pyramid with reduced capacity for social contacts at early stages of treatment.

8D: *STRESS specific - soft walking surface to slow pace (e.g. wood chips, gravel...).*

Walking surfaces that are soft underfoot support the slowing of walking pace, thereby enhancing calm and the overall slowing down to observe and reflect (Pálsdóttir, 2014, Paper 3 Draft, p. 9). Slight undulations and variations in surfaces can help improve impaired bodily awareness and provide opportunities for exercise (Stigsdotter, 2005, p. 34; Stigsdotter et al, 2011, p. 325). The slowing of walking pace may be particularly beneficial for initial reflection phases and *social quietness* (Czerwén et al, 2016, p. 7).

* This quality can be connected to the Main Theories as: *Compatibility* and possibly *Being Away* in the Kaplans’ ART; *Low Risk* from Ulrich’s Stress Recovery Theory.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* with some degree of connection to *Physical Movement* in Ulrich’s Supportive Gardens; *Density of Time*, *Thresholds* and with some link to *Care* in Butterfield’s Garden Essences.

9 - SPATIALITY =

9A: Higher levels of Refuge are desired when ill / depleted.

Higher levels of *Refuge* (structural, physical, perceived) are preferred when people are ill or stressed and can provide a sense of safety. This is also more generally the case for women, whilst teenagers often prefer the opposite of ‘seeing and being seen’, so the gender and age of the user group should be considered within any design (Cooper Marcus & Sachs, 2014, p. 23; Tenngart Ivarsson & Grahn, 2010, p. 107). There is also an important distinction to be made in such spatiality, that of providing privacy without isolating people (Butterfield, 2015, p. 99). Spaces with *refuge* should function as a “*shield*” for and from the outside world / every-day and thereby provide a level of “*seclusion*” and respite (Butterfield, 2014, p. 209-210).

* This quality can be connected to the Main Theories as: *Being Away* and possibly *Extent* in the Kaplans’ ART; *Low Risk* from Ulrich’s Stress Recovery Theory; *Refuge* by Appleton, as in Grahn & Stigsdotter’s PSDs, which also somewhat sees *Space* addressed.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* in Ulrich’s Supportive Gardens; *Care*, *Thresholds* and to some degree *Homeliness* in Butterfield’s Garden Essences; the *Utilitarian Values* in Kellert & Wilson’s Biophilia Hypothesis and there is also connection to Grahn’s Supportive Environment pyramid with reduced capacity for social contacts at early stages of treatment.

9B: Enclosure - safety, privacy of site (non-public access).

This quality could be seen as one interpretation of the above *Refuge* in that it provides the physical enclosure for safety and privacy from public, in the form of fencing, hedges or walls if not automatically provided by adjacent buildings (Cooper Marcus &

(VI) PRACTICAL RECOMMENDATIONS continued:

Sachs, 2014, p. 67). Well-defined areas indicated through boundary demarcations, gates, circuit walks and more, allow users to focus on the ‘self’ without fear of getting lost or confused (Tenngart Ivarsson & Grahn, 2012, p. 529). For example, the Entrance Gate at Alnarp Rehabilitation Garden is perceived as marking a border between “...*hazardous everyday life and a place of seclusion and security...*” (Pálsdóttir et al, 2014, p. 7100).

Being in an enclosed and private area was seen in much of the literature as a form of ‘escape’ or ‘breath of fresh air’, which is connected to the Kaplans’ ART in the form of offering general respite through experiencing something different to everyday stresses (Cooper Marcus & Sachs, 2014, p. 27). The concept of ‘enclosure’ is commonly dealt with in design as garden ‘rooms’, often supported by continuous and/or repeated unifying features such as hedges that can hide people inside / outside (Stigsdotter, 2005, p. 35; Stigsdotter & Grahn, 2003, p. 44).

* This quality can be connected to the Main Theories as: *Refuge* by Appleton, as in Grahn & Stigsdotter’s PSDs, which also sees *Space* addressed; *Being Away* and to some degree *Extent* in the Kaplans’ ART; *Low Risk* from Ulrich’s Stress Recovery Theory.

** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* in Ulrich’s Supportive Gardens; *Thresholds* and possible a degree of *Care* and *Homeliness* in Butterfield’s Garden Essences; the *Utilitarian Values* in Kellert & Wilson’s Biophilia Hypothesis and as with the previous quality, there is also connection to Grahn’s Supportive Environment pyramid with reduced capacity for social contacts at early stages of treatment.

9C: Access to sunshine / daylight (natural Vitamin D).

Access to daylight is the body’s natural process of gaining Vitamin D, which is beneficial for bone and general health, including circadian rhythms that can

improve sleep and counter depression (Sachs, 2017, p. 14). Exposure to daylight has also been linked to pain reduction (Bengtsson, 2015, p. 21), and psychological restoration (Pálsdóttir, 2014, p. 66), thereby leading to overall increased well-being.

* This quality can be connected to the Main Theories as: to some degree *Being Away* in the Kaplans’ ART; *Nature* in Grahn & Stigsdotter’s PSDs; and in a certain way to *Prospect* by Appleton as more open spaces allow access views and access to light.

** Connection to Peripheral Theories can be found as: *Access to Nature* with some degree of connection to *Physical Movement* in Ulrich’s Supportive Gardens if the daylight is gained by physically being outside; *Sensory Richness* in Butterfield’s Garden Essences; with a slight link to Grahn’s Supportive Environment pyramid in reduced physical capacity benefitting from daylight.

9D: Contrast to institutional environment - domestic scale and typology; clear entrance to “be away” – homeliness.

The contrast of “...*messy, slow-growing...*” environments on a more domestic scale compared to those of large institutions such as hospitals, not only provide a degree of homeliness, but also emphasise the concept of ‘a bigger whole’ that can be clearly seen in nature (Jencks, 2016, p. 83). This difference in scale can also enhance feelings of ‘normality’ that are affected or reduced by certain conditions such as cancer, even perhaps able to “*humanise*” medical processes (Blaschke, 2017, p. 8; Butterfield, 2015, p. 108). The effect of this more ‘human’ scale could also be seen as important due to its ability to provide “*anti-institutional intimacy*” as a “*comforting contrast*” and thereby should be used to balance the stress of the conditions people find themselves in when ill (Cooper Marcus & Sachs, 2014, p. 115).

* This quality can be connected to the Main Theories as: *Being Away* and *Compatibility* in the Kaplans’ ART; *Low Risk* from Ulrich’s Stress

(VI) PRACTICAL RECOMMENDATIONS continued:

Recovery Theory; linked to both *Refuge* by Appleton, as in Grahn & Stigsdotter's PSDs.

****** Connection to Peripheral Theories can be found as: *Sense of Control* and *Sense of Safety* in Ulrich's Supportive Gardens; there is some link to *Thresholds* and *Homeliness* in Butterfield's Garden Essences; as well as relating to Grahn's Supportive Environment pyramid of people dealing with reduced capacity of dealing with institutional scale settings.

9E: Avoid perfect grooming, strict paths and maintenance - softer and more casual appearance is less demanding / gentler.

This quality could again be seen as connected to its predecessor, with hard-scaping often connected to institutional environments and perceived as too demanding, strict and ordered to be restorative (Pálsdóttir et al, 2014, p. 7100). The 4 main theories are amongst many to acknowledge the benefits of avoiding a dominance of hard-scaping, with imperfect or more casual spaces felt to be more “*unfinished and flexible*” and thus more conducive for respite and restoration (Stigsdotter, 2005, p. 34). An interesting aspect for the designer here is that this should, in principle, also reduce the maintenance regime and thereby cost of a site, which is beneficial for both user and owner.

* This quality can be connected to the Main Theories as: *Compatibility* in the Kaplans' ART; *Low Risk* from Ulrich's Stress Recovery Theory; *Nature* in Grahn & Stigsdotter's PSDs.

****** Connection to Peripheral Theories can be found as: *Access to Nature* and *Sense of Safety* in Ulrich's Supportive Gardens; *Homeliness* and *Care* with perhaps some degree of connection to *Thresholds* in Butterfield's Garden Essences; and Grahn's Supportive Environment pyramid with reduced capacity at early stages of treatment to deal with demands from both people and spaces.

9F: CANCER specific - Spaces that allow for social interaction, at the same time as a level of privacy.

When designing restorative outdoor spaces, particularly for cancer, it is important to consider areas that allow for more intimate social interactions, which are face-to-face as they are indoors, but private (Annemans et al, 2012, p. 6). This is an elaboration perhaps on the previously discussed need to be alone with nature, but in the case of cancer care this need is often slightly more social, thus while privacy is required it is about supporting social interactions rather than individual contemplation.

* This quality can be connected to the Main Theories as: *Compatibility* and *Being Away* in the Kaplans' ART; *Low Risk* from Ulrich's Stress Recovery Theory; could be seen as a type of *Refuge* by Appleton and in Grahn & Stigsdotter's PSDs, which also sees *Space* somewhat addressed.

****** Connection to Peripheral Theories can be found as: *Sense of Control*, *Sense of Safety* and *Social Support* in Ulrich's Supportive Gardens; *Care* and perhaps the scale of *Homeliness* with some link to *Thresholds* in Butterfield's Garden Essences; there is also clear connection to Pálsdóttir's *Social Quietness* and thereby also to Grahn's Supportive Environment pyramid with varying capacity for social contacts.

10 - VEGETATION =

10A: Dominance (priority) of vegetation over hard-scaping.

Although Cooper Marcus & Sachs (2014, p. 28) were the only ones to put a set figure on the balance between hard and soft-scaping - 30% hardscape to 70% vegetation – this quality is about providing respite through nature. The need for greenery / vegetation, as for example stated by Ulrich in Stress Recovery Theory, goes back to overwhelming agreement that restoration is better

(VI) PRACTICAL RECOMMENDATIONS continued:

supported in natural than urban environments. When connected to other recommendations about the provision of fascination, distraction and preference for vegetation, the priority of it within any design is obvious.

* This quality can be connected to the Main Theories as: *Being Away* and *Compatibility* in the Kaplans' ART; *Verdant Vegetation*, *Flowers* and *Savannah-like landscapes* from Ulrich's Stress Recovery Theory; *Nature* and *Rich in Species* in Grahn & Stigsdotter's PSDs.

** Connection to Peripheral Theories can be found as: *Access to Nature* in Ulrich's Supportive Gardens; *Sensory Richness* and *Homeliness* in Butterfield's Garden Essences; the *Naturalistic Values* in Kellert & Wilson's Biophilia Hypothesis and also connections to Grahn's Supportive Environment pyramid as natural environments are seen to make fewer demands on people in general.

10B: Inclusion of Trees wherever possible – preferably with wide canopy, short trunks.

Trees are predominantly seen as fascinating and often symbolise stability and safety (Tenngart Ivarsson & Grahn, 2010, p. 108), so it is advisable to include them in a design whenever possible. Every opportunity should be sought to plant as mature trees as the budget will allow, providing instant shade and interest (Paine & Francis, 1990, p. 278).

In relation to a preference for savannah-like landscapes from Ulrich's Stress Recovery Theory and at least one other study, there was an overall visual preference for trees with a wider canopy and shorter trunks (Kaufman & Lohr, 2008, p. 179, Kaufman & Lohr, 2004, p. 230). Trees also give off 'phytoncides', which enrich the surrounding air and make people feel better, an aspect also acknowledged for negative ions in Shinrin-Yoku in Japan (Sachs, 2017, p. 15; Guan et al, 2017, p. 335).

* This quality can be connected to the Main Theories as: *Verdant Vegetation* and *Savannah-like landscapes* from Ulrich's Stress Recovery Theory;

Nature and *Rich in Species* in Grahn & Stigsdotter's PSDs.

** Connection to Peripheral Theories can be found as: *Access to Nature* in Ulrich's Supportive Gardens; *Sensory Richness* in Butterfield's Garden Essences.

10C: Biotopes / Plants that attract and support birds and insects.

Due to their benefits connected to fascination and soundscape, it is highly advisable to design bird biotopes, which cater for food, shelter and water with varied canopy density and layers to encourage a diversity of birdlife (Czerwén et al, 2016, p. 12). Considerations in line with this are providing water features that include shallow parts and stones for birds to rest on, provision of nectar and fruit producing plants, various plant structures for shelter, leaving rather than removing dead wood for insects (which in turn provide food for songbirds, for example), effectively providing for all needs of the fauna aimed to attract, which may also be specifically native (Czerwén et al, 2016, p. 174; Dawson, 1988, p. 173).

* This quality can be connected to the Main Theories as: *Fascination* in the Kaplans' ART; *Unthreatening Wildlife* from Ulrich's Stress Recovery Theory; *Rich in Species*, *Nature* and possibly *Serene* in Grahn & Stigsdotter's PSDs.

** Connection to Peripheral Theories can be found as: *Access to Nature* and possibly *Sense of Safety* in Ulrich's Supportive Gardens; *Sensory Richness* and *Homeliness* in Butterfield's Garden Essences; the *Naturalistic Values* in Kellert & Wilson's Biophilia Hypothesis.

10D: Seeing the full life cycle of plants can mirror Life (fascination).

A particular aspect of observing and experiencing nature was described by several authors, namely that of seeing the process of a plant growing from seed to flower as being symbolic of the natural life cycle and

(VI) PRACTICAL RECOMMENDATIONS continued:

thereby inherently fascinating as well as comforting (Tenngart Ivarsson & Grahn, 2010, p. 110; Tenngart Ivarsson & Grahn, 2012, p. 530; Butterfield, 2015, p. 104). These processes were noted as drawing our attention to time both in terms of valuable fleeting moments, but also the inexorability of nature and perhaps life in general (Butterfield, 2015, p. 108).

Literature advice called for the provision of lots of vegetation to increase the opportunities for patients to feel part of nature, part of a larger cycle and life in general (Stigsdotter et al, 2011, p. 325; Van den Berg et al, 2014, p. 174). In the context of cancer care, this provided comfort through being part of a “*bigger whole*” and perhaps finding some form of meaning in difficult times and processes (Blaschke, 2017, p. 9; Butterfield, 2014, p. 274).

* This quality can be connected to the Main Theories as: *Fascination* and *Being Away* in the Kaplans’ ART; *Verdant Vegetation* from Ulrich’s Stress Recovery Theory; *Nature* and perhaps *Rich in Species* in Grahn & Stigsdotter’s PSDs.

** Connection to Peripheral Theories can be found as: there is some degree of connection to *Sense of Control* and *Sense of Safety* in Ulrich’s Supportive Gardens; *Density of Time* and *Sensory Richness*, if not also *Homeliness* in Butterfield’s Garden Essences; the *Naturalistic Values* in Kellert & Wilson’s Biophilia Hypothesis.

10E: Visual and physical connection between inside and outside spaces (green views).

Although perhaps more closely linked to healthcare facilities, the connection between indoor and outdoor spaces remains relevant for any restorative garden design. At its base is the principle found by Ulrich in his 1984 study, that even views of greenery can be restorative and thus the transition between such spaces is an important consideration. This is particularly the case if dealing with users who may be too weak to go outside, but can still take in the calming views of greenery (Jencks, 2017, p. 3f). The other benefit of creating a strong

relationship between inside and outside spaces is that this can encourage physical exercise, resulting in health and well-being benefits (Hartig, 2007, p. 163).

* This quality can be connected to the Main Theories as: *Fascination* and *Being Away* in the Kaplans’ ART; *Low Risk* and perhaps *Verdant Vegetation* from Ulrich’s Stress Recovery Theory; *Nature*, *Rich in Species* and perhaps *Serene* and *Space* in Grahn & Stigsdotter’s PSDs.

** Connection to Peripheral Theories can be found as: *Access to Nature* and *Sense of Safety* in Ulrich’s Supportive Gardens; *Sensory Richness*, *Density of Time* and *Homeliness* in Butterfield’s Garden Essences; and some connection to Grahn’s Supportive Environment pyramid with possible reduced physical capacity at certain stages of treatment.

10F: Lush, diverse, eye-catching plantings (seasonal interest / distraction).

Many authors acknowledged the multitude of benefits that can be derived simply through fascination found in lush, colourful and eye-catching vegetation with seasonal changes (Polat et al, 2017, p. 39). One of the main factors here seems to be the multi-sensory experience of such environments, catering for fragrance, varied visual forms and heights that allow movement in the wind, which also generates sound, not to mention touch and taste (Cooper Marcus & Sachs, 2014, p. 81ff, 125).

Forest Gardens, such as those at Alnarp and Nacadia Rehabilitation Gardens, were perhaps in particular perceived to enhance a complete immersion into nature through the provision of natural floors, walls and ceilings (Corazon et al, 2010, p. 37). The advice offered therefore asserts that designers should “...plant ‘heavier’ at the start and cut back later, to ensure some immediate sensory impact for users” (Butterfield, 2014, p. 260; Cooper Marcus & Barnes, 1999, p. 217; Paine & Francis, 1990, p. 279).

(VI) PRACTICAL RECOMMENDATIONS continued:

* This quality can be connected to the Main Theories as: *Fascination* and *Being Away* in the Kaplans' ART; *Verdant Vegetation* and *Flowers* from Ulrich's Stress Recovery Theory; possible links to *Refuge* by Appleton and in Grahn & Stigsdotter's PSDs, which also sees *Nature*, *Rich in Species* and perhaps *Serene* addressed.

** Connection to Peripheral Theories can be found as: *Access to Nature* in Ulrich's Supportive Gardens; *Sensory Richness* and *Density of Time* if not also *Homeliness* in Butterfield's Garden Essences; the *Naturalistic* and *Aesthetic Values* in Kellert & Wilson's Biophilia Hypothesis.

The above resulting qualities constitute a comprehensive picture of what restorative green spaces can and should contain to be supportive and beneficial to their users. Whilst this list is not definitive and remains open to interpretation, it forms a foundational basis for any future design.

In the following pages, these qualities have been identified and visualised within a range of stress related and cancer care case studies. These images offer a sample of how the qualities may look or be expressed, whilst having no intention to prescribe that this is the 'only' solution, hence the decision to feature three cases of each type of site. The categories and qualities maintain their numbering from above, which will be used to identify photographs in each case study site, with grid maps provided for locating the quality, should this level of detail be of interest for the reader. The goal of providing the case study examples is to provide a range of visual references for each of the resulting qualities, as images often 'speak louder than words', particularly for visual oriented designers.

FINAL RECOMMENDATIONS & QUALITIES FROM LITERATURE:

1) CHOICE / SOCIAL QUIETNESS =

- A. Space to be alone with nature (privacy) - space to “just be” and/or express strong emotions
- B. Choice of variety of spaces to suit mood / capacity - particularly choice between private or social spaces, passive or active

2) COLOUR =

“Softer colour palette” of blues and greens is more calming / restorative than more stimulating reds and yellows

3) COMPOSITION / LAYOUT =

Legible layout (overview) to allow easy way-finding

4) FASCINATION / SENSORY STIMULATION =

- A. “Fascination” - escape from everyday demands through multi-sensory distraction in nature
- B. Water bodies as a source of “fascination”; distraction and tranquillity
- C. Triggering of memory through senses / plants (not always positive)
- D. *CANCER sp. - Avoid sensory overload by reducing strong smelling plants - particularly after chemotherapy and similar treatments*

5) PHYSICAL COMFORT =

- A. Provision of Shade / Sunny areas
- B. Natural Materials - avoid ‘man-made’ materials (e.g. steel, concrete, plastic...)
- C. Provision for bad weather (seasonal shelter) including Greenhouses for all season access to daylight and greenery
- D. Signs of Care / Maintenance (reflects care of person on site)

6) SEATING =

- A. Raised planters as physical support for walking and seating
- B. Seating options - variety of grouped / single seating, with backs and armrests, moveable, opportunity to lie down...

7) SOUNDSCAPE =

Nature sounds (such as birdsong and water) are more restorative than urban (man-made) sounds

8) SPACE / WALKABILITY =

- A. Possibility to move, predominantly walk - gentle, compatible levels of exercise
- B. Wheelchair (wheeled aids) accessible surfaces
- C. *STRESS - Possibility of “escape” - two routes in / out of any space*
- D. *STRESS - Soft walking surface to slow pace (e.g. wood chips, gravel...)*

9) SPATIALITY =

- A. Higher levels of Refuge are desired when ill / depleted
- B. Enclosure - safety, privacy of site (non-public access)
- C. Access to sunshine / daylight (natural Vitamin D) – NO PHOTOS / EXAMPLES
- D. Contrast to institutional environment - domestic scale and typology; clear Entrance to “be away” – homeliness
- E. Avoid perfect grooming, strict paths and maintenance - softer and more casual appearance is less demanding / gentler
- F. *CANCER - Spaces that allow for social interaction, at the same time as a level of privacy*

10) VEGETATION =

- A. Dominance (priority) of vegetation over hard-scaping
- B. Inclusion of Trees wherever possible – preferably with wide canopy, short trunks
- C. Biotopes / Plants that attract and support birds and insects
- D. Seeing the full life-cycle of plants can mirror Life (fascination) – NO PHOTOS / EXAMPLES
- E. Visual and physical connection between inside and outside spaces (green views)
- F. Lush, diverse, eye-catching plantings (seasonal interest / distraction)

(VII A) The CASE STUDIES / PRACTICAL EXAMPLES:

STRESS REHABILITATION

- Alnarp Rehabilitation Garden (Sweden)
- Healing Forest Garden Nacadia
(Denmark)
- Granliden Rehabilitation Garden
(Sweden)

ALNARP REHABILITATION GARDEN, Sweden (2001)

Name: Alnarp Rehabilitation Garden
Location: South-Western Sweden, Alnarp Campus [SLU - Swedish University of Agricultural Sciences]
Size: 5 acres
Established: 2000
Designer(s): Patrik Grahn, Ulrika Stigsdotter, Frederik Tauchnitz & Sara Lundström

Main underlying Theories within Literature:

Prospect & Refuge Theory (Appleton 1975)

QUALITY:	GRID:	DESCRIPTION:
Prospect	N3/4	View from deck over Meadow
Refuge	P5	Corner swing chair

Attention Restoration Theory (Kaplan & Kaplan 1989)

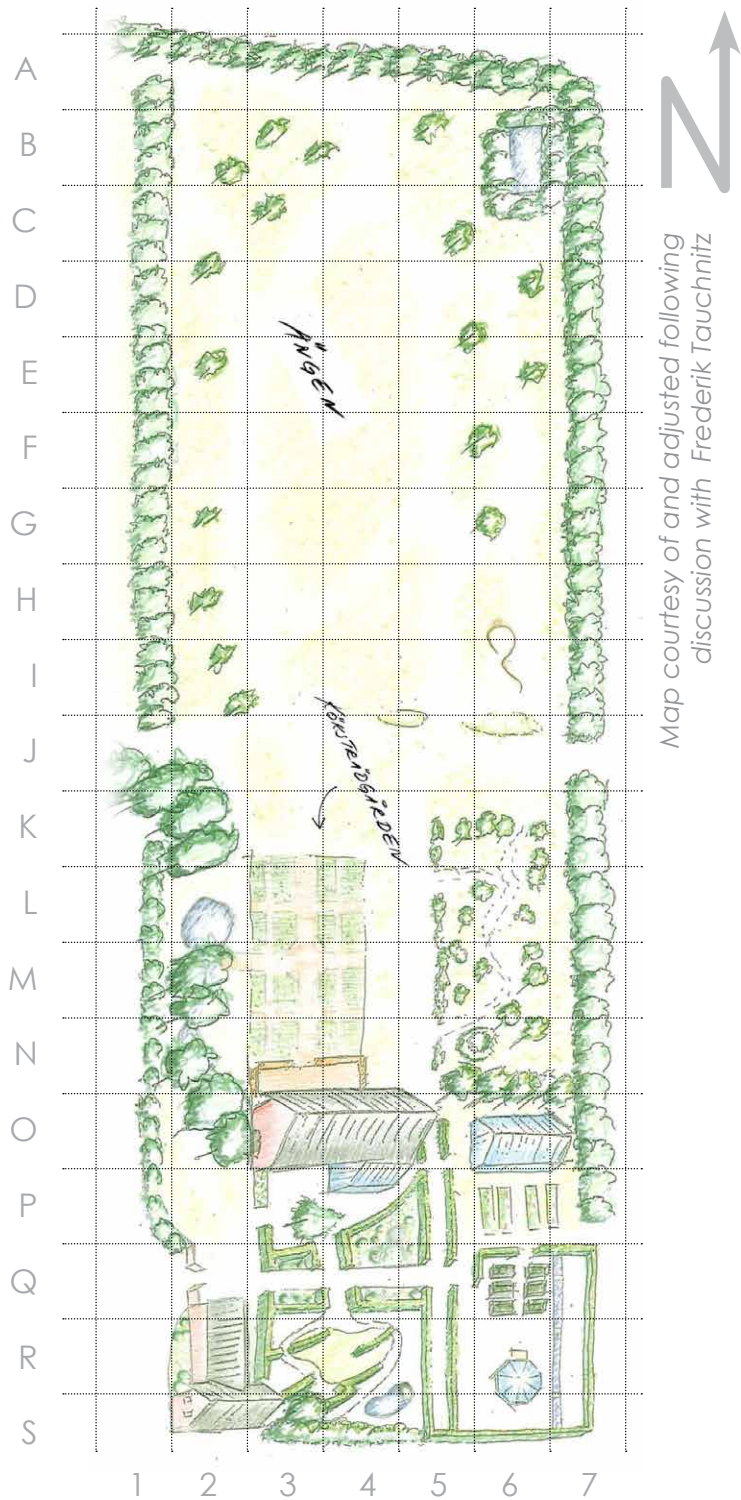
QUALITY:	GRID:	DESCRIPTION:
Being Away	Q2	Gated Entrance
Extent	WHOLE	/
Fascination	S4 & L2	Two separate ponds
Compatibility	WHOLE	Variety of choice

Psycho-Evolutionary / Stress Recovery Theory (Ulrich 1993)

QUALITY:	GRID:	DESCRIPTION:
Vegetation	P/Q 4/5	Perennial plant beds; wild cultivation / forest garden
Water	S4; L2; Q-S 7	Two ponds and the hardscaped channel
Flowers	Q3/4	Flower beds - varied
Savannah	E6	Meadow edge
Wildlife	WHOLE	(Rabbits & Chickens in past)
Low-Risk	P3	Welcoming Garden at Entry

Perceived Sensory Dimensions (Grahn & Stigsdotter 2010)

QUALITY:	GRID:	DESCRIPTION:
Nature	K-N 6	Forest garden
Rich Species	WHOLE	Entire site is very varied
Serene	R4 & S4	Earth mounds; Pond / Woodland
Space	F4	Meadow



The design of Alnarp Rehabilitation Garden was based on the theories of ART and Aesthetic-Affective Theory (Kaplans & Ulrich), as well as Horticultural Therapy (Grahn et al, 2010, p. 125). “The aim of the intervention was to enhance a salutogenic and curative process to reinforce each individual’s physical and mental capacity through connecting to their inner self with firm support from natural environments.” (Pálsdóttir et al, 2014, p. 7097).



Literature recommendations/qualities:

1: CHOICE / SOCIAL QUIETNESS

QUALITY:	GRID:	DESCRIPTION:
A. Space to be alone with nature	B4; M6; S5	Meadow with mown paths; small pond in 'corner'; seat in wilder allotment area
B. Variety of spaces	WHOLE N3/4; M4; R2	Deck; allotment / edible garden; paths near traditional swedish building

2: COLOUR

QUALITY:	GRID:	DESCRIPTION:
Softer colour palette (Cool colours)	R4	Perennial beds along hedged paths

3: COMPOSITION / LAYOUT

QUALITY:	GRID:	DESCRIPTION:
Legible layout	R4; P3/4	Paths inside hedges; main axis of hedge arches

4: FASCINATION / SENSORY STIMULATION

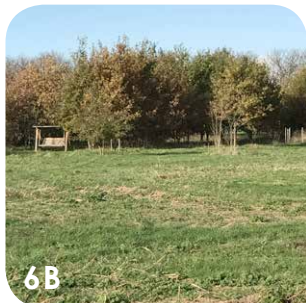
QUALITY:	GRID:	DESCRIPTION:
A. Multi-sensory distraction	I4	Seasonal colour in trees in the Meadow
B. Water Bodies	M2/L2	Larger vegetated pond and stream
C. Memory through senses	R3	Cultural Heritage - Birch tree and in connection with cultural building

5: PHYSICAL COMFORT

QUALITY:	GRID:	DESCRIPTION:
A. Shade / Sunny areas	N3	Sun umbrellas on Deck - also placed in other areas
B. Natural Materials	P6	Woven willow edge of planting bed and compost
C. Seasonal shelter	O6	The main Greenhouse
D. Signs of Care	P3	Seasonal craft and decorations at 'Entrance'

6: SEATING

QUALITY:	GRID:	DESCRIPTION:
A. Raised planters	(Q6)	Planters work, but are too hard to cope with for some
B. Seating options / variety	PF2; P5	Swing seat on edge of trees in Meadow; Swing seat in vegetated perennial corner



Literature recommendations/qualities:

7: SOUNDSCAPE

QUALITY:	GRID:	DESCRIPTION:
Nature Sounds	WHOLE L2	Vegetated stream bed supports fauna habitat

8: SPACE / WALKABILITY

QUALITY:	GRID:	DESCRIPTION:
A. Moving / Walking	R3; I3	Hedged paths; Meadow with mown paths
B. Wheelchair access	(R4)	Firm gravel path in hedged area
C. "Escape" routes	P/Q 4/5	Corner swing chair in corner has 2 routes in / out
D. Soft walking surface	P/Q 4/5	Paths into perennial beds are wood chips

9: SPATIALITY

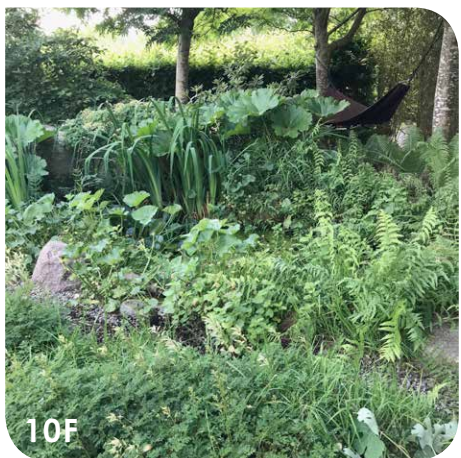
QUALITY:	GRID:	DESCRIPTION:
A. High levels of Refuge	S5	'Corner' hammock behind vegetated pond
B. Enclosure	Q3	Hedged 'rooms'
D. Domestic scale	S3	Traditional domestic scale buildings
E. Avoid perfect grooming	Q4/5; (R7)	Path edges and hedges are not straight or perfect; opposite in hardscape area

* C: 'Access to Daylight' is not shown in pictures as it is a condition of being outside in the entire space.

10: VEGETATION

QUALITY:	GRID:	DESCRIPTION:
A. Dominance of vegetation	WHOLE L2	View from larger pond to main house
B. Trees	R/S3	Larger trees near building
C. Biotopes for Birds / Insects	P/Q3	Perennial beds in hedged area have varied species
E. Connection of inside & outside	R6	Greenhouse & Biodome have view to outside and allow daylight in
F. Lush, diverse plantings	S5	Vegetated smaller pond area (hammock)

* D: 'Full life-cycle of plants mirrors life' is not shown in pictures as it is impossible to capture in single images.



Name: Healing Forest Garden Nacadia
Location: Inside Hørsholm Arboretum - North-East of Copenhagen, Denmark [KU - University of Copenhagen]
Size: c. 2 acres
Established: 2010
Designer: Ulrika Stigsdotter

Main underlying Theories within Literature:

Prospect & Refuge Theory (Appleton 1975)

QUALITY:	GRID:	DESCRIPTION:
Prospect	I 11	View from decked walkway
Refuge	B6/7	Small pond

Attention Restoration Theory (Kaplan & Kaplan 1989)

QUALITY:	GRID:	DESCRIPTION:
Being Away	G4 & B5	Firepit gathering area; Entry
Extent	WHOLE	/
Fascination	I 12/13	Two separate ponds
Compatibility	WHOLE	Variety of choice

Psycho-Evolutionary / Stress Recovery Theory (Ulrich 1993)

QUALITY:	GRID:	DESCRIPTION:
Vegetation	C7	Wooded area near small pond
Water	G6-8	Stream
Flowers	F8	Wildflower Meadow / Orchard and by stream
Savannah	E8	Forest Edge / Orchard
Wildlife	WHOLE	(Many wilder / natural areas)
Low-Risk	WHOLE	/

Perceived Sensory Dimensions (Grahn & Stigsdotter 2010)

QUALITY:	GRID:	DESCRIPTION:
Nature	WHOLE	Very minimal hardscape
Rich Species	WHOLE	Lush environment
Serene	D2	Wooded space chosen by participants for a hammock
Space	H7/8	Meadow



Map courtesy of Ulrik Sidenius - University of Copenhagen

Located in the North American & North European part of the Arboretum, which is well established with mature, tall trees (Corazon et al, 2010, p. 37), the Therapy consists of body awareness and nature-based psychotherapy, using different nature activities and experiences as therapeutic tools. ("Konceptmanual for Nacadias naturbaserede terapi", University of Copenhagen 2018 - Translated from Danish thanks to Anna Bärge).



Literature recommendations/qualities:

1: CHOICE / SOCIAL QUIETNESS

QUALITY:	GRID:	DESCRIPTION:
A. Space to be alone with nature	D6	Wooded area with seats dispersed spatically
B. Variety of spaces	E5; I6; D4	Wooded area with hut & platform; Greenhouse rooms; Meadow walk

2: COLOUR

QUALITY:	GRID:	DESCRIPTION:
Softer colour palette (Cool colours)	C8	Greens of trees dominate (meadow /site was not in flower - difficult to tell)

3: COMPOSITION / LAYOUT

QUALITY:	GRID:	DESCRIPTION:
Legible layout	D5	Wide paths are visible as connecting site spaces

4: FASCINATION / SENSORY STIMULATION

QUALITY:	GRID:	DESCRIPTION:
A. Multi-sensory distraction	I12/I3	Vegetated larger pond with walk into middle
B. Water Bodies	G7/8	Stream bed, runs naturally parrallel to Building
C. Memory through senses	I6	Natural crafts and objects used as decoration or triggers

5: PHYSICAL COMFORT

QUALITY:	GRID:	DESCRIPTION:
A. Shade / Sunny areas	I10	Sun lounges on deck facing southerly
B. Natural Materials	H5/6; Paths	Wooden planter beds combined as seating
C. Seasonal shelter	J5	The Greenhouse - includes heating due to its size
D. Signs of Care	G/H8	Mown paths through meadow

6: SEATING

QUALITY:	GRID:	DESCRIPTION:
A. Raised planters	I9/I0	Planter seats near house, same as by greenhouse
B. Seating options / variety	B6; J6	Hammock in greenhouse; private seat by small pond (choice - social interaction)



Literature recommendations/qualities:

7: SOUNDSCAPE

QUALITY:	GRID:	DESCRIPTION:
Nature Sounds	WHOLE H12	Vegetated larger pond supports fauna habitat

8: SPACE / WALKABILITY

QUALITY:	GRID:	DESCRIPTION:
A. Moving / Walking	G/H8	Meadow with mown paths; wooden supported paths
B. Wheelchair access	(I/J 6/7)	Boardwalk-type ramp connected to Decking
C. "Escape" routes	I6	Private corner in Greenhouse, 2 entry points
D. Soft walking surface	D7	Casual paths in woods are marked by wood chips

9: SPATIALITY

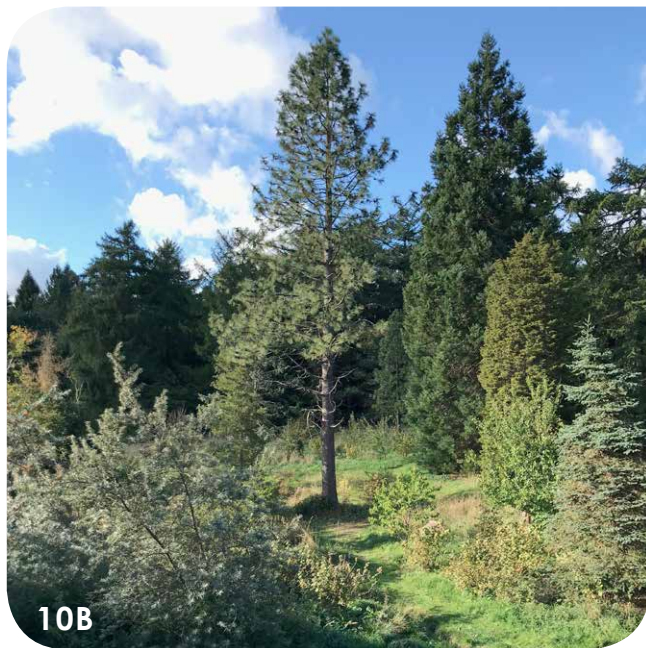
QUALITY:	GRID:	DESCRIPTION:
A. High levels of Refuge	I6; I12	Planted 'nooks' in greenhouse; Deck platform
B. Enclosure	B5	Entrance gate and walk
D. Domestic scale	B6/7	Small pond (to reflect sky and canopy)
E. Avoid perfect grooming	H6/7	Meadow and grass have mown paths instead of complete mowing

* C: 'Access to Daylight' is not shown in pictures as it is a condition of being outside in the entire space.

10: VEGETATION

QUALITY:	GRID:	DESCRIPTION:
A. Dominance of vegetation	WHOLE G6	View over area infront of house
B. Trees	H11	Large trees - Arboretum
C. Biotopes for Birds / Insects	E7	Bee-keeping and varied vegetation
E. Connection of inside & outside	J5	Greenhouse has views to outside and allows in daylight
F. Lush, diverse plantings	G5	Vegetation near Fire Pit

* D: 'Full life-cycle of plants mirrors life' is not shown in pictures as it is impossible to capture in single images.



Name: Granliden Rehabilitation Garden & Nature Area
Location: South-Western Sweden (near Höör)
Size: c. 2 acres
Established: 2009
Designer(s): Karin Lindén (Owner - adapted existing garden over time with input from various others)

Main underlying Theories within Literature:

Prospect & Refuge Theory (Appleton 1975)

QUALITY:	GRID:	DESCRIPTION:
Prospect	P8	View from deck over site
Refuge	P4	Greenhouse

Attention Restoration Theory (Kaplan & Kaplan 1989)

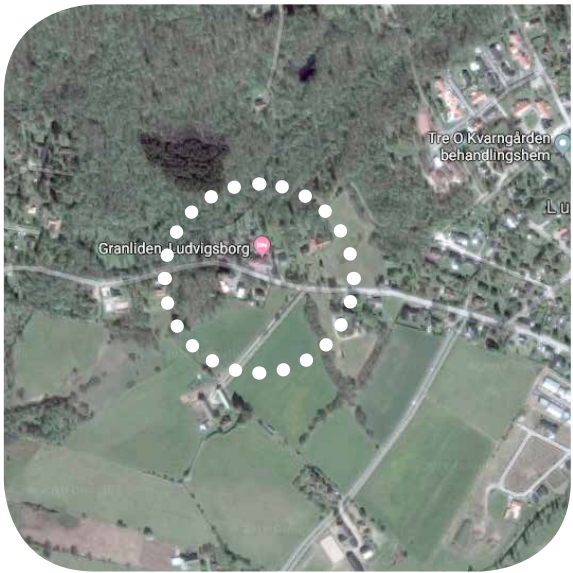
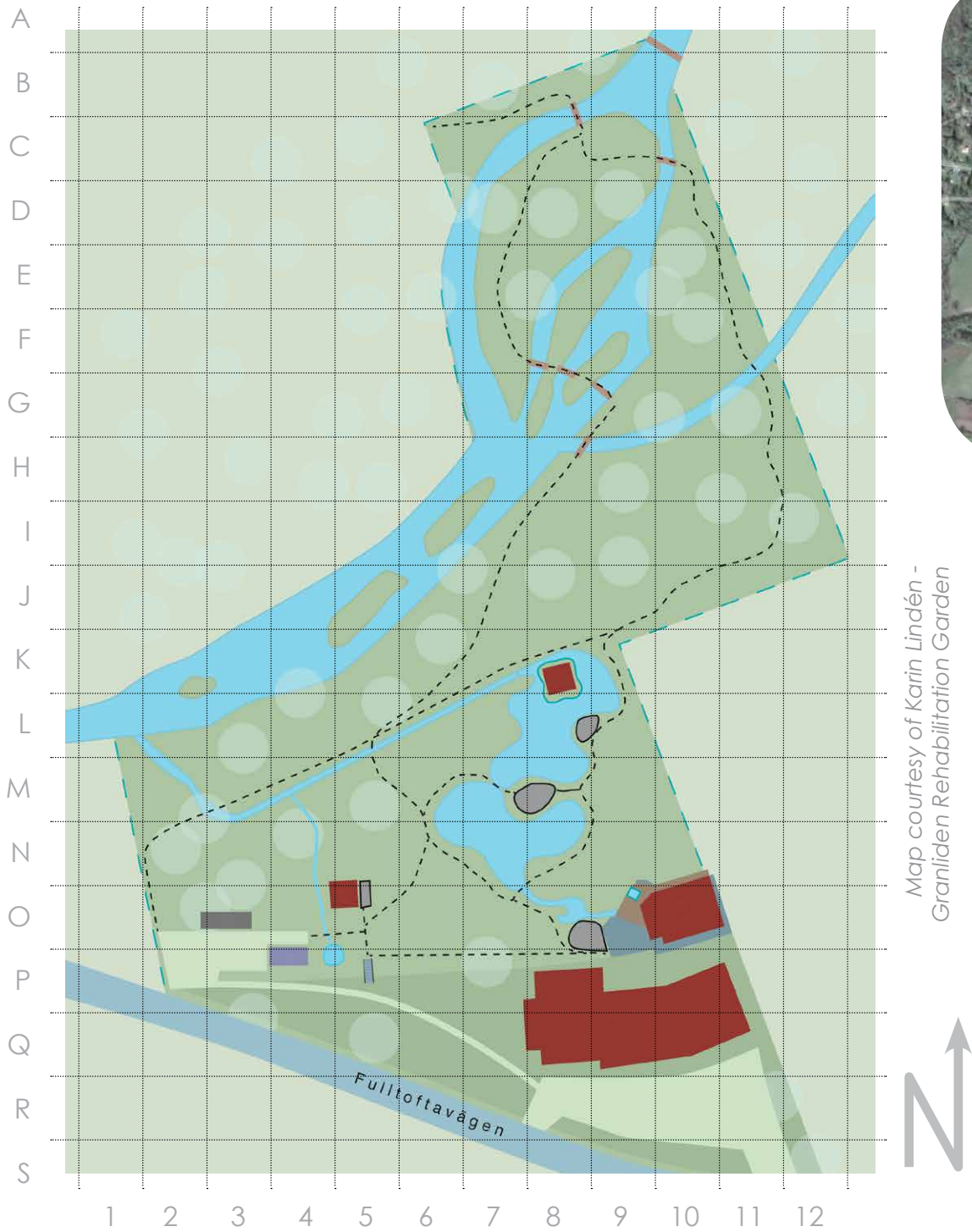
QUALITY:	GRID:	DESCRIPTION:
Being Away	D8	Wooded area to North
Extent	WHOLE	/
Fascination	F9	Wooded stream with mossy boulders
Compatibility	WHOLE	Variety of choice

Psycho-Evolutionary / Stress Recovery Theory (Ulrich 1993)

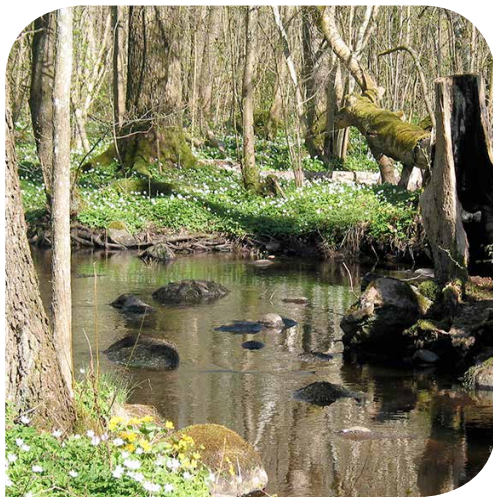
QUALITY:	GRID:	DESCRIPTION:
Vegetation	G9	By stream, many trees
Water	N7 & G8	Pond; Natural stream
Flowers	O9	In pots near buildings
Savannah	NONE	/
Wildlife	O7	Bird-feeders hung in trees
Low-Risk	O5	Hut with overview of garden

Perceived Sensory Dimensions (Grahn & Stigsdotter 2010)

QUALITY:	GRID:	DESCRIPTION:
Nature	C9	Woods with stream running through them
Rich Species	(P5/6)	(Difficult to judge in Winter)
Serene	C9	Fire pit to gether within Woods
Space	J8	Woods - lead out beyond property



Presented as “*Natural-assisted rehabilitation in collaboration with Region Skåne*” the garden and B&B are run by Karin Lindén, who has a Garden Therapy background and connection to SLU. The website explains the program as “...*provid(ing) opportunities for activities adapted to each participant’s own needs. One may need to relax more in nature while another is better off participating more actively in gardening.*”
(www.granlidenrehab.se)



3 images courtesy of www.granlidenrehab.se

Literature recommendations/qualities:

1: CHOICE / SOCIAL QUIETNESS

QUALITY:	GRID:	DESCRIPTION:
A. Space to be alone with nature	G9; G8	Along stream; Wooded area with stream continuing to run through it
B. Variety of spaces	K8; C9; O9	Larger pond and shelter; Fire Pit in wooded area; Deck terrace of activity building

2: COLOUR

QUALITY:	GRID:	DESCRIPTION:
Softer colour palette (Cool colours)	(Winter)	(Due to visit in winter, after snowfall this was impossible to tell)

3: COMPOSITION / LAYOUT

QUALITY:	GRID:	DESCRIPTION:
Legible layout	O5/6; P4	Path network near hut; paths around larger pond

4: FASCINATION / SENSORY STIMULATION

QUALITY:	GRID:	DESCRIPTION:
A. Multi-sensory distraction	F8	Wooded area with stream and moss covered rocks
B. Water Bodies	P4	Smaller pond near greenhouse
C. Memory through senses	O5	Traditional swedish hut and colours (as plants were difficult to identify)

5: PHYSICAL COMFORT

QUALITY:	GRID:	DESCRIPTION:
A. Shade / Sunny areas	M7/K8	Shelter - half open walls
B. Natural Materials	C9	Wooden logs at Fire Pit used as seats
C. Seasonal shelter	O10	Activity building used in winter
D. Signs of Care	F/G8	Bridges and cleared paths

6: SEATING

QUALITY:	GRID:	DESCRIPTION:
A. Raised planters	(O4)	Planters for vegetable growing, not for seating
B. Seating options / variety	N5; C9	Bench near hut; Fire Pit in wooded area



Literature recommendations/qualities:

7: SOUNDSCAPE

QUALITY:	GRID:	DESCRIPTION:
Nature Sounds	WHOLE G8	Stream within wooded area

8: SPACE / WALKABILITY

QUALITY:	GRID:	DESCRIPTION:
A. Moving / Walking	B4; I7	Wooded areas near and adjacent to property
B. Wheelchair access	(L5)	Paved paths
C. "Escape" routes	(N6)	Path network allows some choice
D. Soft walking surface	G9; C6	Wood chips and needle debris in wooded area

9: SPATIALITY

QUALITY:	GRID:	DESCRIPTION:
A. High levels of Refuge	P4	Hedge around smaller pond with seating (behind viewer)
B. Enclosure	P5	Site is much lower than road
D. Domestic scale	M7	Structures and features all have 'typical' garden feel
E. Avoid perfect grooming	I7	Fallen branches and chopped trees are not always removed

* C: 'Access to Daylight' is not shown in pictures as it is a condition of being outside in the entire space.

10: VEGETATION

QUALITY:	GRID:	DESCRIPTION:
A. Dominance of vegetation	P4/O5	View from smaller pond to larger pond
B. Trees	K9; D8	Large neighbouring trees
C. Biotopes for Birds / Insects	O7	Birds feeders actively support wildlife
E. Connection of inside & outside	P4; O9	Greenhouse and large window in activity building allow views out/daylight in
F. Lush, diverse plantings	N7-9	Large pond seems particularly vegetated / lush

* D: 'Full life-cycle of plants mirrors life' is not shown in pictures as it is impossible to capture in single images.



(VII B) The CASE STUDIES / PRACTICAL EXAMPLES:

MAGGIE'S CANCER CARE CENTRES

- Dundee Maggie's Centre (Scotland)
- Gartnavel Maggie's Centre (Scotland)
- Manchester Maggie's Centre (England)

Name: Dundee Maggie's Cancer Care Centre
Location: Dundee, Scotland [Ninewells Hospital]
Size: c. 3 acres (incl. Building)
Established: Labyrinth 2008 / Garden 2009
Designer(s): Arabella Lennox-Boyd Studio

Main underlying Theories within Literature:

Prospect & Refuge Theory (Appleton 1975)

QUALITY:	GRID:	DESCRIPTION:
Prospect	N7	View from Anthony Gormley sculpture "Another Time X"
Refuge	N3	Grassed area behind building

Attention Restoration Theory (Kaplan & Kaplan 1989)

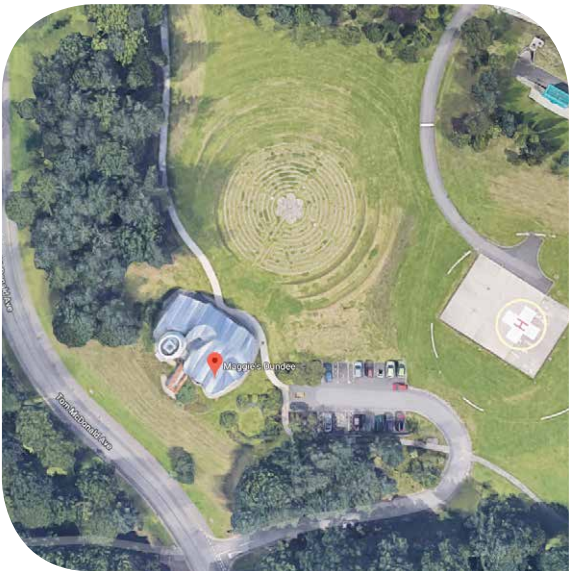
QUALITY:	GRID:	DESCRIPTION:
Being Away	N3	Deck above grassed area with view to forest
Extent	(L7)	(Overview of Site)
Fascination	O / P4	Perennial flower beds
Compatibility	/	(Limited variety)

Psycho-Evolutionary / Stress Recovery Theory (Ulrich 1993)

QUALITY:	GRID:	DESCRIPTION:
Vegetation	(O / P4)	(Limited variety)
Water	NONE	/
Flowers	(O / P4)	(Very Limited)
Savannah	(H7)	(Once trees established but at distance, near Hospital)
Wildlife	(O / P4)	(Possible insects - minimal)
Low-Risk	N3	Sheltered position

Perceived Sensory Dimensions (Grahn & Stigsdoffer 2010)

QUALITY:	GRID:	DESCRIPTION:
Nature	M/N 3	Grassed slope & forest
Rich Species	(O / P4)	(Minimal variety)
Serene	N3	Deck above grassed area with view to forest
Space	N7	View over labyrinth from Gormley sculpture



“Lennox-Boyd replaced Gehry’s imagined lake with a 33 metre cobblestone labyrinth surrounded by terraced grass banks that create a circular amphitheatre. A range of trees planted beyond the labyrinth is beginning to screen the hospital building from the centre.” (Butterfield, 2014, p. 164).



Literature recommendations/qualities:

1: CHOICE / SOCIAL QUIETNESS

QUALITY:	GRID:	DESCRIPTION:
A. Space to be alone with nature	(N3)	Deck / balcony that stretches over grasses and looks towards forest
B. Variety of spaces	M5/L6; N6	Labyrinth; Landform surrounding labyrinth that is sunken & suitable for sitting

2: COLOUR

QUALITY:	GRID:	DESCRIPTION:
Softer colour palette (Cool colours)	P4; O/N3	Greens, creams and some purple flowering perennials were visible in summer

3: COMPOSITION / LAYOUT

QUALITY:	GRID:	DESCRIPTION:
Legible layout	K/L6/7	Overview of the labyrinth and surrounding landform

4: FASCINATION / SENSORY STIMULATION

QUALITY:	GRID:	DESCRIPTION:
A. Multi-sensory distraction	M2/3	Most vegetated area is at rear of building - mainly grasses
B. Water Bodies	NONE	/
C. Memory through senses	NONE	(None identified)
D. Avoid sensory overload	(O/N3)	Almost mono-culture of grasses - could lead to some allergy reactions

5: PHYSICAL COMFORT

QUALITY:	GRID:	DESCRIPTION:
A. Shade / Sunny areas	N/O4	Seat in shade / under shelter
B. Natural Materials	L6	River rocks used as surface for labyrinth walk
C. Seasonal shelter	N3	Building roof juts out over balcony for some shelter
D. Signs of Care	O3/4	Mown lawn and clipped edges



Literature recommendations/qualities:

6: SEATING

QUALITY:	GRID:	DESCRIPTION:
A. Raised planters	NONE	/
B. Seating options / variety	J5; L4; N3	Single seat along path; Landform amphitheatre; Balcony seating

7: SOUNDSCAPE

QUALITY:	GRID:	DESCRIPTION:
Nature Sounds	NONE	(Not widely supported)

8: SPACE / WALKABILITY

QUALITY:	GRID:	DESCRIPTION:
A. Moving / Walking	(J-K5-8)	Labyrinth is intended for walking meditation
B. Wheelchair access	M5	Path towards Hospital

9: SPATIALITY

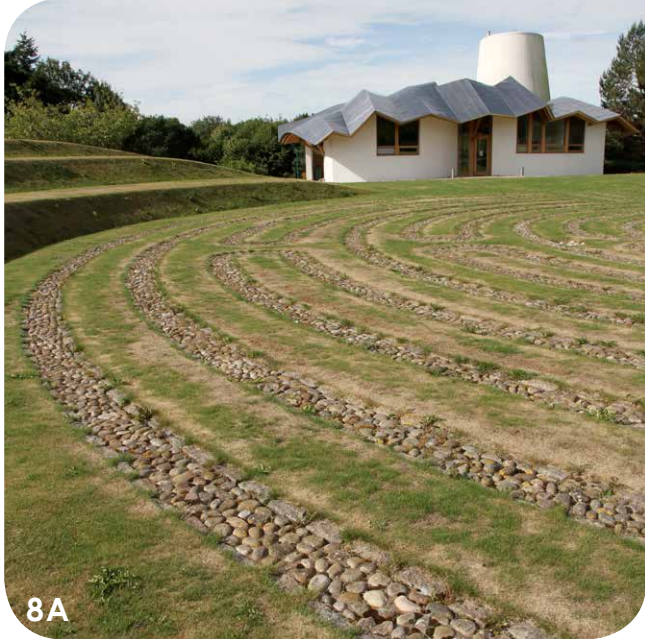
QUALITY:	GRID:	DESCRIPTION:
A. High levels of Refuge	N/O4; N3	Seat nestled into rear of building; Balcony
B. Enclosure	N/O4	Seat patio almost walled
D. Domestic scale	M/N 3/4	Building and statue are both very much human scale
E. Avoid perfect grooming	O/P5	Some vegetation between carpark and building is left more loose in form
F. Spaces social yet private	N3	Balcony at rear of building - turns back on Hospital and feels quite secluded

* C: 'Access to Daylight' is not shown in pictures as it is a condition of being outside in the entire space.

10: VEGETATION

QUALITY:	GRID:	DESCRIPTION:
A. Dominance of vegetation	J-K5-8	Dominance of lawn only
B. Trees	L2/3	Trees on edges - borrowed
C. Biotopes for Birds / Insects	NONE	(Minimal vegetation variety to support fauna)
E. Connection of inside & outside	N3	Balcony at rear of building links to inside and has windows along wall
F. Lush, diverse plantings	N3	Grasses at rear of building most lush vegetation

* D: 'Full life-cycle of plants mirrors life' is not shown in pictures as it is impossible to capture in single images.



Name: Gartnavel Maggie's Cancer Care Centre
Location: Glasgow, Scotland [Gartnavel General Hospital]
Size: c. 2 acres (incl. Building)
Established: 2010/11
Designer(s): Lily Jencks Studio

Main underlying Theories within Literature:

Prospect & Refuge Theory (Appleton 1975)

QUALITY:	GRID:	DESCRIPTION:
Prospect	F5	View down path into woods
Refuge	F7	Seating in courtyard

Attention Restoration Theory (Kaplan & Kaplan 1989)

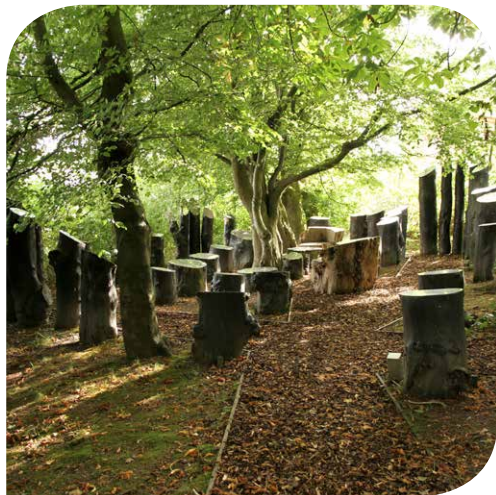
QUALITY:	GRID:	DESCRIPTION:
Being Away	C5	Lush path to North of building
Extent	/	/
Fascination	K1	Tree stump installation with mirrored tops to reflect sky
Compatibility	WHOLE	Variety of choice

Psycho-Evolutionary / Stress Recovery Theory (Ulrich 1993)

QUALITY:	GRID:	DESCRIPTION:
Vegetation	G6	Woods - reflected in mirrored wall inside - very green.
Water	NONE	(Possible ephemeral water in raingardens)
Flowers	F8	Courtyard - abundant
Savannah	NONE	/
Wildlife	(E8)	(Courtyard diversity of plants)
Low-Risk	E7	Bench in courtyard

Perceived Sensory Dimensions (Grahn & Stigsdotter 2010)

QUALITY:	GRID:	DESCRIPTION:
Nature	I5	Wooded area to South-West
Rich Species	F7	Courtyard - abundant
Serene	K2	Wooded walk to mirrored stump installation
Space	G4	Wooded area to South-West



Literature recommendations/qualities:

1: CHOICE / SOCIAL QUIETNESS

QUALITY:	GRID:	DESCRIPTION:
A. Space to be alone with nature	J2	Wooded areas at rear and sides of building
B. Variety of spaces	F6/7; E8; D5	Window seats; Vegetated courtyard; Private rooms in building; Wooded areas

2: COLOUR

QUALITY:	GRID:	DESCRIPTION:
Softer colour palette (Cool colours)	F7	Bright, warm colour plantings - reds and yellows to compliment orange seats

3: COMPOSITION / LAYOUT

QUALITY:	GRID:	DESCRIPTION:
Legible layout	F7/8; D11	Path network within courtyard

4: FASCINATION / SENSORY STIMULATION

QUALITY:	GRID:	DESCRIPTION:
A. Multi-sensory distraction	F7	Large variety of vegetation in courtyard
B. Water Bodies	NONE	/
C. Memory through senses	F7	Traditional plants such as Hosta within courtyard
D. Avoid sensory overload	E8	Plants such as ferns and hosta avoid over-stimulation

5: PHYSICAL COMFORT

QUALITY:	GRID:	DESCRIPTION:
A. Shade / Sunny areas	J2	Wooden stumps as seats positioned under trees
B. Natural Materials	J2/3	Wooden stumps for seating and wood chips for paths
C. Seasonal shelter	E/F9	Building has vast windows for shelter with views
D. Signs of Care	E10/11	Mowed lawns and edges, mulching of trees

6: SEATING

QUALITY:	GRID:	DESCRIPTION:
A. Raised planters	E8	Planters in courtyard, not for seating
B. Seating options / variety	E8; J2	Bright seating in courtyard; Informal seating of tree stumps in wooded area



Literature recommendations/qualities:

7: SOUNDSCAPE

QUALITY:	GRID:	DESCRIPTION:
Nature Sounds	WHOLE G4	Wooded area

8: SPACE / WALKABILITY

QUALITY:	GRID:	DESCRIPTION:
A. Moving / Walking	I3; H5/6	Wooded areas surrounding and leading to building
B. Wheelchair access	F7	Paved paths only in courtyard and to entrance

9: SPATIALITY

QUALITY:	GRID:	DESCRIPTION:
A. High levels of Refuge	F6; E8	Window seats by mirror wall; Courtyard seating
B. Enclosure	F6; E8	As above
D. Domestic scale	F9 WHOLE	Building and structures all very 'homely' scale
E. Avoid perfect grooming	C8/9	Some sections of grass allowed to become more meadow-like
F. Spaces social yet private	G6/7	Seating at ends of indoor mirror wall, that reflects nature whilst secluded

* C: 'Access to Daylight' is not shown in pictures as it is a condition of being outside in the entire space.

10: VEGETATION

QUALITY:	GRID:	DESCRIPTION:
A. Dominance of vegetation	C/D 10/11	Entry to centre shows the enveloping of vegetation
B. Trees	G5/6; E10/11	Birches near entrance; larger trees in wooded area
C. Biotopes for Birds / Insects	F4/5	Wooded area to rear of building is more 'natural'
E. Connection of inside & outside	F/G6; H8	Reflection of outdoors through mirror wall; vast windows allow views out
F. Lush, diverse plantings	F7	Courtyard is particularly densely vegetated & lush

* D: 'Full life-cycle of plants mirrors life' is not shown in pictures as it is impossible to capture in single images.



Name: Manchester Maggie's Cancer Care Centre
Location: Manchester, England [Robert Parfett Building / The Christie Hospital]
Size: c. 2000m² (incl. Building)
Established: 2016
Designer(s): Dan Pearson Studio

Main underlying Theories within Literature:

Prospect & Refuge Theory (Appleton 1975)

QUALITY:	GRID:	DESCRIPTION:
Prospect	N6	Entry view along deck towards North
Refuge	J3	Courtyard - West side of building

Attention Restoration Theory (Kaplan & Kaplan 1989)

QUALITY:	GRID:	DESCRIPTION:
Being Away	O7 & G5	Entrance; Deck surrounding greenhouse
Extent	WHOLE	/
Fascination	E6	Flower beds - high diversity
Compatibility	WHOLE	Variety of choice

Psycho-Evolutionary / Stress Recovery Theory (Ulrich 1993)

QUALITY:	GRID:	DESCRIPTION:
Vegetation	E3	Raised planter beds
Water	(M3)	(Stone with indentation - tiny)
Flowers	E5	Planted beds along Eastern side of building
Savannah	NONE	/
Wildlife	H3	Birdfeeder (diverse plants)
Low-Risk	WHOLE	Easy access on deck around entire building

Perceived Sensory Dimensions (Grahn & Stigsdotter 2010)

QUALITY:	GRID:	DESCRIPTION:
Nature	J2 & D7	Dense vegetation to West
Rich Species	H7	Whole - particularly North-East
Serene	N3	Courtyards offer seclusion / privacy
Space	H5	Out from deck near greenhouse



Source: Jencks (2015, p. 213)



googlemaps



“Throughout the centre, there is a focus on natural light, greenery and garden views...Each treatment and counselling room on the eastern façade faces its own private garden...The greenhouse provides a garden retreat, a space for people to gather, to work with their hands and enjoy the therapeutic qualities of nature and the outdoors. It will be a space to grow flowers and other produce that can be used at the centre giving the patients a sense of purpose at a time when they may feel at their most vulnerable.” (www.fosterandpartners.com/projects/maggie-s-manchester)



Literature recommendations/qualities:

1: CHOICE / SOCIAL QUIETNESS

QUALITY:	GRID:	DESCRIPTION:
A. Space to be alone with nature	R4/5	Courtyard space at rear of building
B. Variety of spaces	N3; C3; G4	Side courtyard; perennial & productive plantings to North; Greenhouse

2: COLOUR

QUALITY:	GRID:	DESCRIPTION:
Softer colour palette (Cool colours)	M-G6	Mainly greens but also some warmer flower colours such as pinks / purples were seen

3: COMPOSITION / LAYOUT

QUALITY:	GRID:	DESCRIPTION:
Legible layout	E6; C-F2	Perennial path network; Paths along side of house

4: FASCINATION / SENSORY STIMULATION

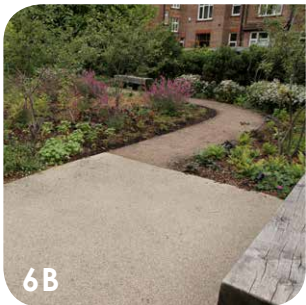
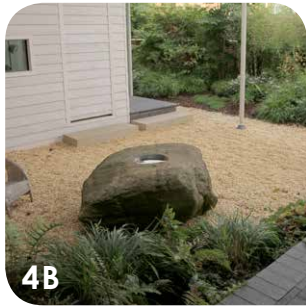
QUALITY:	GRID:	DESCRIPTION:
A. Multi-sensory distraction	E/F4/5	Rich perennial plantings surrounding attached greenhouse
B. Water Bodies	(J3)	(Stone with indentation - tiny)
C. Memory through senses	D/E4/5	Various & edible plants in the productive garden and perennial beds
D. Avoid sensory overload	O/P2	Bamboo Garden / Courtyard

5: PHYSICAL COMFORT

QUALITY:	GRID:	DESCRIPTION:
A. Shade / Sunny areas	I-M6; H5	Roofing overhang on building and by greenhouse
B. Natural Materials	I/J6; F/G4	Visible wooden building structures; Wooden stools
C. Seasonal shelter	F/G4	The Greenhouse - connected to building
D. Signs of Care	D3/4	Arbours and plant protection

6: SEATING

QUALITY:	GRID:	DESCRIPTION:
A. Raised planters	H2/3	Vegetable planters offer some walking support
B. Seating options / variety	D5/E6; F/G5	Bench in perennial area; benches and table near greenhouse - raised for view



Literature recommendations/qualities:

7: SOUNDSCAPE

QUALITY:	GRID:	DESCRIPTION:
Nature Sounds	WHOLE	Rich, varied vegetation

8: SPACE / WALKABILITY

QUALITY:	GRID:	DESCRIPTION:
A. Moving / Walking	I-M6; R-M2	Paved patio along building; gravel courtyard path
B. Wheelchair access	H3	Paved paths with ramp

9: SPATIALITY

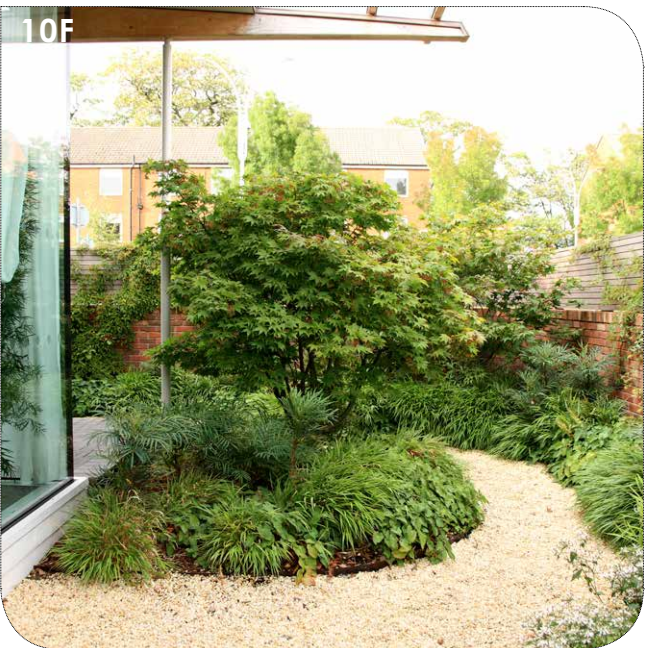
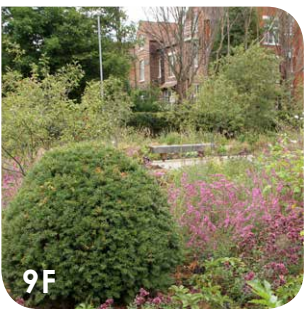
QUALITY:	GRID:	DESCRIPTION:
A. High levels of Refuge	L2	Private courtyards alongside building
B. Enclosure	O7	Entrance gate and fence
D. Domestic scale	D5; F4	Perennial beds and plantings feel very 'homely'
E. Avoid perfect grooming	D3; I5	Productive garden plants reach beyond their beds; Casual potted plants
F. Spaces social yet private	E6	Seating is spread out in perennial area to allow for privacy / space

* C: 'Access to Daylight' is not shown in pictures as it is a condition of being outside in the entire space.

10: VEGETATION

QUALITY:	GRID:	DESCRIPTION:
A. Dominance of vegetation	D/E5	Varied plantings surround the entire building
B. Trees	K7; E-B1	Quite large neighbouring Trees; some young trees
C. Biotopes for Birds / Insects	G3	Birds feeders actively support wildlife
E. Connection of inside & outside	M3/4	Greenhouse windows and skylights allow views out/ daylight in
F. Lush, diverse plantings	Q/R5	Lush grasses and small tress cover walls visually

* D: 'Full life-cycle of plants mirrors life' is not shown in pictures as it is impossible to capture in single images.



(VIII) CASE STUDY SUMMARY:

The images for the case studies were chosen on a context by context basis, working through the list of categories and qualities for each specific site. The resulting images shown above were afterwards compared per quality, to analyse if there were similarities in image choice, site and/or expression of the space itself. The following notes are a brief reflection from this image comparison:

1A – Space to be alone with nature:
The stress sites all featured a greater abundance of literal space than the cancer sites, but this demonstrates that physical space is not necessary to achieve this quality, it can be achieved within compact courtyards as much as in larger meadows or woods.

1B – Variety of spaces:
There was great variety amongst all the sites, ranging from enclosed nooks to meadow vistas, formal decks to forest edges.

2 – Softer colour palette (cool colours):
There was clear distinction between the two types of sites, with stress sites having a cooler palette in comparison to the bright reds and yellows in a number of the cancer sites – the effect and emphasis of colour clearly differs for each condition.

3 – Legible layout:
In each example my interpretation was drawn to the image of seeing where paths lead – this could be personal bias, but it led to an understanding of the site in each case.

4A – Multi-sensory distraction:
There seemed to be much more scope for multi-sensory stimulation amongst vegetated water bodies, which were only available in the stress sites. In the cancer sites the focus is thus more on vegetative variety, which was available to a lesser degree in some sites.

4B – Water bodies:
These seemed to be a fundamental feature within the stress sites, but none were found (except a small bird bath at Maggie's Manchester) at the cancer sites, possibly due to the risks of water-borne infections or such.

4C – Memory through senses:
This quality should really relate to the specific user group, but in the case of the stress sites this was

interpreted as more culturally connected, such as birch trees and Swedish style houses. In the cancer sites it was more closely linked to plants such as Hosta, which have a long tradition in English Gardens.

4D – CANCER sp. - Avoid sensory overload:

The grasses at Maggie's Dundee could be positive in terms of a monoculture, but may also lead to allergies. Otherwise monocultures of bamboo or non-fragrant plants were found for this quality.

5A – Shade / Sunny areas:
Both types of sites had a variety of temporary and permanent shelter from sun and rain, including places to sit under cover of roof overhangs and the like.

5B – Natural Materials:
In all of the sites there was a large use of timber in both buildings and other structures, with logs and stumps being used for casual seating in various sites for both conditions. Rocks and stone were also seen in both types of sites, but to a lesser degree.

5C – Seasonal shelter:
The stress sites all featured a greenhouse of larger or smaller scale, whilst for the cancer sites the flagship buildings themselves were places to view the outdoors during inclement weather or weaker health condition.

5D – Signs of Care:
Maintenance of lawns and meadows was common in both types of site, with the cancer sites being slightly more formally kept than the forest-linked stress sites.

6A – Raised planters:
Planters as seats did not feature often throughout any of the case studies, in fact only Nacadia used planters in conjunction with seating, whilst 2/3 of the cancer sites featured planters as possible walking support.

6B – Seating options / variety:
There was quite a lot of variety of types of seating in both types of sites, though higher numbers of seats were possible throughout the stress sites and most notably lacking at Maggie's Dundee.

7 – Nature sounds:
All of the stress sites supported fauna through abundant and varied vegetation and specific feeding

(VIII) CASE STUDY SUMMARY

continued:

opportunities, with Maggie's Manchester providing similar, but Maggie's Dundee struggling to show evidence of varied fauna encouragement.

8A – Moving / walking:

Provision of distance to walk, especially away from buildings, was most common at the stress sites, with each of them offering some wooded areas to explore. The cancer sites showed greater variety in surfaces on which to walk, being situated in much more compact spaces.

8B – Wheelchair access:

The cancer sites were more prepared for wheelchair access than the stress sites, which is perhaps not surprising, but in all cases this type of access could be improved to some extent. (It is recognised, however, that at this stage of development these needs were seen as less relevant or urgent.)

8C – STRESS sp. - "Escape routes":

Such dual routes to spaces, especially private nooks, were clearly evident in all of the stress sites.

8D – STRESS sp. - Soft walking surface:

Conversely connected to wheelchair access, soft walking surfaces of wood chips and needle debris was very clearly supported at each of the stress sites.

9A – Higher levels of Refuge:

Hedges, walls and other vegetation have been used to create nooks and snug corners within the stress sites with similar effect achieved at the cancer sites through more built structures such as walls and courtyards.

9B – Enclosure:

All of the stress sites were either physically enclosed with fences or set well below the street to shelter the site, whilst Maggie's Manchester was also fenced and Gartnavel features the enclosed courtyard.

9D – Domestic scale:

The homely feel of the domestic scale was evident at all sites with buildings of 'normal' residential size and larger sites being divided into human scale sections.

9E – Avoid perfect grooming:

Although the cancer sites were more 'manicured' overall, none of the sites were overly formal and rather used a more casual and loose maintenance of vegetation, such as meadows instead of lawns.

9F – CANCER sp. - Spaces social yet private:

All of the cancer sites offered small seating opportunities for two people in protected areas, with the best examples and number witnessed at Maggie's Gartnavel.

10A – Dominance of vegetation:

The stress sites all featured abundant vegetation, evident even in winter for Granliden, with the cancer sites similar for two, however, whilst Maggie's Dundee could be said to be green it is not truly vegetated in the same manner.

10B – Trees:

Trees featured quite heavily in all of the stress sites, with similar effect in the cancer sites, but through borrowed trees from the surroundings as much as within their own grounds.

10C – Biotopes for birds / insects:

The variety of vegetation in all of the stress and 2/3 cancer sites supports fauna, with some specific elements such as birdhouses and feeders also seen to be in place.

10E – Connection of inside & outside:

Within the stress sites this connection was predominantly in the form of greenhouses with some large windows in connected buildings. The connection at the cancer sites was clearly a priority and works particularly well from the inside of their flagship buildings, with many large windows and sliding doors throughout.

10F – Lush, diverse plantings:

This type of vegetation was evident at all sites except Maggie's Dundee.

Within the qualities interpreted in the case studies, there was often consensus or similarity in how this could be expressed, such as smaller nooks surrounded by vegetation providing refuge. There was also some variety of expression found, particularly when it came to opportunities to walk, where the space available clearly differed. This has demonstrated that the qualities are easily interpreted and identified within a range of settings, also allowing for diversity in their physical creation. Having various examples to illustrate the qualities makes them clear and easier to communicate to others, without becoming prescriptive.

(IX) DISCUSSION OF FINDINGS:

IX.1 MATRIX RESULTS:

The creation of the 10 categories of recommendations is in this format a set of equally weighted findings guided by the literature. The interpretation and discussion of the qualities was deemed in this context to be more important than evaluating or scaling them. At a minor level, being the sole interpreter of the literature, they will be influenced by personal interest and bias. Having reflected on the results and process, a more statistical review of these categories and the thresholds that fed them can be given. The categories that stand out as being the most represented and discussed within the literature therefore are:

1: Choice / Social Quietness – 2 qualities (Mentions in Lit. = **29; 36**)

4: Fascination / Sensory Stimulation – 3 qualities + 1 Cancer sp. quality (Mentions in Lit. = **29; 19; 8 + 8**)

7: Soundscape – 1 quality (Mentions in Lit. = **34**)

8: Space / Walkability – 2 qualities + 2 Stress sp. qualities (Mentions in Lit. = **22; 12 + 8; 6**)

9: Spatiality – 5 qualities + 1 Cancer sp. quality (Mentions in Lit. = **22; 19; 7; 14; 6 + 8**)

10: Vegetation – 6 qualities (Mentions in Lit. = **6; 6; 9; 26; 10; 33**)

The qualities within the categories that stand out due to their notably high level of discussion within a broad range of literature are thus, in ranked order:

- Choice / Social Quietness *1B: Choice of variety of spaces to suit mood / capacity* (**36**)
- Soundscape *7: Nature Sounds (such as birdsong and water) are more restorative* (**34**)
- Vegetation *10F: Lush, diverse, eye-catching plantings* (**33**)
- Choice / Social Quietness *1A: Space to be alone with nature* (**29**)
- Fascination / Sensory Stimulation *4A: Multi-sensory distraction through Nature* (**29**)
- Vegetation *10D: Full life-cycle of plants mirroring Life* (**26**)
- Space / Walkability *8A: Possibility to move, predominantly Walk* (**22**)
- Spatiality *9A: Higher levels of Refuge are desired when ill/ depleted* (**22**)

This would indicate that the most ideally recommended setting for restoration is one that *provides choice of spaces to occupy, within a lush and diverse natural landscape that encourages birdsong*. Further refinement of the method could prompt the revisiting of the resulting categories and recommendations as part of a panel and possible adjustment of the matrix parameters. As a foundational approach the matrix results demonstrate potential to provide quite solid guidelines for design.

IX.2 COLLATION & SYNTHESIS:

Having gained a strong overview and background in the research into restorative green spaces, there are two aspects of the results that stood out. The first was the intuitive process through which the categories of advice / recommendations resulted from the reading collation. The resulting categories were guided by the recommendations themselves, rather than having any strict pre-existing expectation of what these categories could be. The second, and perhaps most dominant result, was the sheer amount of recommendations that resulted from the literature read. The initial aim had been to produce results that would be much more compact and concise, but in fact considerably more examples of specific and practical advice were available than initially thought. This outcome may be related to this area of research still being somewhat new and presently focussed in the northern hemisphere. Thus there has perhaps not been enough research to agree upon new theories or specific recommendations, nor have these had a chance to be properly tested. Thereby, authors propose a diversity of new and slightly unique qualities that at this stage in time, show a lesser level of common agreement and greater variety. Aside from the consistent principle of there being no one-size-fits-all solution, it is evident that this topic is worthy of writing books about, as per examples such as Cooper Marcus and her various colleagues. There are numerous considerations to take into account for designers, and these should in fact be most of all site and user specific (as will be discussed briefly below). Therefore, the information within the literature that has been identified, collated and synthesised was wider reaching than had been originally anticipated.

(IX) DISCUSSION OF FINDINGS continued:

IX.3 RESULTING CATEGORIES:

Having allowed the literature to guide the potential design conclusions, the set of 10 categories and the qualities within them are a more tangible and practical set than those found presented in any single article or book. With texts being specific to particular experiments / studies or settings such as healthcare, the resulting categories and qualities are more broadly based and applicable to both stress related and cancer, if not additional, conditions. During the process of identifying and categorising the information, terms that had previously been found 'vague or intangible' became much more familiar and this may, to a slight extent, have affected the objectivity of the search. This has caused some of the resulting categories to remain or become less specific and practical than initially intended. For example, whilst the category of Colour and its aim to provide a 'softer' palette is specific and objective, qualities such as 'triggering memory through plant choice' or 'seeing the full life cycle through plants' remain a little more visceral or interpretative. In saying that, this is perhaps exactly the kind of potential that such recommendations require, with options to be interpreted in a diverse, creative and context related manner.

IX.4 CASE STUDIES:

The documentation of case study site visits was successful in providing as objective a collection of imagery as possible, which was then revisited through the lens of the 10 categories and their qualities. Aside from the three Maggie's Centres not providing water bodies, an example of each of the qualities was identifiable in almost all of the sites (Maggie's Dundee being the exception). This demonstrates that the categories and their qualities are relatively easy to 'recognise', though certainly with varying levels of ambiguity and perhaps success. For the context of this Thesis, the site visits and proceeding interpretation of qualities was not performed as a quality assessment of the sites in any way. It would, however, be interesting to trial these categories and qualities as a POE Tool in future.

In the Introduction I noted the possible impact of the stress related gardens having been based more firmly on academic research than the cancer

care designs. This distinction is certainly evident in the results of qualities identified in the case study sites. The stress rehabilitation gardens featured the qualities more strongly overall, which is likely, however, due to the distinctly higher number of research articles and studies connected to these sites than were found in connection to cancer care. This means the advice already stems from findings regarding these recommended qualities, whilst few cancer care sites have been investigated or analysed in a similar fashion, which obviously impacts the findings. The main aim in this instance was to explore whether the qualities and recommendations from the literature could be easily identified with a 'designer's eye' on the whole, so as to inform future design in general and this has clearly been achieved.

IX.5 QUALITIES:

Within the final 10 categories, there are certainly qualities that could be shifted or have a certain level of overlap, which allows for a level of flexibility for future uses. The subject of Colour seems to be more connected to research regarding stress rehabilitation, as although a cooler palette was also seen as beneficial for calm spaces in cancer care, these studies were more focussed on providing vibrant colour for distraction. In this instance it would perhaps be useful in future to make colour a quality within the 'Fascination / Sensory Stimulation' category. For the present, it has remained separate due to the repeated discussion of the quality, particularly from authors connected to the Alnarp Rehabilitation Garden.

In none of the case studies was it possible to gain a complete overview of the site. In the three stress rehabilitation gardens and Maggie's Dundee, it was possible to view some, most or quite vast areas of the site, but never the whole. Whether this is what is explicitly meant by authors remains uncertain, but it raises questions of how way-finding, landmarks and 'legibility' of a site function. This is an area of research that could be seen as a distinct field of its own, so in this instance it provides more of a philosophical query. [From the experience of the research undertaken for this task, this emphasis on 'way-finding' is also more prevalent in Dementia.] In the case of stress and cancer, legibility can

(IX) DISCUSSION OF FINDINGS continued:

perhaps be more closely connected to concepts of privacy and being able to easily choose routes and spaces for social engagement with others or not, in any given situation.

The ‘signs of care’ quality was grouped within ‘physical comfort’ due to maintenance often enabling views, or clearing paths within the physical environment, that thereby provide literal or perceived physical comfort in that it is, for example, easier to move around. Additionally, it provides the emotional comfort that enables the user to relax and feel more comfort or calm. An aspect of the ‘seating’ category that should be noted is how significantly the user group and context in particular affect these qualities. The physical impacts on strength and endurance from medications, treatments and even surgery or age must be seriously considered when dealing with furniture within a restorative green space site. In this case, the quality provided by raised planters as secondary seating could perhaps in future be one alternative option for seating, instead of a separate quality. At present, the specific reference to planters in the literature was the reason for maintaining two separate qualities.

There are a number of qualities resulting from the literature that require detailed and thorough plant knowledge:

4A = *Multi-sensory distraction in Nature;*

4B = *Plants to compliment water bodies;*

4D = *Cancer specific avoidance of sensory overload; 7 = Plants that enhance fauna and other soundscapes; 10C = Biotopes / Plants that attract and support birds and insects.*

This knowledge may be sought on a consultant level and is as important as medical consultation for knowledge on specifics of possible user health conditions. This would also be useful for the consideration of plants and other features that can trigger memory (4C), which requires thorough knowledge of the user groups from treatment experts. Due to the vitally important role plants play in these qualities, it is imperative that such knowledge is applied, as this will greatly affect the success or potential of the design, as opposed to the quality of colour, for example, which is a more aesthetic based choice.

The provision of being able to move / walk (8A)

in the restorative space is the only quality directly linked to the size of the site. In this case, especially in relation to stress rehabilitation, the ‘bigger the better’ is the rule for the overall site. Whilst size does not affect the remaining qualities in the same way, having scope to walk and thereby also be alone with nature (1A) allows for both emotional and physical benefits. An example where this is perhaps particularly evident is in the distinct spaces offered at Maggie’s Gartnavel, with its smaller courtyard and larger wooded areas. The courtyard allows for the more social and enclosed qualities, whilst the wooded, larger area provides more opportunities for physical exercise, privacy and contemplation. Although the Labyrinth of Maggie’s Dundee may be an interesting walking alternative within smaller spaces, the open and exposed nature of such a feature should be considered, which may well be a factor in the Labyrinth not being used often by patients there. This challenge of physical space may provide opportunities to creatively provide longer stretches of paths, be it in greater proximity to other users while being visually separated or other alternatives. Clearly, this does not address the need for physical space to roam and be alone that is so well catered for at all of the stress rehabilitation gardens, but at Maggie’s Manchester it offers options for longer walking stretches. The Maggie’s Centres are in this way at a naturally unfair disadvantage, as their sites are often significantly smaller and located near hospitals.

Perhaps unsurprisingly across the case study sites, was the general lack of or limited access given to wheelchair users. This could be addressed as part of a ‘universal design’ process, although one must recognise the challenge of qualities such as the softening of ground surface to slow walking pace being lost. This may overall be an aspect of the evolution of the sites, being dynamic in nature and thereby allowing design adjustments as such needs evolve. For example, in the case of Alnarp Rehabilitation Garden, where other health conditions are being trialled for nature-based treatments, this may become more relevant in future.

The qualities of provision of ‘refuge’ and ‘enclosure’ have been used separately in this instance as it was felt they can be quite distinct

(IX) DISCUSSION OF FINDINGS continued:

qualities, however, in some aspects they could be combined in future. Refuge is, in my interpretation, more perceptual and atmospheric, whereas enclosure is something quite literal and physical, such as gates, fences etc. Thereby, it could be suggested that enclosure would almost always provide a sense of refuge, whilst the opposite is not necessarily as true. In the case studies, the predominant function of enclosure was to provide privacy from public access, which is in itself a distinct interpretation of enclosure and thereby safety.

What also became evident in comparing the stress to cancer sites is the slight but important difference in emphasis on the connection of inside and outside spaces. The stress rehabilitation sites all had a predominant emphasis on spending time in the outdoors, often regardless of weather and with a clear priority over the buildings on site. [It should be noted that this may also be connected to Scandinavian cultural values.] At present, the Maggie's Centres remain heavily dominated by the buildings that are their flagship, even if some shift in design process seems to be occurring. This means that whilst the buildings allow for, sometimes vast, views of the outdoors, not all of the spaces encouraged or supported time spent outside. Thereby, the interpretation of this in / out connection has slightly different connotations. The site where this connection was perhaps most striking and successful, was at Maggie's Gartnavel, where views to nature were not only visually spectacular at times (huge mirrored walls reflecting outside greenery), but also provided a balance between viewing and actually being outside.

The qualities that resulted from the literature and the examples seen at the case study sites seem to all have a vital motivating principle that returns to the Kaplans' *being away*. I would argue that almost all of the qualities described above have this as an underlying value, particularly for the ever-growing urban population, aiming to provide a welcome contrast to environments that induce stress, anxiety or fear. It is their inherently contrasting nature that allows restorative green spaces to become calming, salutogenic and restorative.

IX.6 MATRIX THRESHOLD:

The final point of reflection relates to a recommendation that was not included in the final categories, due to being under the threshold within the matrix. The recommendation to avoid ambiguous or abstract designs in restorative spaces was experienced to have been much more relevant and widely discussed than the matrix result showed. This was perhaps due to a more emotional and subjective interpretation of this quality connected to experiences at a Maggie's Centre not included in this task, and to some extent at Maggie's Dundee. A design becoming too metaphorical and ambiguous results in what Butterfield (2014) describes as the "*undermining of ownership*" (p. 280) and the relationship people have with less ambiguous garden spaces was certainly shown to be much stronger and deeper. As Roger Ulrich himself told me, if you are sick, tired and/or depressed, your perceptions are likely to be negatively influenced and thus contemplating the deeper meaning of an abstract artwork or landform is also likely to be negatively biased. He also wrote of this in his work: "*...restorative influences of exposure to nature involve, among other responses, a broad shift in feelings towards a more positively-toned emotional state...*" (Ulrich et al, 1991, p. 224).

On reflection this result demonstrated that within healthcare facilities and cancer care this issue is more pertinent, whilst in the sites for stress rehabilitation it was not as relevant, particularly as sculptures and artworks were overall much less present, if not entirely omitted there. Therefore, it is quite possible that many authors researching stress would actually agree with a recommendation to avoid ambiguous or abstract forms, but it has not yet been relevant in their given contexts. This was really interesting, due to the initial result seeming to show discrepancy or even disagreement of a recommendation, when in fact it is almost circumstantial or contextual that this recommendation was not so commonly discussed. This kind of difference in focus and context should be considered whenever performing a literature review, as it perhaps shows that no study of this type can be entirely objective or comparative within the diversity of research that exists.

(X) REFLECTIONS ON METHOD:

This process began with a broad view of the topic, explored a range of perspectives and resulted in an interpretative meta-analysis that consciously aimed to target both a ‘non-academic’ and more scientific audience. It is recognised that this approach was one of breadth over depth, yet this was a choice made due to seeing more value in visiting a larger number of sites and reading more references, than in investigating a single site or topic in greater depth. The complexity required of the alternative was not deemed realistic at the beginning of this Thesis, and it is only now at the end of the task, that I feel more prepared for such an investigation, having gained knowledge and a firm grasp of what this topic involves. This task could be seen as a starting point, to explore further through research or in professional practice. There are a myriad of new and scaffolded questions and ideas that have resulted from the process of writing this Thesis. The following reflections are suggestions on how the process could be improved or adapted and ponders how results are overall affected by the choice of methods.

X.1 LITERATURE STUDY:

Completing a literature study was felt to be the only realistic approach to the task as a whole, gleaning advice from scientific research to inform design in the way of Evidence Based Design. The framework of this literature search was approached as objectively as possible through the use of the two matrices. As a future alternative such a review could be performed within a limited timeframe of dates, only searching within set publication types or choosing relevant references based purely on keyword searches, although each of these alternatives bring their own biases. In this case, the task was completed in a slightly more intuitive manner, allowing the literature to guide the results as an exploration of the topic rather than a pre-set formula of parameters. This method was particularly suited for the interpretation of texts required.

X.2 MAIN THEORIES MATRIX / SYNTHESIS:

The matrix created to better grasp the overlap

of main theories underwent possibly the greatest metamorphosis during this process. It was initially used to gain an understanding of information found and at that point included what was deemed to be the original version of Roger Ulrich’s Psycho-Evolutionary Theory from 1983. The environmental qualities seen there allowed me to understand his theory, but were felt to be essentially covered by Appleton’s Theory. Therefore, even though included in the matrix (see *Appendix A*), the qualities from this particular article were eventually entirely removed from the main Thesis text.

The matrix expressed the overlaps and thereby reduced the 26 found qualities down to 16, at that stage being a highly appropriate method to perform this ‘funnelling’. With the 1983 Ulrich qualities removed, however, the reduction or synthesising of qualities in turn went from only 20 to 16, and these overlaps were much more evident and perhaps did not require a matrix per se. [i.e. *Prospect & Refuge* were an obvious overlap, and *Social* and *Culture* were PSDs recognised by the authors as not supporting restoration in an equal manner.] Whilst the matrix method was originally useful in highlighting overlaps in a visual manner, it was more appropriate for funnelling the larger amount of qualities before Ulrich’s 1983 qualities had been omitted.

X.3 LITERATURE MATRIX / SYNTHESIS:

There were many interesting consideration and options within the second matrix, which was used to collate and synthesise the wider literature recommendations. The method was an attempt to step back and try to more objectively reduce the recommendations to a manageable and concise ‘set’. Some questions that arose throughout and on final reflection were:

- How does the repetition of a particular author affect the result? Is this fair in the scoring?
- Was there a fair distribution of authors from different fields? There is far more literature available beyond what was possible to read in this context – how does this parameter affect the results?

(X) REFLECTIONS ON METHOD continued:

- Are the recommendations allocated to the 'correct' category or could they be interpreted differently? Certain qualities suit various categories – where are they most suitable?
- Several of the categories are much more heavily weighted in number of qualities – is this acceptable as a natural result or should some sort of quota be applied?
- Are these categories and qualities easy to recognise in the field for others?

I do not have answers for these questions at this stage, but certainly recognise the impact of a single 'interpreter' on a task such as this. In the sense that this work functions as a starting point for further explorations, this was a valid strategy, but it would be interesting to repeat the method within a team and supported by an even more rigorous critical discourse. This would affect practical aspects such as where the threshold of the matrix is set, amongst other parameters. For example, the cut off for the 'general' recommendations could instead have been set at 10, where there could be deemed to be a natural threshold perhaps. However, whilst recognising that a more stringent method and threshold are possible, the aim was to translate and discuss recommendations and qualities that resulted from the readings. Perhaps in this way, the initial expectation that it was possible to create a very concise set of conclusions is what evolved most notably, with recognition that a larger set of recommendations is necessary and even advisable in this task.

X.4 CASE STUDY COMPARISON:

Increasing the depth of my understanding of the categories and qualities that resulted from the literature by identifying them in physical sites allowed not only the clarification of the qualities that remain slightly less concrete, but also to maintain an open view of the qualities, as they can take a myriad of forms. Seeing them in the context of both stress rehabilitation and cancer care emphasised the similarities, but also the differences in how these qualities can be expressed or applied. By presenting

three sites of each, it was possible to provide a broad palette of practical incarnations of each of the qualities, rather than limiting interpretation to a single example of each, which could be seen as too prescriptive. Two exceptions within the case studies should be noted: *SPATIALITY* = 9C: Access to sunshine / daylight (natural Vitamin D) and *VEGETATION* = 10A: Seeing the full life-cycle of plants can mirror Life (fascination). Neither of these qualities were presented in photographic format due to the first being seen as 'too broad' and thus essentially applicable to entire sites, and the second being too conceptual or abstract to capture in single images. Whilst being concepts that can be quite easily understood within a design context, they were not appropriate or possible to adequately represent in the context of this Thesis.

The exciting potential of these qualities and the evidence found within the case study sites to inform a future Post-occupancy Evaluation Tool has already been raised. As a next step I would recommend an analysis of specific spaces within the case studies, which contain the most quality overlaps or more qualities on the whole. It would also be fundamental to compare the results found at the sites to actual user groups and relate their perceptions to the current results. The results could indeed even be developed as a Designer 'Toolkit'. Overall, it is felt that through consultation and discourse the resulting categories and qualities have great potential to build a foundation for evaluating and designing restorative green spaces.

(XI) RESULTING GENERAL CONCLUSIONS:

Within the scope of this Thesis the ‘starting point’ has been completed and a platform for ‘deep diving’ prepared. A clear set of tangible qualities that benefit and support the design of restorative green space has been presented, both in text and visual examples, providing clarity of interpretation. The recommendations have been gleaned from a wide variety of literature sources and synthesised into design-connected terms to be utilised as a foundation for informed design and future research.

It is becoming more widely recognised that the earlier a Landscape Architect can be involved in a project, the more integrated and successful a design will be, as it allows relationships of inside / outside, as well as those between elements in the entire site to be more effective and efficient (Cooper Marcus & Sachs, 2014, p. 60). Restorative green spaces can allow not only a process of recovery by addressing qualities such as those discussed here, but can actually be salutogenic (health promoting) and even “*instorative*” for individuals, in that they can strengthen and build on people’s capabilities to deal with every day demands (Hartig, 2007, p. 164). When considering the quotes of people connected to this field across the centuries, including more recent scientific research, it is clear that humans have a deep and vital connection to nature. We need to re-embrace the healing potential of gardens and green spaces as an intrinsic part of healthcare. As Butterfield (2014) states, “...it is clearly no coincidence that healthcare design (and healthcare more generally) has gradually begun to re-look at green nature as a way to slow people down and create a sense of sacred space with the intention to assist, even speed up, the healing process.” (p. 95). Looking to understand how this can be done on a practical design level is one aspect of this, as it seems more and more evident in this urban dominated world that restoration through nature is not optional, but essential.

Whether people find restoration and well-being in nature due to studied processes such as “*perceptual fluency*” (Joye & Van den Berg, 2012, p. 62) from our inherent understanding or connection of fractals or something that has not yet been explained, seems less important than the evident outcomes. Ulrich and others describe our reading of nature as being ‘instinctive’, using sub-conscious reflexes (affective), while the urban is read ‘rationally’, using logic, rationally conscious (cognitive) processes (Stigsdotter & Grahn, 2002, p. 62). I propose that we should trust our instincts more to realign the societal moral compass that is the basis of this entire topic – people feel better in nature so let’s design for this fact. There is a vast amount of research demonstrating the health benefits and value of nature and green spaces for our psychological and physiological well-being. I suggest it is time to set what we already know to work and apply the knowledge in a practical way, bridging the gap between research and practice.

One strategy for creating a ‘connect’ between research and practice, is Evidence Based Design (EBD). Multi-discipline knowledge and skills are needed as much as iterative processes of design and research. Designs need to be evaluated to inform new research, which can then inform new design, creating a continuous cycle of learning and development (Hartig & Cooper Marcus, 2006). In essence, the design and research process needs to mimic nature’s dynamic quality, which has been embraced by Nature-based Design: “...dynamic, a program in continuous evolution that does not foresee stagnation and operational rigidity...” (Stigsdotter et al, 2011, p. 322). Perhaps the most dynamic aspect of EBD is the collaboration between varied embodiments of ‘expertise’ that stem from diverse backgrounds such as medicine, professional design and most of all, are user led to ensure a design is well-informed to achieve its goals (Oher, 2016, p. 8). Public participation (particularly former

(XI) RESULTING GENERAL CONCLUSIONS continued:

patients and staff as ‘expert users’) will often lead to custom made and unique solutions (Oher, 2016, p. 18; Valente & Cooper Marcus, 2015, p. 181). Only through such collaboration and dialog can gardens become spaces that fully support both passive and active experiences that are restorative (Bengtsson & Grahn, 2014, p. 879). It is imperative that designers and clients of restorative green spaces realise that *“Healing gardens represent both a dynamic process and a place.”* (Valente & Cooper Marcus, 2015, p. 181). Restorative green space designs **must** be site AND user specific, because as Cooper Marcus so often reminds her readers, there is no ‘one-size-fits-all’ (Cooper Marcus & Sachs, 2014, p. 16).

My research indicates that there is a stronger basis of research informing green space design within the Stress Rehabilitation field than, for example, cancer care, which could be explained in part due to its relatively recent re-emergence. Although Butterfield (2014) stated in her PhD Thesis that *“While Maggie’s take great pride in their ‘communities’ there is little evidence of a broad collaborative design process”* (p. 32), it is encouraging to see that collaboration and a more informed approach is being integrated into the more recent Maggie’s Centres (since around 2015). Landscape Architects and Garden Designers are being brought in earlier to the design process, in a more collaborative way, and perhaps being informed more by research (Butterfield, 2015, p. 99). There was also a strategic move in the organisation to employ a Therapeutic Gardener per site, so that the green spaces could be more specifically integrated into treatments, which is also encouraging (Butterfield, 2014, p. 344; Butterfield, 2015, p. 105). This would suggest that design for both conditions is incorporating EBD principles, which can only strengthen the industry as a whole.

At the core of this topic is a need to support and encourage more communication between designers and medical practitioners to allow landscape architects / designers to *“...translate the specifics of medically defined conditions into the design of gardens that will effectively support caring...”* (Hartig & Cooper Marcus, 2006, p. S36). These green spaces need to go beyond permitting restoration, rather promoting or enhancing it through the use of qualities such as those discussed in this Thesis. To paraphrase Hartig (2007), these spaces go beyond the absence of negative influences and instead feature a presence of positive features for restoration (p. 164). Thereby, through the inclusion of such qualities as described above, the aim of all of the authors read, is not to replace medical processes, but to create designs that support them.

(XII) CONCLUDING SUMMARY:

The reason this topic has been of such passionate interest is that I view it from the practical lens of the designer, one who intends to use this knowledge to inform future work. Available research often expresses what patients need in terms of atmosphere or almost visceral qualities (e.g. tranquillity, to feel safe), but less frequently offers the practical and descriptive support of tangible examples to depict what these could mean and my aim was to fill this 'gap'. There is definitively no 'one-size-fits-all recipe' for restorative gardens, but while many authors seem almost afraid to say 'here is a good example of what that could look like', this present work can provide such references for designers, researchers and students. This Thesis has aimed to aid others' interpretation of the research available, particularly if they do not have the time or opportunity to read the vast literature that is being developed.

The results of the literature study demonstrated that there is an array of tangible and specific recommendations for the design of restorative green spaces. Although it is fair to say that more practical advice has been published in the form of commercial books than within academic research, the information exists and can thereby inform practitioners. At its most fundamental level, the results showed a need for designers to include lush and dominant amounts of diverse vegetation, with its inherent fascination and as a support for a natural soundscape and overall multi-sensory stimulation. Designs should provide choice of a variety of spaces that incorporate in particular the options to walk and sit, both in shade and sun, as well as allowing varying levels of social interaction. If these qualities were to form the basis of a design, especially when combined with detailed consultation and research into the context and users of the proposed site, I

suggest that a strong foundation will have been achieved. It is vital for a designer to understand the user of their created space, as this will impact the design first and foremost, particularly in the fields of restoration and healthcare, which deal with both the therapeutic process and space. Almost all authors within the literature emphasised the unique conditions and needs that must be considered for each individual site.

My experience of this process has involved the interpretation of ambiguous terminology and language between the sometimes-disparate fields of research and landscape architecture practice. That being said, both the overall literature recommendations and the main theories could be readily identified in the case study sites, though admittedly some in a more definite or tangible way. For my own learning and in preparation for professional life, I have synthesised and translated the information found within research about qualities that enhance or benefit restorative green spaces, explaining and showcasing examples of these qualities through the Case Studies. My results provide some details within an overview of physical qualities that are recommended by experts in the fields of environmental psychology, horticultural therapy and landscape architecture.

These resulting recommendations and qualities form a solid foundation for physical design or planning discussions for restorative spaces. There was never an intention to prescribe which plants or exact colours to use, which forms to include or how to layout a site. Rather the aim was to take a step closer to practical or physical examples for designers to understand, being informed by the existing research. This goal has been achieved and

(XII) CONCLUDING SUMMARY continued:

whilst the qualities remain open to interpretation, they are certainly close to the ideal of the Maggie's Design Brief mentioned in the Preface – they explain the requirements of the space and the needs of the user without prescribing how the individual design solution should look. This task has thus allowed for the creation of a set of research informed recommendations that can act as a foundational basis for the design of restorative green spaces, a base that should form a strong catalyst for discussion of needs with the client and user of each individual space.

Restoration in nature-based environments occurs due to the relationship between the person, the activity and the setting – it is a holistic picture and not only the sum of its parts. The recommendations and qualities explained here are only one aspect of this equation, but one that I have hopefully been able to clearly translate and depict throughout this Thesis.

APPENDIX A: Main Theories comparison matrix

Appleton (1975)
Prospect &
Refuge Theory


Ulrich (1983)
Psycho-evolutionary
Theory *[removed from text]*


Kaplan & Kaplan
(1989 / 1995)
Attention
Restoration
Theory


Ulrich (1993)
Psycho-evolutionary
Theory / Stress
Recovery Theory


Grahn & Stigsdotter
(2002 / 2010)
Perceived Sensory
Dimensions

	Prospect	Refuge	Complexity	Structural Properties	Focalilty	Depth	Ground Surface Texture	Lack of Threat	Deflected Vista	Water	Being Away	Extent	Fascination	Compatibility	Verdant Vegetation	Water	Flowers	Savannah-like Landscape	Unthreatening Wildlife	Low Risk	Refuge	Nature	Rich in Species	Serene	Space	Prospect	Cultural	Social
Prospect	/				Connected	Essentially the same			Connected			Connected								Connected						Essentially the same		
Refuge		/					Connected	Connected												Connected	Essentially the same							
Complexity			/									Connected										Connected	Essentially the same					
Structural Properties				/									Connected									Connected				Connected		
Focalilty	Connected				/							Connected	Connected													Connected		
Depth	Essentially the same					/						Connected													Essentially the same	Essentially the same		
Ground Surface Texture		Connected					/					Connected								Essentially the same	Connected							
Lack of Threat		Connected						/											Essentially the same	Essentially the same	Connected							
Deflected Vista	Connected								/			Connected	Essentially the same												Connected	Connected		
Water										/						Essentially the same						Connected		Connected				
Being Away											/																	
Extent	Connected				Connected	Connected	Connected		Connected			/													Essentially the same	Connected		
Fascination			Connected		Connected				Essentially the same				/				Connected					Connected	Connected					
Compatibility														/						Connected							Vague Link	Vague Link
Verdant Vegetation															/							Essentially the same	Connected					
Water										Essentially the same						/						Connected		Connected				
Flowers												Connected					/					Essentially the same	Connected					
Savannah-like Landscape																		/				Essentially the same						
Unthreatening Wildlife								Essentially the same											/	Essentially the same								
Low Risk	Connected	Connected					Essentially the same	Essentially the same					Connected						/	Essentially the same	Connected					Connected		
Refuge		Essentially the same					Connected	Connected												Connected	/							
Nature			Connected	Connected						Connected			Connected		Essentially the same	Connected	Essentially the same	Essentially the same				/	Connected					
Rich in Species			Essentially the same									Connected			Connected		Connected					Connected	/					
Serene										Connected						Connected								/				
Space						Essentially the same			Connected			Essentially the same													/			
Prospect	Essentially the same				Connected	Essentially the same			Connected			Connected								Connected						/		
Cultural														Vague Link												/		
Social														Vague Link													/	

 Vague Link

 Connected

 Sub-category of other Theory

 Essentially the same

APPENDIX B: GENERAL Recommendations from Literature Matrix

RECOMMENDATION / Design Principle:	SOURCES (1 = mention; 2 = multi / discussed):	POINTS:	TOTAL:	CATEGORY:
Space to be alone with nature (privacy) - space to "just be" and/or express strong emotions	Adevi & Lieberg, 2012, p. 55-56; Bengtsson & Grahn, 2014, p. 888; Butterfield, 2014, p. 88; Butterfield, 2015, p. 99; Cooper Marcus & Barnes, 1995, p. 60; Cooper Marcus & Sachs, 2014, p. 25, 115, 119; Corazon et al, 2010, p. 37; Grahn et al, 2010, p. 123; Grahn & Stigsdotter, 2010, p. 270-271; Korpela & Staats, 2014, p. 352, 357, 359, 363; Pantelidou, 2013, p. 24; Pálsdóttir, 2014, (Draft Paper 3) p. 18, 21, 51-55; Pálsdóttir, 2015, p. 10; Pálsdóttir, 2016, p. 117-118; Pálsdóttir, Stigsdotter, Persson, Thorpert & Grahn, 2018, p. 315, 318-319; Sidenius et al, 2017, p. 13, 15, 18; Tenngart Ivarsson, 2011, p. 34; Tenngart Ivarsson & Grahn, 2012, p. 526-529; Tenngart Ivarsson & Grahn, 2010, p. 106-107	2; 1; 1; 1; 1; 2; 1; 1; 2; 2; 1; 2; 1; 2; 2	29	CHOICE / SOCIAL QUIETNESS
Choice of variety of spaces to suit mood / capacity - particularly choice between private or social spaces, passive or active	Adevi, 2012, p. 50; Adevi & Lieberg, 2012, p. 55; Adevi & Martensson, 2013, p. 234; Annemans et al, 2012, p. 6; Bengtsson & Grahn, 2014, p. 882; Blaschke et al, 2018, p. 50; Butterfield, 2014, p. 20; Butterfield & Martin, 2016, p. 704; Cooper Marcus & Barnes, 1995, p. 61; Cooper Marcus & Sachs, 2014, p. 24-26, 119; Corazon et al, 2010, p. 38; Flemming & Figueiredo, 2013, p. 13; Grahn et al, 2010, p. 123, 131, 135, 155; Pálsdóttir, 2015, p. 53; Pálsdóttir, 2016, p. 114; Pálsdóttir et al, 2018, p. 314-315; Pantelidou, 2013, p. 24; Polat et al, 2017, p. 38; Sachs, 2017, p. 7, 26; Sidenius et al, 2017, p. 13; Smith, 2007, p. 7, 217; Stigsdotter, 2005, p. 20, 34; Stigsdotter & Grahn, 2002, p. 65; Stigsdotter & Grahn, 2003, p. 42; Tenngart Ivarsson, 2011, p. 34; Tenngart Ivarsson & Grahn, 2010, p. 105, 109, 111, 112; Tenngart Ivarsson & Grahn, 2012, p. 534; Ulrich, 1999, p. 46; Valente & Cooper Marcus, 2015, p. 188	1; 1; 1; 1; 1; 1; 1; 1; 1; 2; 1; 1; 2; 1; 2; 2; 1; 1; 1; 1	36	CHOICE / SOCIAL QUIETNESS
Social support - physical and emotional care	Butterfield & Martin, 2016, p. 696; Cooper Marcus & Sachs, 2014, p. 26, 31	1; 2	3	CHOICE / SOCIAL QUIETNESS
Colours in nature facilitating "fascination"	Block et al, 2004, p. S163; Paine & Francis, 1990, p. 278; Souter-Brown, 2015, p. 248; Thorpert & Busse Nielsen, 2014, p. 62, 64, 67	1; 1; 1; 2	5	COLOUR
"Softer colour palette" of Blues & Greens is more calming / restorative than more stimulating Reds & Yellows	Bengtsson & Grahn, 2014, p. 884; Block et al, 2004, p. S163; Butterfield, 2014, p. 245; Grahn et al, 2010, p. 156; Kaufman & Lohr, 2004, p. 229; Kaufman & Lohr, 2008, p. 180; Nicholson-Lord 2003, p. 19; Pálsdóttir, 2014, (Draft Paper 3) p. 5; Pálsdóttir et al, 2014, P. 5, 20; Pálsdóttir, 2015, p. 52, 56; Pálsdóttir, 2016, p. 114, 118; Pálsdóttir et al, 2018, p. 315; Sachs, 2017, p. 15; Tenngart Ivarsson & Grahn, 2010, p. 108	1; 1; 1; 1; 1; 1; 1; 1; 2; 2; 2; 1; 1; 1	17	COLOUR
Legible layout (overview) to allow easy way-finding	Bengtsson & Grahn, 2014, p. 884; Cooper Marcus & Barnes, 1995, p. 59; Cooper Marcus & Sachs, 2014, p. 68, 182; Grahn & Stigsdotter, 2010, p. 270; Stigsdotter & Grahn, 2002, p. 60; Stigsdotter & Grahn, 2003, p. 44; Tenngart Ivarsson & Grahn, 2012, p. 529, 533-534	1; 1; 2; 1; 1; 1; 2	9	COMPOSITION / LAYOUT
Physical scale of space (size of grounds)	Nordh et al, 2009, p. 233	1	1	COMPOSITION / LAYOUT

APPENDIX B: GENERAL Recommendations Matrix (continued)

"Fascination" - escape from everyday demands through multi-sensory distraction in Nature	Adevi, 2012, p. 50; Adevi & Martensson, 2012, p. 55-56; Bengtsson & Grahn, 2014, p. 887; Blaschke, 2017, p. 5, 7; Blaschke et al, 2018, p. 49-50, 53-54; Butterfield, 2014, p. 229, 231, 242, 253, 265, 352, 357; Butterfield, 2015, p. 103; Butterfield & Martin, 2014, p. 319; Butterfield & Martin, 2016, p. 701; Cooper Marcus & Barnes, 1995, p. 61; Cooper Marcus & Sachs, 2014, p. 27, 58, 81, 90, 118, 127, 275, 277; Grahn & Stigsdotter, 2010, p. 270-271; Jencks, 2016, p. 83; Jencks, 2017, p. 1-3; Pálsdóttir, 2015, p. 36; Sachs, 2017, p. 7; Smith, 2007, p. 12; Tennqart Ivarsson, 2011, p. 34, 70	1; 2; 1; 2; 2; 2; 1; 1; 1; 1; 2; 2; 1; 2; 1; 1; 1; 2	26	FASCINATION / SENSORY STIMULATION
Water Bodies as a source of "fascination" / distraction and tranquillity	Blaschke, 2017, p. 9; Blaschke et al, 2018, p. 49, 51-52; Butterfield, 2014, p. 88; Cooper Marcus & Barnes, 1999, p. 71; Cooper Marcus & Sachs, 2014, p. 24, 85, 183, 202; Gerlach Spriggs et al, 1998, p. 37; Grahn et al, 2010, p. 156; Grahn & Stigsdotter, 2010, p. 270-271; Hartig, 2004, p. 276; Pálsdóttir, 2014, (Draft Paper 3) p. 11; Pálsdóttir et al, 2014, p. 7103; Pálsdóttir, 2015, p. 52; Pálsdóttir et al, 2018, p. 315, 317; Polat et al, 2017, p. 39; Ulrich, 1999, p. 52	1; 2; 1; 1; 2; 1; 1; 2; 1; 1; 1; 1; 2; 1; 1	19	FASCINATION / SENSORY STIMULATION
Close physical access to water, plants, stones (touch)	Cooper Marcus & Sachs, 2014, p. 24, 182; Pálsdóttir, 2014, (Draft Paper 3) p. 12; Stigsdotter & Grahn, 2003, p. 41-42	2; 1; 2	5	FASCINATION / SENSORY STIMULATION
Triggering of Memory through senses / plants (not always positive)	Blaschke, 2017, p. 7; Bengtsson & Grahn, 2014, p. 885; Butterfield, 2014, p. 240, 254, 285; Butterfield, 2015, p. 99, 103; Grahn et al, 2010, p. 141; Sidenius et al, 2017, p. 15	1; 1; 2; 2; 1; 1	8	FASCINATION / SENSORY STIMULATION
Provision of Shade / Sunny areas	Butterfield, 2014, p. 253; Cooper Marcus & Barnes, 1995, p. 62; Cooper Marcus & Sachs, 2014, p. 25, 67, 115, 182; Flahive DiNardo et al, 2013, p. 2; Flemming & Figueiredo, 2013, p. 14; Hazen, 2013, p. 3; Polat et al, 2017, p. 39; Sachs, 2017, p. 22, 25, 233; Stigsdotter & Grahn, 2003, p. 41; Tennqart Ivarsson & Grahn, 2010, p. 107; Valente & Cooper Marcus, 2015, p. 187, 189	1; 1; 2; 1; 1; 1; 1; 2; 1; 1; 2	14	PHYSICAL COMFORT
Natural Materials - avoid 'man-made' materials (E.g. steel, concrete, plastic...)	Blaschke et al, 2018, p. 53; Butterfield, 2014, p. 235; Cerwen et al, 2016, p. 7; Cooper Marcus & Sachs, 2014, p. 58, 115, 118-119; Flemming & Figueiredo, 2013, p. 14; Paine & Francis, 1990, p. 279; Pálsdóttir, 2015, p. 52; Souter-Brown, 2015, p. 132; Valente & Cooper Marcus, 2015, p. 188-189	1; 1; 1; 2; 1; 1; 1; 1; 2	11	PHYSICAL COMFORT
Provision for bad weather (seasonal shelter) incl. Greenhouses for all season access to daylight and greenery	Bengtsson & Grahn, 2014, p. 884; Butterfield, 2014, p. 217, 352; Cooper Marcus & Sachs, 2014, p. 70, 124; Pálsdóttir, 2014, (Draft Paper 3) p. 14; Pálsdóttir et al, 2018, p. 317; Sachs, 2017, p. 25; Smith, 2007, p. 13	1; 2; 2; 1; 1; 1; 1	9	PHYSICAL COMFORT
Practical services / amenities - bins, toilets...	Cooper Marcus & Sachs, 2014, p. 83, 85; Paine & Francis, 1990, p. 280	2; 1	3	PHYSICAL COMFORT
Signs of Care / Maintenance (reflects care of person on site)	Blaschke, 2017, p. 9; Butterfield, 2014, p. 273, 310-311, 319, 328; Butterfield, 2015, p. 99, 105; Butterfield & Martin, 2014, p. 319; Cooper Marcus & Barnes, 1995, p. 64; Cooper Marcus & Sachs, 2014, p. 125; Polat et al, 2017, p. 39; Sachs, 2017, p. 11, 22, 25; Van den Berg et al, 2014, p. 174	1; 2; 2; 1; 1; 1; 1; 2; 1	12	PHYSICAL COMFORT
Raised planters as physical support for walking and seating	Cooper Marcus & Sachs, 2014, p. 76, 118; Flahive DiNardo et al, 2013, p. 3; Flemming & Figueiredo, 2013, p. 13; Paine & Francis, 1990, p. 279; William Thompson, 1998, p. 71, 90	2; 1; 1; 1; 2	7	SEATING
Safe and comfortable seating - at edge of activity (refuge)	Cooper Marcus & Barnes, 1995, p. 59; Mumcu et al, 2010, p. 1225; Paine & Francis, 1990, p. 279-280	1; 1; 1	3	SEATING
Seating options - variety of grouped / single seating, with backs & armrests, moveable, opportunity to lie down...	Butterfield, 2014, p. 203; Butterfield, 2015, p. 102; Cooper Marcus & Barnes, 1995, p. 62, 79-80; Cooper Marcus & Barnes, 1999, p. 224; Cooper Marcus & Sachs, 2014, p. 70, 79-80, 118, 122; Corazon et al, 2010, p. 44; Paine & Francis, 1990, p. 279-280; Pálsdóttir, 2016, p. 118; Pálsdóttir et al, 2018, p. 317; Polat et al, 2017, p. 39; Sachs, 2017, p. 22, 26; Sidenius et al, 2017, p. 13, 19; Souter-Brown, 2015, p. 131; Valente & Cooper Marcus, 2015, p. 187, 189	1; 1; 2; 1; 2; 1; 2; 1; 1; 1; 2; 2; 1; 2	20	SEATING

APPENDIX B: GENERAL Recommendations Matrix (continued)

<p>Nature Sounds (such as Birdsong & Water) are more restorative than urban (man-made) sounds</p> <p>Softer sounds for walking paths can cover other sounds and slow pace while signalling presence (warning)</p>	<p>Aletta et al, 2016, p. 367, 375; Alvarsson, Wiens & Nilsson, 2010, p. 1037, 1043; Bengtsson & Grahn, 2014, p. 884; Blaschke et al, 2018, p. 52; Butterfield, 2014, p. 249, 251; Butterfield, 2015, p. 103; Cerwen et al, 2016, p. 2, 5-7, 12; Cooper Marcus & Barnes, 1995, p. 61; Cooper Marcus & Barnes, 1999, p. 6, 250; Cooper Marcus & Sachs, 2014, p. 21, 58, 71, 115, 183; Dawson, 1988, p. 171-173; Flemming & Figueiredo, 2013, p. 14; Pálsdóttir et al, 2014, p. 7102; Pálsdóttir, 2015, p. 52, 72; Pálsdóttir et al, 2018, p. 317-319; Polat et al, 2017, p. 39; Ratcliffe et al, 2013, p. 4, 6, 7, 18-19; Sidenius et al, 2017, p. 13, 18; Tenngart Ivarsson & Grahn, 2010, p. 107-108; Ulrich, 1999, p. 62-63; Van den Berg et al, 2014, p. 174</p>	<p>2; 2; 1; 1; 2; 1; 2; 1; 2; 2; 2; 1; 1; 2; 2; 1; 2; 2; 2; 2; 1</p>	34	SOUNDSCAPE
	<p>Aletta et al, 2016, p. 367, 375; Cerwen et al, 2016, p. 1, 5-7, 9-10</p>	<p>2; 2</p>	4	SOUNDSCAPE
<p>Light coloured surfaces that reduce glare</p>	<p>Butterfield, 2014, p. 230; Cooper Marcus & Sachs, 2014, p. 3, 76, 182; Flahive DiNardo et al, 2013, p. 3; Valente & Cooper Marcus, 2015, p. 188 Blaschke et al, 2018, p. 50, 52, 54; Block et al, 2004, p. S162-S163; Butterfield, 2014, p. 86, 268, 271; Cooper Marcus & Barnes, 1995, p. 61; Cooper Marcus & Sachs, 2014, p. 24, 26, 65, 115, 182, 196; Corazon et al, 2010, p.44; Flemming & Figueiredo, 2013, p. 13; Polat et al, 2017, p. 39; Smith, 2007, p.8, 13; Tenngart Ivarsson, 2011, p. 34, 67; Tenngart Ivarsson & Grahn, 2010, p. 107; Tenngart Ivarsson & Grahn, 2012, p. 526-531; Ulrich, 1999, p. 47-48; William Thompson, 1998, p. 71</p>	<p>1; 2; 1; 1</p>	5	SPACE / WALKABILITY
<p>Possibility to move, predominantly Walk - gentle, compatible levels of exercise</p>	<p>Bengtsson & Grahn, 2014, p. 883; Blaschke et al, 2018, p. 52; Cooper Marcus & Barnes, 1995, p. 59-61; Cooper Marcus & Sachs, 2014, p. 70, 74; Flahive DiNardo et al, 2013, p. 2-3; Hazen, 2013, p. 3; Paine & Francis, 1990, p. 275; Polat et al, 2017, p. 39; Sachs, 2017, p. 24</p>	<p>2; 2; 2; 1; 2; 1; 1; 1; 2; 2; 1; 2; 2; 1</p>	22	SPACE / WALKABILITY
<p>Wheelchair (wheeled aids) accessible surfaces</p>		<p>1; 1; 2; 2; 2; 1; 1; 1; 1</p>	12	SPACE / WALKABILITY
<p>Higher levels of Refuge are desired when 'ill' / depleted</p>	<p>Blaschke, 2017, p. 8; Bengtsson, 2015, p. 24; Bengtsson & Grahn, 2014, p. 882, 888; Butterfield, 2014, p. 209-210; Butterfield, 2015, p. 102; Cooper Marcus & Sachs, 2014, p. 23, 124; Corazon et al, 2010, p. 37; Flemming & Figueiredo, 2013, p. 14; Grahn & Stigsdotter, 2010, p. 270; Pálsdóttir, 2014, p. 21; Pálsdóttir, 2015, p. 56, 74; Pálsdóttir, 2016, p. 118; Pálsdóttir et al, 2018, p. 315, 318-319; Sidenius et al, 2017, p. 13, 15, 18-19; Tenngart Ivarsson, 2011, p. 71; Tenggart Ivarsson & Grahn, 2010, p. 107</p>	<p>1; 1; 2; 2; 1; 2; 1; 1; 1; 1; 2; 1; 2; 2; 1; 1</p>	22	SPATIALITY
<p>Open views - incl. smooth ground surface</p>	<p>Grahn & Stigsdotter, 2010, p. 270-271; Herzog et al, 2003, p. 165 Bengtsson & Grahn, 2014, p. 883; Butterfield, 2014, p. 202; Cooper Marcus & Barnes, 1995, p. 59; Cooper Marcus & Sachs, 2014, p. 24-25, 67, 192, 202; Grahn & Stigsdotter, 2010, p. 270-271; Hazen, 2013, p. 3; Pálsdóttir, 2015, p. 50; Pálsdóttir, 2016, p. 114; Pálsdóttir et al, 2018, 314-315; Polat et al, 2017, p. 38; Sidenius et al, 2017, p. 13, 18; Stigsdotter, 2005, p. 35; Tenngart Ivarsson, 2011, p. 64, 71; Ulrich, 1999, p. 46</p>	<p>2; 1</p>	3	SPATIALITY
<p>Enclosure - safety, privacy of site (non-public access)</p>		<p>1; 1; 1; 2; 2; 1; 1; 1; 2; 1; 2; 1; 2; 1</p>	19	SPATIALITY
<p>Spaciousness of overall space</p>	<p>Grahn et al, 2005, p. 5-6; Pálsdóttir et al, 2018, p. 317 Bengtsson, 2015, p. 21; Cooper Marcus & Barnes, 1995, p. 236-237; Cooper Marcus & Sachs, 2014, p. 179; Pálsdóttir, 2014, p. 66; Sachs, 2017, p. 14; Ulrich, 1999, p. 64</p>	<p>2; 1</p>	3	SPATIALITY
<p>Access to sunshine / daylight (natural Vitamin D)</p>	<p>Blaschke et al, 2018, p. 50; Block et al, 2004, p. S163; Butterfield, 2014, p. 301, 357; Butterfield, 2015, p. 105, 108; Butterfield & Martin, 2016, p. 696, 703; Cooper Marcus & Sachs, 2014, p. 27, 115, 119, 122; Jencks, 2016, p. 83; Pálsdóttir et al, 2014, p. 7100; Pantelidou, 2013, p. 22; Tenngart Ivarsson & Grahn, 2010, p. 111</p>	<p>1; 2; 1; 1; 1; 1</p>	7	SPATIALITY
<p>Contrast to institutional environment - domestic scale and typology; clear Entrance to "be away" - homeliness</p>		<p>1; 1; 2; 2; 2; 2; 1; 1; 1; 1</p>	14	SPATIALITY

APPENDIX B: GENERAL Recommendations Matrix (continued)

Avoid perfect grooming, strict paths and maintenance - softer and more casual appearance is less demanding / gentler Avoid abstract or ambiguous design components (incl. sculptures)	Butterfield, 2014, p. 203-204, 269; Cooper Marcus & Sachs, 2014, p. 115; Pálsdóttir, 2016, p. 118; Pálsdóttir et al, 2018, p. 317; Valente & Cooper Marcus, 2015, p. 189	2; 1; 1; 1; 1	6	SPATIALITY
	Bengtsson & Grahn, 2014, p. 883; Butterfield, 2014, p. 280; Cooper Marcus & Barnes, 1999, p. 66, 91, 212; Sidenius et al, 2017, p. 2	1; 1; 2; 1	5	SPATIALITY
30% Hardscape vs 70% Vegetation Lighter coloured Trees that also allow light through Use of low maintenance, resilient plants Inclusion of Trees wherever possible - pref. wide canopy, short trunks Biotores / Plants that attract and support Birds & Insects Seeing the full life-cycle of plants can mirror 'life' (fascination) Visual and physical connection between inside and outside spaces (green views) Use of local / native plants for familiarity Lush, diverse, eye-catching plantings (seasonal interest / distraction)	Bengtsson, 2015, p. 23; Cooper Marcus & Sachs, 2014, p. 28, 81; Grahn & Stigsdotter, 2010, p. 270; Valente & Cooper Marcus, 2015, p. 188	1; 2; 1; 1; 1	6	VEGETATION
	Guan et al, 2017, p. 337			VEGETATION
	Cooper Marcus & Sachs, 2014, p. 81-83; Hazen, 2013, p. 3	2;1	3	VEGETATION
	Adevi & Martensson, 2013, p. 231; Kaufman & Lohr, 2004, p. 230; Kaufman & Lohr, 2008, p. 179; Paine & Francis, 1990, p. 278; Tenngart Ivarsson & Grahn, 2010, p. 108; Thorpert & Busse Nielsen, 2014, p. 62	1; 1; 1; 1; 1; 1	6	VEGETATION
	Cerwen et al, 2016, p. 12; Cooper Marcus & Barnes, 1995, p. 61, 64; Dawson, 1988, p. 173-174; Pálsdóttir, 2015, p. 56; Smith, 2007, p. 12; Stigsdotter, 2005, p. 34; Tenngart Ivarsson, 2011, p. 64	1; 2; 2; 1; 1; 1; 1	9	VEGETATION
	Adevi & Lieberg, 2012, p. 54; Adevi & Martensson, 2013, p. 233; Blaschke, 2017, p. 9; Bengtsson, 2015, p. 19; Bengtsson & Grahn, 2014, p. 888; Butterfield, 2014, p. 258, 261-263, 272, 274; Butterfield, 2015, p. 104, 108; Butterfield & Martin, 2016, p. 701, 703; Cooper Marcus & Barnes, 1995, p. 61; Cooper Marcus & Sachs, 2014, p. 197; Grahn et al, 2010, p. 125; Pálsdóttir, 2015, p. 10; Pálsdóttir, 2016, p. 119; Pálsdóttir et al, 2018, p. 318; Sidenius et al, 2017, p. 13; Smith, 2007, p. 12; Stigsdotter & Grahn, 2003, p. 42; Stigsdotter et al, 2011, p. 325; Tenngart Ivarsson & Grahn, 2010, p. 110-111; Tenngart Ivarsson & Grahn, 2012, p. 530, 534; Van den Berg et al, 2014, p. 174	1; 1; 1; 1; 1; 2; 2; 2; 1; 1; 1; 1; 1; 1; 2; 2; 1	26	VEGETATION
	Block et al, 2004, p. S163; Butterfield, 2014, p. 133-134, 200-202, 290; Butterfield & Martin, 2016, p. 697; Cooper Marcus & Barnes, 1995, p. 59-60; Cooper Marcus & Sachs, 2014, p. 182; Hartig, 2004, p. 274; Jencks, 2017, p. 3-4	1; 2; 1; 2; 1; 1; 2	10	VEGETATION
	Cooper Marcus & Sachs, 2014, p. 81-83; William Thompson, 1998, p. 73	2; 1	3	VEGETATION
	Blaschke et al, 2018, p. 52; Butterfield, 2014, p. 88, 235, 260, 280; Butterfield, 2015, p. 103; Cooper Marcus & Barnes, 1995, p. 60-61; Cooper Marcus & Barnes, 1999, p. 6, 71, 217; Cooper Marcus & Sachs, 2014, p. 25, 81-83, 115, 120; Corazon et al, 2010, p. 37; Flemming & Figueiredo, 2013, p. 13-14; Hartig, 2004, p. 276; Gerlach Spriggs et al, 1998, p. 37; Grahn & Stigsdotter, 2010, p. 270-271; Nordh et al, 2009, p. 214; Paine & Francis, 1990, p. 278-279; Pálsdóttir, 2015, p. 10; Pálsdóttir, 2016, p. 114, 119; Pálsdóttir et al, 2018, p. 314, 317; Polat et al, 2017, p. 39; Sidenius et al, 2017, p. 14, 19; Tenngart Ivarsson, 2011, p. 71; Tenngart Ivarsson & Grahn, 2012, p. 531; Ulrich, 1999, p. 46, 52; Valente & Cooper Marcus, 2015, p. 189	1; 2; 1; 2; 2; 2; 1; 2; 1; 1; 2; 1; 2; 1; 1; 2; 1	33	VEGETATION

APPENDIX C: STRESS specific Recommendations from Literature Matrix

RECOMMENDATION / Design Principle:	SOURCES (1 = mention; 2 = multi / discussed):	POINTS:	TOTAL:	CATEGORY:
Green Trees perceived as more calming than those with red, orange, yellow or purple foliage	Kaufman & Lohr, 2004, p. 230-231; Kaufman & Lohr, 2008, p. 182	2; 1	3	COLOUR
Firm support of seating at back and sides - "refuge" (E.g. Garden Swing, Hedges, corners...)	Palsdottir, 2014, (Draft Paper 3) p. 9, 20; Palsdottir et al, 2018, p. 315	2; 1	3	SEATING
Possibility of "escape" - two routes in / out of any space	Bengtsson & Grahn, 2014, p. 888; Palsdottir, 2014, (Draft Paper 3) p. 9; Palsdottir, 2014, p. 56; Palsdottir, 2016, p. 118-119; Palsdottir et al, 2018, p. 315, 317; Tenngart Ivarsson, 2011, p. 71	1; 1; 1; 2; 2; 1	8	SPACE / WALKABILITY
Soft walking surface to "slow" pace (E.g. wood chips, gravel...)	Cerwen et al, 2016, p. 7; Palsdottir, 2014, (Draft Paper 3) p. 10-11; Palsdottir, 2016, p. 118; Palsdottir et al, 2018, p. 315; Stigsdotter, 2005, p. 34	1; 2; 1; 1; 1	6	SPACE / WALKABILITY
Older (non-perfect) furniture perceived as having 'character' and being less demanding	Palsdottir, 2014, (Draft Paper 3) p. 12	1	1	SPATIALITY
Hard edged planters and hardscaping perceived as too demanding and strict	Palsdottir et al, 2018, p. 317	1	1	SPATIALITY
Wilder attributes of nature perceived as less demanding, able to hide behind / within	Palsdottir, 2014, (Draft Paper 3) p. 17; Palsdottir et al, 2014, p. 7100	1; 1	2	VEGETATION
Vegetation positioned to shelter people from wind and also create sound (E.g. rustle of bamboo from wind)	Cerwen et al, 2016, p. 12	1	1	VEGETATION
Opportunity to work with purpose (Horticultural Therapy)	Grahn et al, 2010, p. 124	1	1	VEGETATION

APPENDIX D: CANCER specific Recommendations from Literature Matrix

RECOMMENDATION / Design Principle:	SOURCES (1 = mention; 2 = multi / discussed):	POINTS:	TOTAL:	CATEGORY:
Avoid sensory overload by reducing strong smelling plants - particularly after chemotherapy and similar treatments	Blaschke et al, 2018, p. 52; Butterfield, 2014, p. 86, 230-231, 237-238; Cooper Marcus & Sachs, 2014, p. 56, 115, 117; Flemming & Figueiredo, 2013, p. 14; Paine & Francis, 1990, p. 279; Valente & Cooper Marcus, 2015, p. 189	1; 2; 2; 1; 1; 1	8	FASCINATION / SENSORY STIMULATION
Use some scented plants for sensory stimulation - incl. herbs to make teas, crafts...	Blaschke et al, 2018, p. 50; Jencks, 2017, p. 1, 3	1; 2	3	FASCINATION / SENSORY STIMULATION
Frequent seating opportunities for rest	Cooper Marcus & Sachs, 2014, p. 115, 125; Flemming & Figueiredo, 2013, p. 14; Stigsdotter, 2005, p. 9	2; 1; 1	4	SEATING
Spaces that allow for social interaction, at the same time as a level of privacy	Annemans et al, 2012, p. 6; Blaschke, 2017, p. 7, 10; Block et al, 2004, p. S163; Butterfield & Martin, 2016, p. 700	1; 2; 1; 1	5	SPATIALITY
Spaces to rest and watch from the periphery of action	Butterfield, 2014, p. 213; Butterfield, 2015, p. 102	1; 1	2	SPATIALITY
Contrasting vegetated landscapes as a buffer to the outside world - threshold of "being away"	Blaschke, 2017, p. 8; Jencks, 2016, p. 83	1; 1	2	VEGETATION
Dissolved edges to divide space and frame views	Jencks, 2017, p. 3	1	1	VEGETATION
Beware of bacterial infection from water, soil etc.	Blaschke et al, 2018, p. 49, 52, 54	2	2	VEGETATION
Plantings of edible vegetation that encourages fruit & vegetable consumption	Blaschke, 2017, p. 11	1	1	VEGETATION
Colourful plantings (distraction)	Butterfield, 2014, p. 244-245, 248;	2	2	VEGETATION

REFERENCES:

- Adevi, A.A. (2012). Supportive Nature – and Stress – Wellbeing in connection to our inner and outer landscape. *Doctoral Thesis 2012:11*. Faculty of Landscape Planning, Horticulture and Agricultural Sciences. Swedish University of Agricultural Sciences, Alnarp.
- Adevi, A.A. & Lieberg, M. (2012). Stress rehabilitation through garden therapy – A caregiver perspective on factors considered most essential to the recovery process. *Urban Forestry & Urban Greening, Vol. 11*. (pp. 51-58).
doi: 10.1016/j.ufug.2011.09.007
- Adevi, A.A. & Mårtensson, F. (2013). Stress rehabilitation through garden therapy: The garden as a place in the recovery from stress. *Urban Forestry & Urban Greening, Vol. 12*. (pp. 230-237).
doi: 10.1016/j.ufug.2013.01.007
- Aletta, F., Kang, J., Astolfi, A. & Fuda, S. (2016). Differences in soundscape appreciation of walking sounds from different footpath materials in urban parks. *Sustainable Cities and Society, Vol. 27*. (pp. 367-376).
doi: 10.1016/j.scs.2016.03.002
- Alvarsson, J.J., Wiens, S. & Nilsson, M.E. (2010). Stress Recovery during Exposure to Nature Sound and Environmental Noise. *International Journal of Environmental Research and Public Health, Vol. 7*. (pp. 1036-1046).
doi:10.3390/ijerph7031036
- Annemans, M., Van Audenhove, C., Vermolen, H. & Heylighen, A. (2012). What makes an environment healing? Users and designer about the Maggie's Cancer Caring Centre London. *Conference Paper FROM 8th International Design and Emotion Conference, London, UK*.
- Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health Promotion International, Vol. 11, No. 1*. (pp. 11-18).
- Appleton, J. (1975). *The Experience of Landscape*. London, John Wiley & Sons.
- Bengtsson, A. (2015). From Experiences of the Outdoors to the Design of Healthcare Environments – A Phenomenological Case Study at Nursing Homes. *Doctoral Thesis No. 2015:66*. Faculty of Landscape Architecture, Horticulture and Crop Production Science. Swedish University of Agricultural Sciences, Alnarp.
- Bengtsson, A. & Grahn, P. (2014). Outdoor environments in healthcare settings: A quality evaluation tool for use in designing healthcare gardens. *Urban Forestry & Urban Greening, Vol. 13*. (pp. 878-891).
- Blaschke, S. (2017). The role of nature in cancer patients' lives: a systematic review and qualitative meta-synthesis. *BioMed Central Cancer, Vol. 17, No. 370*.
doi: 10.1186/s12885-017-3366-6
- Blaschke, S., O'Callaghan, C.C. & Schofield, P. (2018). Cancer Patients' Recommendations for Nature-Based Design and Engagement in Oncology Contexts: Qualitative Research. *Health Environments Research & Design Journal, Vol. 11, No. 2*. (pp. 45-55).
doi: 10.1177/1937586717737813
- Block, K.I., Block, P. & Gyllenhaal, C. (2004). The Role of Optimal Healing Environments in Patients Undergoing Cancer Treatment: Clinical Research Protocol Guidelines. *The Journal of Alternative and Complementary Medicine, Vol. 10, Supp. 1*. (pp. S-157-S-170).
- Bourassa, S. (1988). Toward a Theory of Landscape Aesthetics. *Landscape and Urban Planning, Vol. 15*. (pp. 241-252).
- Burton, A. (2014). Gardens that take care of us. *The Lancet - Neurology, Vol. 13*. (pp. 447-448).
doi: 10.1016/S1474-4422(14)70002-X
- Butterfield, A. (2014). Resilient Places? Healthcare Gardens And The Maggie's Centres. *Doctoral Thesis*. University of Arts, London / Falmouth University, UK.
- Butterfield, A. (2015). The Garden Essences. IN Jencks, C. *The Architecture of Hope – Maggie's Cancer Care Centres (New Edition)*. Frances Lincoln Ltd, London. (pp. 98-109).

REFERENCES continued:

Butterfield, A. & Martin, D. (2016). Affective sanctuaries: understanding Maggie's as therapeutic landscapes. *Landscape Research*, Vol. 41, No. 6. (pp. 695-706).
doi: 10.1080/01426397.2016.1197386

Cerwén, G., Pedersen, E. & Pálsdóttir, AM. (2016). The Role of Soundscape in Nature-Based Rehabilitation: A Patient Perspective. *International Journal of Environmental Research and Public Health*, Vol. 13, No. 1229.
doi: 10.3390/ijerph13121229

Cooper Marcus, C. (2016). The Future of Healing Gardens. *Health Environments Research & Design Journal*, Vol. 9, No. 2. (pp. 172-174).
doi: 10.1177/1937586715606926

Cooper Marcus, C. & Barnes, M. (1995). *Gardens In Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations*. The Centre for Health Design Inc., California, USA.

Cooper Marcus, C. & Barnes, M. [Eds.] (1999). *Healing Gardens – Therapeutic Benefits and Design Recommendations*. John Wiley & Sons Inc., New York.

Cooper Marcus, C. & Francis, C. [Eds.] (1990). *People Places – Design Guidelines for Urban Open Space*. Van Nostrand Reinhold, New York, USA.

Cooper Marcus, C. & Sachs, N. (2014). *Therapeutic Landscapes – An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. Wiley, New Jersey, USA.

Corazon, S.S., Stigsdotter, U.K., Claudi Jensen, A.G. & Nilsson, K. (2010). Development of the Nature-Based Therapy Concept for Patients with Stress-Related Illness at the Danish Healing Forest Garden Nacadia. *Journal of Therapeutic Horticulture*. (pp. 34-51).

Dawson, K. (1988). Flight, Fancy, and the Garden's Song. *Landscape Journal*, Vol. 7. (pp. 170-175).

Dosen, A. & Ostwald, M. (2013). Prospect and Refuge Theory: Constructing a Critical Definition for Architecture and Design. *The International Journal of Design in Society*, Vol. 6, No. 11. (pp. 9-23).

Dosen, A. & Ostwald, M. (2016). Evidence for prospect-refuge theory: a meta-analysis of the findings of environmental preference research. *City, Territory and Architecture*, Vol. 3, Suppl. 4.
doi: 10.1186/s40410-016-0033-1

Flahive DiNardo, M., DePrado, L., Polanin, N. & Flagler, J. (2013). Enabling Gardens: The Practical Side of Horticultural Therapy. *Fact Sheet FS1208*. Rutgers New Jersey Agricultural Experiment Station / State University of New Jersey, USA.

Flemming, L. & Figueiredo, M. (2013). Healing Gardens for Cancer Populations. *American Horticultural Therapy Association News Magazine*, Vol. 41, No. 2. (pp. 13-15).

Gatersleben, B. & Andrews, M. (2013). When walking in nature is not restorative – The role of prospect and refuge. *Health & Place*, Vol. 20. (pp. 91-101).
doi: 10.1016/j.healthplace.2013.01.001

Gerlach-Spriggs, N., Enoch Kaufman, R. & Warner Jr., S.B. (1998). *Restorative Gardens – The Healing Landscape*. Yale University Press, New Haven / London, UK.

Grahn, P. (1991). Om parkers betydelse. ("The importance of Parks" – Google translate.) [Swedish] *Stad & Land Nr. 93. Movium* – Swedish University of Agricultural Sciences.

Grahn, P., Stigsdotter, U.K. & Berggren-Bärring, AM. (2005). A planning model for designing sustainable and healthy cities. The importance of people's need of recreational environments in an urban context. *Volume: Post-conference proceedings "Inspiring Global Environmental Standards & Ethical Practices"*, NAEP. [30th Annual Conference, National Association of Environmental Professionals (NAEP), Virginia, USA.]

Grahn, P. & Stigsdotter, U.K. (2010). The relation between perceived sensory dimensions of urban green space and stress restoration. *Landscape and Urban Planning*, Vol. 94. (pp. 264-275).
doi: 10.1016/j.landurbplan.2009.10.012

REFERENCES continued:

Grahn, P., Tenngart Ivarsson, C., Stigsdotter, U.K. & Bengtsson, I.L. (2010). Using affordances as a health-promoting tool in a therapeutic garden. IN Ward Thompson, C., Aspinall, P. & Bell, S. [Eds.] *Innovative approaches to researching landscape and health*. Routledge, London, UK. (pp. 116-154).

Guan, H., Wei, H., He, X., Ren, Z. & An, B. (2017). The tree-species-specific effect of forest bathing on perceived anxiety alleviation of young-adults in urban forests. *Annals of Forest Research*, Vol. 60, No. 2. (pp. 327-341).
doi: 10.15287/afr.2017.897

Hartig, T. (2004). Restorative Environments. *Encyclopedia of Applied Psychology*, Vol. 3. (pp. 273-279).

Hartig, T. (2007). Three steps to understanding restorative environments as health resources. IN Ward Thompson, C. & Travlou, P. [Eds.] (2007). *Open Space – People Space*. Taylor & Francis, London, UK. (pp. 163-179).

Hartig, T. & Cooper Marcus, C. (2006). Essay Healing gardens – places for nature in health care. *The Lancet*, Vol. 368. (pp. S36-S37).

Hartig, T., Van den Berg, A., Hagerhall, C., Tomalak, M., Bauer, N., Hansmann, R., Ojala, A., Syngollitou, E., Carrus, G., Van Herzele, A., Bell, S., Camilleri Podesta, M.T. & Waaseth, G. (2011). Health Benefits of Nature Experience: Psychological, Social and Cultural Processes. IN Nilsson, K., Sangster, M., Gallis, C., Hartig, T., de Vries, S., Seeland, K. & Schipperijn, J. [Eds.] *Forests, Trees and Human Health*. (pp. 127–168).
doi: 10.1007/978-90-481-9806-1_5

Hazen, T. (2013). Therapeutic garden characteristics. *American Horticultural Therapy Association News Magazine* Vol. 41, No. 2, Suppl. 3. (pp. 3).

Herzog, T.R., Maguire, C.P. & Nebel, M.B. (2003). Assessing the restorative components of environments. *Journal of Environmental Psychology* 23. (pp. 159-170).
doi: 10.1016/S0272-4944(02)00113-5

Jencks, L. (2016). *Rakesprogress Magazine*, Summer #1. (pp. 83).

Jencks, L. (2017). Maggies Cancer Centre Gardens: Herbs, Habitat and a Search for Deep Meaning. *Lecture to Society for Architectural Historians, Glasgow*. (Notes courtesy of Lily Jencks Studio).

Joye, Y & Van den Berg, A.E. (2012). Restorative Environments. IN Steg, L., van den Berg, A. & de Groot, J. [Eds.] *Environmental Psychology: An Introduction*. British Psychological Society and John Wiley & Sons Ltd. New York, USA. (pp. 57-66).

Kaplan, R. & Kaplan, S. (1989). *The Experience of Nature – A psychological Perspective*. Cambridge University Press, New York, USA.

Kaplan, S. (1992). The Restorative Environment: Nature and Human Experience. IN Relf, D. [Ed.] *The Role of Horticulture in Human Well-Being and Social Development*. Timber Press, Portland, USA. (pp. 134-142).

Kaplan, S. (1995). The restorative benefits of Nature: Toward an integrative Framework. *Journal of Environmental Psychology*, Vol. 15. (pp. 169-182).

Kaplan, S. (2001). Meditation, Restoration, and the Management of Mental Fatigue. *Environment and Behavior*, Vol. 33, No. 4. (pp. 480-506).

Kaufman, A.J. & Lohr, V.I. (2004). Does Plant Color Affect Emotional and Physiological Responses to Landscapes? IN Relf, D. [Ed] *Acta Horticulturae*, Vol. 639. *International Society for Horticultural Science*. [Proceedings from XXVI International Horticultural Congress – Horticulture, Human Well-Being and Life Quality – Toronto, Canada]. (pp. 229-233).

Kaufman, A.J. & Lohr, V.I. (2008). Does it matter what colour tree you plant? IN Matsuo, E., Relf, P.D. & Burchett, M. [Eds.] *Acta Horticulturae*, Vol. 790. [Proceedings from VIII International People - Plant Symposium - Hyogo, Japan.] (pp. 179-184).
doi: 10.17660/ActaHortic.2008.790.25

Kellert, S.R. & Wilson, E.O. [Eds.] (1993). *The Biophilia Hypothesis*. Island Press, Washington D.C., USA.

REFERENCES continued:

Keniger, L., Gaston, K.J., Irvine, K.N. & Fuller, R.A. (2013). What are the Benefits of Interacting with Nature? *International Journal of Environmental Research and Public Health*, Vol. 10. (pp. 913-935). doi: 10.3390/ijerph10030913

Keswick Jencks, M. (1995). *A View From the Front Line*. Maggie's Cancer Caring Centre, Edinburgh / London, online publication. www.maggiescentres.org/about-maggies/news-and-publications/publications (Accessed 7 November, 2018)

Korpela, K. & Staats, H. (2014). The Restorative Qualities of Being Alone with Nature. IN Coplan, R.J. & Bowker, J.C. [Eds.] *The Handbook of Solitude: Psychological Perspectives on Social Isolation, Social Withdrawal, and Being Alone*. First Edition, John Wiley & Sons Ltd. New York, USA. (pp. 351-367).

Maggie Keswick Jencks Cancer Caring Trust. (2015). *Maggie's Architectural Brief*. www.maggiescentres.org/media/uploads/publications/other-publications/Maggies_architecturalbrief_2015 (Accessed 23 May, 2017)

Maggie Keswick Jencks Cancer Caring Trust. (post 2014). *Maggie's Architecture and Landscape Brief*. www.maggiescentres.org (Accessed 20 March, 2018)

Messer Diehl, E.R. [Ed.] (2007). *American Horticultural Therapy Association – Definitions and Positions*. American Horticultural Therapy Association (AHTA) online publication. (pp. 1-9). www.ahta.org/ahta-definitions-and-positions (Accessed 12 July, 2018)

Mumcu, S., Düzenli, T. & Özbilen, A. (2010). Prospect and refuge as the predictors of preferences for seating areas. *Scientific Research and Essays Vol. 5, No. 11*. (pp. 1223-1233).

Nicholson-Lord, D. (2003). *Green Cities – And Why We Need Them*. New Economics Foundation, London, UK.

Nordh, H., Hartig, T., Hagerhall, C.M. & Fry, G. (2009a). Components of small urban parks that predict the possibility of restoration. *Urban Forestry & Urban Greening*, Vol. 8. (pp. 225-235). doi: 10.1016/j.ufug.2009.06.003

Nordh, H., Grahn, P. & Währborg, P. (2009b). Meaningful activities in the forest, a way back from exhaustion and long-term sick leave. *Urban Forestry & Urban Greening* 8. (pp. 207-219). doi: 10.1016/j.ufug.2009.02.005

Oher, N. (2016). Evidence-based Design – From an outdoor healthcare perspective. *Unpublished – coursework for Project-based Research Training*. Swedish University of Agricultural Sciences, Alnarp.

Paine, R. & Francis, C. (1990). Hospital Outdoor Spaces. IN Cooper Marcus, C. & Francis, C. [Eds.] *People Places – Design Guidelines for Urban Open Space*. Van Nostrand Reinhold, New York, USA. (pp. 263-288).

Pálsdóttir, AM. (2014). The Role of Nature in Rehabilitation for Individuals with Stress-related Mental Disorder – Alnarp Rehabilitation Garden as Supportive Environment. *Doctoral Thesis No. 2014:45*. Faculty of Landscape Architecture, Horticulture and Crop Production Science. Swedish University of Agricultural Sciences, Alnarp.

Pálsdóttir, AM. (2015). Biodiversity as health promoting quality. *Biodiverse, No. 1*. Swedish Biodiversity Centre. (pp. 9-10).

Pálsdóttir, AM. (2016). A Salutogenic approach in Nature-Based Rehabilitation (NBR) for individuals with stress-related mental disorders. IN Jordan, M. & Hinds, J. [Eds.] (2016). *Ecotherapy – Theory, Research & Practice*. Palgrave Publishing, London, UK. (pp. 112-121).

Pálsdóttir, AM., Persson, D., Persson, B. & Grahn, P. (2014). The Journey of Recovery and Empowerment Embraced by Nature – Clients' Perspectives on Nature-based Rehabilitation in Relation to the Role of the Natural Environment. *International Journal of Environmental Research and Public Health*, Vol. 11. (pp. 7094-7115). doi: 10.3390/ijerph110707094

Pálsdóttir, AM., Stigsdotter, U.K., Persson, D., Thorpert, P. & Grahn, P. (2018). The qualities of natural environments that support the rehabilitation process of individuals with stress-related mental disorder in nature-based rehabilitation. *Urban Forestry & Urban Greening*, Vol. 29. (pp. 312-321). doi: 10.1016/j.ufug.2017.11.016

REFERENCES continued:

Pantelidou, N. (2013). Ein arkadischer Heilgarten in Dänemark. [German] *Garten & Landschaft, Vol. 4.* (pp. 22-27).

Park, B.J., Tsunetsugu, Y., Kasetani, T., Kagawa, T. & Miyazaki, Y. (2010). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. *Environmental Health and Preventative Medicine, Vol. 15.* (pp. 18-26).
doi: 10.1007/s12199-009-0086-9

Polat, A.T., Güngör, S. & Demir, M. (2017). The Design Principles of Therapeutic Gardens. *International Journal of Landscape Architecture Research, Vol. 1, No. 2.* (pp. 37-42).

Ratcliffe, E., Gatersleben, B. & Sowdon, P.T. (2013). Bird sounds and perceived restoration – Bird sounds and their contribution to perceived attention restoration and stress recovery. *Journal of Environmental Psychology, Vol. 36.* (pp. 221-228).

Relf, P.D. (2005). The therapeutic values of plants. *Pediatric Rehabilitation, Vol. 8, No. 3.* (pp. 235-237).
doi: 10.1080/13638490400011140

Sachs, N. (2017). The Healthcare Garden Evaluation Toolkit: A Standardized Method For Evaluation, Research, And Design Of Gardens In Healthcare Facilities. *Doctor of Philosophy Dissertation.* Graduate and Professional Studies of Texas A&M University, USA.

Sidenius, U., Karlsson Nyed, P., Linn Lygum, V. & Stigsdotter, U.K. (2017). A Diagnostic Post-Occupancy Evaluation of the Nacadia® Therapy Garden. *International Journal of Environmental Research and Public Health, Vol. 14, No. 882.*
doi:10.3390/ijerph14080882

Smith, J. (2007). Health And Nature: The Influence Of Nature On Design Of The Environment Of Care. *Position Paper for the Environmental Standards Council of The Center for Health Design.* Cincinnati, USA – online publication 2017.
www.healthdesign.org/chd/knowledge-repository/health-and-nature-influence-nature-design-environment-care (Accessed 10 July, 2018)

Souter-Brown, G. (2015). *Landscape and Urban Design for Health and Well-being – Using healing, sensory and therapeutic gardens.* Routledge, Milton Park, UK / New York, USA.

Stichler, J.F. & Hamilton, D.K. (2008). Evidence-Based Design: What is it? *Health Environments Research & Design Journal, Vol. 1, No. 2.* (pp. 3-4).

Stigsdotter, U.A. (2005). Landscape Architecture and Health - Evidence-based health-promoting design and planning. *Doctoral Thesis 2055:55.* Faculty of Landscape Planning, Horticulture and Agricultural Science, Department of Landscape Planning. Swedish University of Agricultural Sciences, Alnarp.

Stigsdotter, U.K. & Grahn, P. (2002). What Makes a Garden a Healing Garden? *Journal of Therapeutic Horticulture, Vol. 13.* (pp. 60-69).

Stigsdotter, U.K. & Grahn, P. (2003). Experiencing a Garden: A Healing Garden for People Suffering from Burnout Diseases. *Journal of Therapeutic Horticulture, Vol. 14.* (pp. 38-49).

Stigsdotter, U.K., Pálsdóttir, A.M., Burls, A., Chermaz, A., Ferrini, F. & Grahn, P. (2011). Nature-Based Therapeutic Interventions. IN Nilsson, K., Sangster, M., Gallis, C., Hartig, T., de Vries, S., Seeland, K. & Schipperijn, J. [Eds.] *Forests, Trees and Human Health.* (pp. 309-342).
doi: 10.1007/978-90-481-9806-1_11

Tenngart Ivarsson, C. (2011). On the Use and Experience of a Health Garden - Exploring the Design of the Alnarp Rehabilitation Garden. *Doctoral Thesis 2011:89.* Faculty of Landscape Planning, Horticulture & Agricultural Science / Department of Work Science, Business Economics & Environmental Psychology – Swedish University of Agricultural Sciences, Alnarp.

Tenngart Ivarsson, C. & Grahn, P. (2010). Patients' experiences and use of a therapeutic garden: from a designer's perspective. *Schweizerische Zeitschrift für Forstwesen, Vol. 161, No. 3.* (pp. 104-113).
doi: 10.3188/szf.2010.0104

REFERENCES continued:

Tenngart Ivarsson, C. & Grahn, P. (2012). Differently Designed Parts of a Garden Support Different Types of Recreational Walks: Evaluating a Healing Garden by Participatory Observation. *Landscape Research*, Vol. 37, No. 5. (pp. 519-537). doi: 10.1080/01426397.2011.641948

Thorpert, P. & Busse Nielsen, A. (2014). Experience of vegetation-borne colours. *Journal of Landscape Architecture*, Vol. 9, No. 1. (pp. 60-69). doi: 10.1080/18626033.2014.898834

Ulrich, R.S. (1983). Aesthetic and affective response to natural environment. IN Altman, I. & Wohlwill, J. [Eds.] *Human Behavior and Environment*, Vol. 6. Plenum, New York, USA. (pp. 85-125). doi: 10.1007/978-1-4613-3539-9_4

Ulrich, R.S. (1984). View Through a Window May Influence Recovery from Surgery. *Science*, Vol. 224, Issue 4647. (pp. 420-421).

Ulrich, R.S. (1986). Human Responses to Vegetation and Landscapes. *Landscape and Urban Planning*, Vol. 13. (pp. 29-44).

Ulrich, R.S. (1993). Biophilia, Biophobia, and Natural Landscapes. IN Kellert, S.R. & Wilson, E.O. [Eds.] *The Biophilia Hypothesis*. Island Press, Washington D.C., USA. (pp. 73-137).

Ulrich, R.S. (1999). Effects of Gardens on Healthcare Outcomes: Theory and Research. IN Cooper Marcus, C. & Barnes, M. [Eds.] (1999). *Healing Gardens – Therapeutic Benefits and Design Recommendations*. John Wiley & Sons Inc., New York, USA. (pp. 27-86).

Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M. & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, Vol. 11. (pp. 201-230).

Valente, R. & Cooper Marcus, C. (2015). Healing Gardens: design processes and realizations of beneficial environments. *TECHNE*, Vol. 09. Firenze University Press, Florence, Italy. (pp. 180-190). doi: 10.13128/Techne-16120

Van den Berg, A.E., Jorgensen, A. & Wilson, E.R. (2014). Evaluating restoration in urban green spaces: Does setting make a difference? *Landscape and Urban Planning* 127. (pp. 173-181). doi: 10.1016/j.landurbplan.2014.04.012

William Thompson, J. (1998). A Question of Healing. *Landscape Architecture* Vol. 88, No. 4. (pp. 67-73 / 89-92).

Beatley, T. (2011)

“Nature in our lives is not optional but essential. We need it for our emotional health and well-being, and we need it for planetary health as well. It is not a thing or a place that we periodically visit but a surrounding condition, an ideally ubiquitous context that delights, relaxes, soothes, replenishes, inspires, and uplifts us in our daily urban lives.”

Biophilic Cities - Integrating Nature into Urban Design and Planning. (p. 16).