



Outdoor environments in healthcare settings: A quality evaluation tool for use in designing healthcare gardens



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ABSTRACT

This article presents the first outline of a quality evaluation tool (QET) to be used in the process of designing outdoor environments in healthcare settings, e.g. healthcare gardens. Theory triangulation is used to integrate theories and evidence from selected research on people's health/well-being and the outdoor environment. The results first present the theoretical principles underlying the tool and justifying its practical construction. Then, 19 environmental qualities constituting the backbone of the practical tool are presented, including six qualities based on the need to be comfortable in the outdoor environment and 13 qualities based on the need for access to nature and surrounding life. Furthermore, this work presents suggestions of how the tool might include concepts dealing with how users can become involved in the design process, as well as general design guidelines corresponding to the various needs and wishes users may have. The paper ends with a discussion that, among other things, relates the QET to evidence-based design, salutogenesis and pathogenesis.

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Introduction

Research conducted during recent decades has demonstrated how the outdoor environment can serve as a resource for recovery and rehabilitation (e.g., Ulrich et al., 2008; Währborg et al., 2014). These findings have resulted, among other things, in the establishment of gardens in connection with healthcare settings. Post-occupation evaluation (POE) examines the effectiveness of occupied designed environments for human users (Zimring and Reizenstein, 1980) and is the most common method of examining garden environments in healthcare settings (Cooper Marcus and Barnes, 1999a). POEs of such settings examine, e.g., the patterns of use, benefits of use (Whitehouse et al., 2001; Sherman et al., 2005) as well as the design goals and garden features (Heath and Gifford, 2001). POEs seek to assess the quality of existing projects based on the opinions of occupants (Vischer and Zeisel, 2008), and therefore must be conducted after the design process has been completed. In their review, Ulrich et al. (2008) pointed out that healthcare design is now moving toward evidence-based design (EBD). Vischer and Zeisel (2008, pp. 58) considered POE and EBD to be two related pre-design activities and stated that, compared

with POE, "evidence-based research draws on a broader base of stakeholders than simply the occupants of the building at a specific time." The present article intends to combine the implications of POE for design with theories and results from various disciplines studying therapeutic environments to create a comprehensive tool for applying EBD processes to new as well as existing garden environments in healthcare settings. Evidence-Based Practice is used in many academic areas, and has long been used in medicine (Viets, 2009). EBD allows designers who are developing environments in healthcare settings to communicate with healthcare professionals using an established concept (Hamilton and Shepley, 2010).

A salutogenic perspective on garden environments in healthcare settings

EBD often takes a salutogenic perspective. Salutogenesis is the study of health development, and thus salutogenic strategies include efforts to create, enhance and improve physical, mental and social well-being and to move toward optimal well-being (Antonovsky, 1979, 1996). In contrast, pathogenesis focuses on disease origins and causes, and thus pathogenic strategies aim to avoid, manage or eliminate disease and infirmity (Antonovsky, 1996; Becker et al., 2010). According to Becker et al. (2010), research has shown that decreasing a negative state does not necessarily increase positive states. Antonovsky (1979, 1996) argued that more

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than preventive efforts are needed if we are to promote health. In 1979, Antonovsky put forward the concept of salutogenesis as a complement to the concept of pathogenesis. Used in combination, pathogenic and salutogenic strategies should work to create an environment that nurtures, supports and facilitates optimal well-being (Becker et al., 2010). Thus, from this perspective, outdoor environments intended to support health need to consider risk factors as well as salutary factors.

Several of the concepts related to garden environments in healthcare settings are relevant to the notions of salutogenesis and pathogenesis. Cooper Marcus and Barnes (1999b) pointed out three aspects of the healing process that help clarify how garden environments can have therapeutic benefits: (1) relief from physical symptoms, (2) stress reduction and (3) improvement of the overall sense of well-being. These three aspects correspond to pathogenic as well as salutogenic strategies. Cooper Marcus and Barnes further stated that “Any environment can hinder as well as enhance these components of healing” (1999b, pp. 3). They also made a distinction between (1) gardens that allow passive experiences of nature and (2) gardens for physical rehabilitation or horticultural therapy. The term healing garden often refers to more passive experiences of nature (Cooper Marcus and Barnes, 1999b; Stigsdotter and Grahn, 2002, 2003; Sempik et al., 2010). From a salutogenic perspective, if we are to fulfill the potential of a garden to optimize health, we need to consider design aspects related to passive experiences of the environment as well as to activities in the environment. In the present article, we will hereafter use the term ‘healthcare garden’ to refer to the unique health-promoting potential of garden environments in healthcare settings to offer experiences of both passive and active engagement with nature.

Basic theories

Knowledge of previous research on restorative environments is fundamental when studying garden environments in healthcare settings. The two predominant theories explaining restorative responses to nature are the Attention Restoration Theory (ART) (Kaplan and Kaplan, 1989) and the psycho-evolutionary theory (Ulrich, 1984; Ulrich et al., 1991). Kaplan and Kaplan’s ART describes the psychological benefits of restorative environments as well as the qualities characterizing such environments (Kaplan and Kaplan, 1989; Kaplan, 1995). Their basic conviction is that humans have two kinds of attention: directed attention versus soft fascination. Directed attention requires mental effort, and its overuse may lead to directed attention fatigue. However, a shift to soft fascination may facilitate restoration and recovery from directed attention fatigue. According to Kaplan (1992), many illnesses, traumatic experiences and difficult life transitions place extreme demands on directed attention, and therefore people in such situations may benefit from restorative experiences. A restorative environment offers experiences that promote recovery from directed attention fatigue and supports a reflective mode, where one can step back and consider one’s life and priorities. Recovery from directed attention fatigue may be temporary and measures are required to avoid relapsing into the fatigue state again. For this reason, the reflective mode is crucial to positive change and moving toward optimal health and well-being, and thus to striving to move in a salutogenic direction. On the basis of this line of reasoning, we can conclude that restorative environments are connected to both pathogenic and salutogenic strategies.

The Kaplans’ ART (Kaplan and Kaplan, 1989) and Ulrich’s (Ulrich et al., 1991) psycho-evolutionary theory both build on the notion that people have an inherent ability to attend to vegetation, water and other physical features of the environment that have been beneficial to survival and well-being during human evolution. Ulrich’s theory, however, contradicts the Kaplans’ cognitive perspective

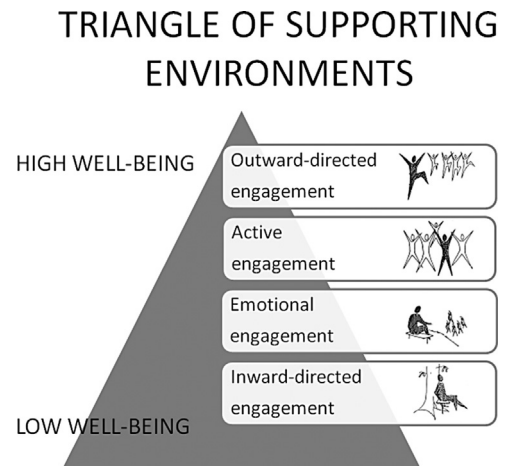


Fig. 1. Triangle of supporting environments.

when it suggests that immediate, preconscious, affective responses play a central role in the initial stage of responding to nature (Ulrich et al., 1991). According to Ulrich, the initial affective response influences attention, physiological responses and behavior differently depending on whether it is positive or negative. This response process is adaptive because it triggers approach-avoidance behavior that fosters ongoing well-being or survival (Ulrich et al., 1991). Both the Kaplans’ and Ulrich’s theories claim that natural environments are particularly restorative. However, more recent research findings have shown that mixed built and natural scene types are particularly restorative (Peron et al., 2002). Tenngart Ivarsson and Hägerhäll (2008) even suggested that the restorative qualities described by Kaplan and Kaplan are essential properties of man-made healthcare gardens.

Stigsdotter et al. (2011) discussed a gap between the research and programs focusing on passive involvement with nature (e.g., Ulrich, 1999; Kaplan, 1995) versus active participation with nature (e.g., Relf, 1999). Approaches emphasizing active participation suggest that working in a garden can be particularly rewarding because: (1) human existence is based on and dependent on plants, (2) observing the beauty of plants and animals distracts us from our problems, (3) by cultivating we develop attachment and (4) horticultural activities facilitate integration into society (Relf, 1999; Stigsdotter et al., 2011). Thus, even when the focus of research and programs is on active participation in nature, there would seem to be no contradiction between this focus and the Kaplans’ and Ulrich’s theories on restorative responses to nature. In this context, Grahn’s triangle of supporting environments (Fig. 1) is a useful model because it combines aspects of both passive and active engagement with nature. The triangle of supporting environments illustrates how a person’s relationship with the physical and social environment is dependent on his/her subjective experience of well-being (Grahn et al., 2010). At the bottom of the triangle, experienced well-being is low and sensitivity to the environment is high. A person at this stage can manage inward-directed engagement. Successively, as his/her well-being increases, sensitivity to the environment decreases. At the top of the triangle, the person’s well-being is high and sensitivity to the environment low. At this stage, he/she can manage outward-directed engagement (Grahn et al., 2010). The two intermediate steps illustrating the transition from bottom to top are emotional engagement followed by active engagement (Fig. 1).

Grahn’s triangle of supporting environments originally stems from studies on public parks, but has more recently been used as a theoretical basis in explaining interaction with the outdoor environment among individuals suffering from stress-related illnesses

(Grahn et al., 2010; Tengart Ivarsson, 2011) and among those greatly affected by crises (Ottosson, 2007; Ottosson and Grahn, 2008). It has also proved useful in the process of designing healthcare gardens (Stigsdotter and Grahn, 2002, 2003).

The above-mentioned theories all seem to be relevant to the process of designing outdoor environments in healthcare settings. Still, it is not obvious how they should be translated into guidelines concerning the content and design of such gardens. Cooper Marcus and Barnes (1999a) stated that, when designing environments intended to facilitate healing, the design needs to support the healing process. However, as Tengart Ivarsson (2011) pointed out, existing frameworks are difficult to use because they list features rather than guiding design. To bridge the gap between research and design and to achieve evidence-based design of healthcare gardens, there is a need to integrate theories on the interaction between people and the outdoor environment and evidence from, e.g., POEs revealing important features of the outdoor environment in healthcare settings.

Aims of the study

The main purpose of the present paper is to compile and integrate theories and evidence that have implications for the process of designing outdoor environments in healthcare settings. In addition, to clarify the integration of theories and qualities, a first preliminary outline of an evidence-based tool to be used in such design processes is presented. The focus is thus on the description and clarification of the environmental qualities and the theoretical context, which together are intended as the fundamental basis of this forthcoming practical quality evaluation tool.

Method

The overall method was to synthesize theories and evidence of relevance to the design and content of garden environments in healthcare settings. This is in accordance with theory triangulation, which was described by Patton (2002) as the use of multiple theoretical perspectives to examine and interpret data. Thus, in the present study, theory triangulation was used to begin the development of an evidence-based tool that we henceforth call the quality evaluation tool (QET).

The procedure comprised two steps: (1) developing the theoretical principles of the QET and (2) beginning the development of the practical construction of the QET. To increase validity, each step was carried out using a process in which the two authors discussed the principles, construction and content of the QET until consensus was reached.

Developing the theoretical principles of the QET

The theoretical principles are intended to illustrate how the QET is related to basic theories of restorative environments and to clarify the theoretical evidence-based nature of the QET. Theories and models were selected that have implications either for general design or for constituents of outdoor environments in healthcare settings. One theory was used as the foundation, and other theories and concepts were then related to this theory using a set of models. These models formed the basis for developing the practical structure of the QET.

Developing the practical construction of the QET

This article takes a first step toward the practical construction of the QET, to present an outline for future expansion. This first step mainly regards the development of environmental qualities. As the

QET is intended to be used in EBD processes in healthcare settings, the environmental qualities are based on evidence-based research. Evidence that is useful in design processes is based on both quantitative and qualitative research (Viets, 2009). To increase the validity further, all evidence (i.e., environmental qualities) included in the present study is confirmed by multiple sources and originates either from international peer reviewed journals or from reputable scientific anthologies. However, credible evidence-based explanations are achieved only when they are based on good theoretical models (Giacomini, 2009). Hence, our aim is to integrate evidence based on field research (interventions, POEs, questionnaires, interviews, observations) with theories in health and design.

The basic ambition has been to encompass a wide range of needs: from basic human needs to the general needs of individuals in healthcare settings. Thus, the QET aims to include needs due to poor general health in connection to impaired physical and/or cognitive functions as well as emotional disabilities and fatigue. The following works have had particular influence on the overall set-up of the QET and on the environmental qualities in particular:

- Grahn et al.'s (2010) eight main dimensions of experience that constitute the fundamental building blocks of parks and gardens and that has been evaluated in a Swedish healthcare garden.
- Cooper Marcus' (2007) ten design guidelines for hospital outdoor space, for the garden to be used and reach its full potential.
- Bengtsson and Carlsson's (2006, 2013) descriptions of 10 respective 12 themes describing nursing home residents' needs and sensitivities in their contact with the outdoor environment.
- Rodiek's (2008) tool for evaluating senior living environments; a tool that consists of seven environmental principles with nine to ten assessable items in each.

In addition, research focusing on other groups with specific needs with regard to the outdoors has been added from particular POE studies, as well as from Cooper Marcus and Barnes' (1999a,b) anthology.

The collected data were processed to allow description of coherent environmental qualities that are intended to be useful in design processes. The number of qualities and their descriptions were carefully considered so as to achieve a diverse but still workable tool. The theoretical principles were used as a guide to place the environmental qualities in a larger context, the aim being to achieve design solutions of a general character that facilitate healing processes, as advocated by Cooper Marcus and Barnes (1999b) and Tengart Ivarsson (2011). The theoretical principles were also used to determine the basic order of qualities listed in the QET. In addition to this, empirical studies reported by Grahn et al. (2010) determined the order of certain qualities (i.e., the earlier-mentioned nature dimensions). Each quality was labeled with one umbrella term, sometimes originating from different sources. The qualities are presented with references to their sources. Each quality is exemplified with at least one photo. The next step of the practical construction of the QET will be to clarify the disposition of the environmental qualities in relation to the different steps in the design process. A first preliminary outline describing the overall principles of this disposition is presented in Table 1.

Results

The theoretical principles of the QET

If the triangle of supporting environments (Fig. 1) is to be translated into a healthcare garden that aims for optimal well-being (as described by Becker et al., 2010), it should contain a combination of pathogenic strategies, i.e. avoiding risk factors, and salutogenic

Table 1
An outline of the overall structure of QET.

Environmental qualities	Step 1. Investigation of environmental qualities in the outdoor environment	Step 2. Evaluation of qualities importance to potential users	Step 3. Suggested measures
<p>Section A.</p> <p>Six environmental qualities allowing persons to be comfortable in the outdoor environment:</p> <ol style="list-style-type: none"> 1. Closeness and easy access 2. Enclosure and entrance 3. Safety and security 4. Familiarity 5. Orientation and way finding 6. Different options in different kinds of weather 	<p>Summary of Section A:</p> <ul style="list-style-type: none"> - overall observations - additional observations 		<p>A. Suggested measures for comfortable design</p> <p>Note that comfortable design needs to be considered in the environment as a whole so that everyone, irrespective of physical and cognitive condition, is able to use and experience the garden in its entirety.</p>
<p>Section B.</p> <p>Thirteen environmental qualities supporting persons' access to nature and surrounding life:</p> <ol style="list-style-type: none"> 1. Joyful and meaningful activities 2. Contact with surrounding life 3. Social opportunities 4. Culture and connection to past times 5. Symbolism/reflection 6. Prospect 7. Space 8. Rich in species 9. Sensual pleasures of nature 10. Seasons changing in nature 11. Serene 12. Wild nature 13. Refuge 	<p>Summary of Section B:</p> <ul style="list-style-type: none"> - overall observations - additional observations 		<p>B. Suggested measures for inspiring design</p> <p>Note that the qualities of inspiring design should be placed according to the gradient of challenge so that users can choose whether or not they wish to confront from the more challenging qualities.</p>

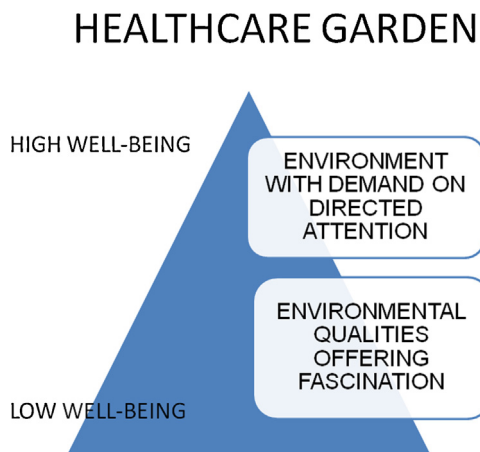


Fig. 2. The triangle of supporting environments in relation to the Kaplans' attention restoration theory.

strategies, i.e. supporting salutary factors. In the context of healthcare gardens, we interpret risk factors as those that would cause a person not to be able or not to dare to go out in and/or use the garden, or that would cause actual danger to a person when using the garden. Similarly, we interpret salutary factors as attractive qualities that are desired and preferred in the garden and that encourage people to go outdoors.

If the triangle of supporting environments is related to the Kaplans' two kinds of attention (Kaplan and Kaplan, 1989), our suggestion is that people situated at the bottom of the triangle need environments offering soft fascination, whereas people situated at the top of the triangle can handle an environment with higher demands on directed attention (Fig. 2).

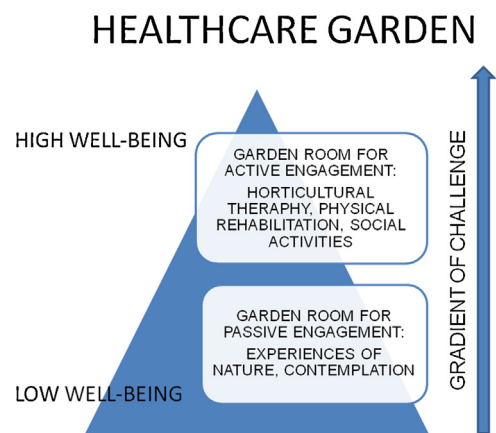


Fig. 3. The triangle of supporting environments in relation to the gradient of challenge.

This gradual increase in the demand on attention in the environment, which we would like to call the *gradient of challenge*, is an important health-promoting aspect of the overall design of the healthcare garden and reflects the healing process. Thus, the garden needs to provide a continuum of environmental qualities offering everything from passive experiences of nature to active interaction with people and natural elements (Fig. 3).

The triangle of supporting environments has been combined with research on experienced qualities in green open spaces in terms of nature dimensions (Grahn et al., 2010), defined as eight Perceived Sensory Dimensions (PSDs) by Grahn and Stigsdotter (2010). In green spaces, parks and gardens, people generally prefer eight PSDs. The most preferred is *serene*, followed by *space*, *nature*, *rich in species*, *refuge*, *culture*, *prospect* and *social*. The more PSDs there are in a park, the more popular the park is (Björk et al.,

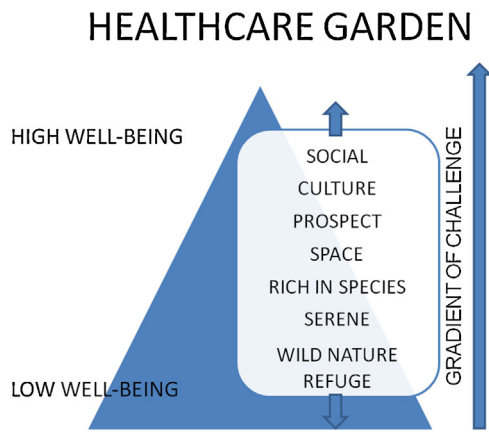


Fig. 4. The triangle of supporting environments in relation to nature dimensions in healthcare gardens.

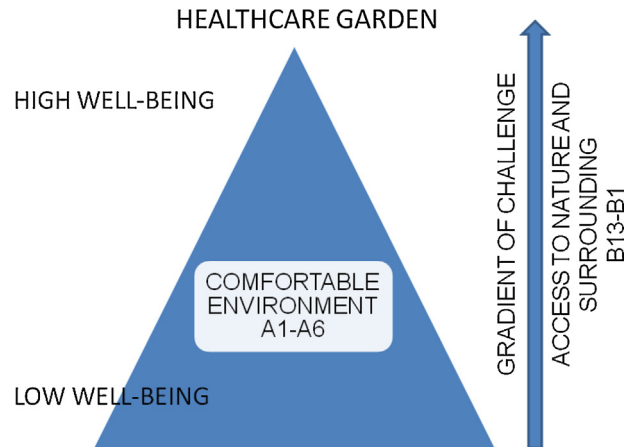


Fig. 6. Model of the practical construction of the QET.

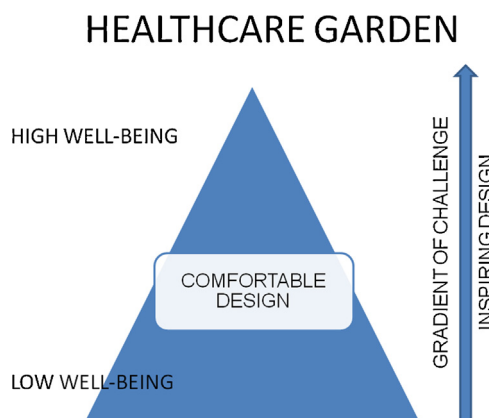


Fig. 5. The triangle of supporting environments in relation to general design concepts.

2008; Grahn and Stigsdotter, 2010). PSDs have been evaluated in a Swedish healthcare garden intended for people with stress-related mental disorders (Stigsdotter and Grahn, 2002, 2003; Grahn et al., 2010; Tengart Ivarsson and Grahn, 2010; Tengart Ivarsson, 2011). The results suggest that the PSD *refuge* followed by *wild nature* and *serene* are particularly important at the beginning of the rehabilitation period. Later on, the dimensions *rich in species*, *space* and *prospect* are important. Then, the dimension *culture* and little by little the dimension *social* seem to become important during the later stage of the rehabilitation process (Grahn et al., 2010). The temporal order of the PSDs suggests a connection between different environmental qualities and the healing process that is in line with the gradient of challenge illustrated in Fig. 4.

In order to understand the design implications of the triangle of supporting environments and the concepts related to it in Figs. 2–4, we find Bengtsson and Carlsson's (2006, 2013) concepts of comfortable design and inspiring design to be useful. Comfortable design is intended to meet the need for comfort in the outdoor environment by providing security, safety and comfort and, thus, is in accordance with the pathogenic strategies of avoiding risk factors. Inspiring design is intended to meet the need for access to nature and surrounding life by providing variation and change in daily life, the freedom to choose among alternatives and stimulation of the senses and intellect and, thus, is in accordance with salutogenic strategies supporting salutary factors. Comfortable design needs to be considered in the environment as a whole so that everyone, irrespective of physical and cognitive condition, is able to use and experience the garden in its entirety (Fig. 5). According to Bengtsson and Carlsson

(2013), some users are eager to obtain new impressions, whereas others are very sensitive to anything unknown. For this reason, the qualities of inspiring design should be placed according to the gradient of challenge so that users can choose whether or not they wish to confront the more challenging qualities (Fig. 5). Also, the deliberate disposition of salutary factors supports the healing process and is the basis that allows people to move upward in the triangle. The three concepts of comfortable design, inspiring design and the gradient of challenge are intended to be used as guides in the design process using the QET, as they place individual environmental qualities in a larger context. In relation to the users' specific wishes and needs, a well-considered gradient of challenge and a balance of comfortable and inspiring design are key to designing a pleasant healthcare garden (Bengtsson et al., in press).

Outline of the practical construction of the QET

Our idea so far is that the QET should consist of four columns corresponding to different steps in the design process (Table 1). Column 1 presents the environmental qualities in the order implied by the theoretical principles. Column 2 corresponds to step 1 in the design process and involves an investigation of the environmental qualities in a specific target environment. Column 3 corresponds to step 2 in the design process and involves an evaluation of the importance of each quality to the specific users. Column 4 corresponds to step 3 in the design process and involves drawing conclusions about the measures needed in the target environment based on steps 1 and 2.

Column 1 (i.e., the environmental qualities) is the main focus of the present findings. A preliminary outline of Columns 2, 3 and 4 is presented following the presentation of the environmental qualities.

Column 1 includes 19 environmental qualities. To clarify the design implications of these qualities, they are divided into two sections based on Bengtsson and Carlsson's main themes (2006, 2013). Section A describes aspects of how to be comfortable in the outdoor environment and lists six environmental qualities that people need to be able to and to dare to go out. These qualities need to be considered in the environment as a whole (Figs. 5 and 6). Section B describes 13 qualities of access to nature and surrounding life that provide for different possibilities to experience and use the outdoor environment. In Section B, the order of qualities is based on the above-mentioned gradient of challenge (Figs. 3 and 4). Thus, Section B begins with the more demanding qualities and moves down along the gradient of challenge to the less demanding ones (Figs. 5 and 6).



Fig. 7. Closeness and easy access. Outdoor environment close at hand and clearly visible from inside the building.



Fig. 9. Enclosure and entrance. Hedges and plantings in stages create enclosure without confining.



Fig. 8. Closeness and easy access.



Fig. 10. Enclosure and entrance. Several hedge gates accentuate the entrance to the welcome garden in the Alnarp rehabilitation garden.

Section A. Six environmental qualities “to be comfortable in the outdoor environment”

Closeness and easy access

The outdoor environment is physically close to, visible and easily accessible from those parts of the indoor environment where users spend time (Bengtsson and Carlsson, 2006, 2013; Rodiek, 2008). Technical properties, e.g. locking devices, doors and thresholds, support both getting outdoors and getting back inside (Bengtsson and Carlsson, 2006, 2013) (Figs. 7 and 8).

Enclosure and entrance

The enclosure of the outdoor environment corresponds to the degree of safety and security needed by the users (Zeisel and Tyson, 1999; Bengtsson and Carlsson, 2006, 2013; Eriksson et al., 2011). However, the garden must not feel confined (Cooper Marcus, 2007; Bengtsson et al., in press) (Fig. 9).

Consider whether gates should be disguised, e.g. as part of the fence, to protect users with cognitive difficulties who may be prone to wandering outside the garden (Zeisel and Tyson, 1999). On the other hand, a deliberate design of the entrance to the garden, creating a distinction between the outer world of everyday life and struggle, and the garden as a safe place where you do not have

to keep up appearances, is beneficial to sensitive users (Pálsdóttir, 2014) (Fig. 10).

Safety and security

- The outdoor environment is safe and secure to use without risking any physical unpleasantness (Bengtsson and Carlsson, 2006, 2013; Cooper Marcus, 2007; Rodiek, 2008), e.g. the risk of falling or sliding, of toxic plants and of falling into water. Ground covers are accessible with regard to their width, surface, gradient and edges. Distances between benches and the availability of handrails fit the users' needs (Bengtsson and Carlsson, 2006, 2013) (Fig. 11).
- The outdoor environment is safe and secure to use without risking any psychological unpleasantness (Bengtsson and Carlsson, 2006, 2013; Cooper Marcus, 2007; Rodiek, 2008), e.g. the risk of intrusion or of unwillingly being viewed by outsiders. Consider the risk of garden users possibly intruding on the privacy of those situated indoors (Cooper Marcus and Barnes, 1999c; Sachs, 1999; Sherman et al., 2005) and vice versa. Take into consideration that ambiguous design elements are more likely to cause stressful reactions to fragile and vulnerable people than to



Fig. 11. Safety and security. Much appreciated handrails along walking paths in a Swedish nursing home garden.



Fig. 13. Familiarity. The hammock is a familiar feature of the home garden.



Fig. 12. Safety and security. Plantings with soft shapes and colors in the Alnarp rehabilitation garden.



Fig. 14. Orientation and way finding. A number of seats and varying plantings along distinctly shaped paths.

healthy individuals (Ulrich, 1999). In a healthcare garden, sensitive users often perceive soft shapes and soft colors, e.g. green, lilac, blue and white, as comfortable and soothing, whereas hard angular shapes and intense colors, e.g. red, orange and yellow, are too demanding to them. Furthermore, sounds of nature, e.g. wind and water, are preferred, whereas manmade sounds and sounds of city life are perceived as disturbing (Pálsdóttir, 2014). Accordingly, shapes, color schemes and sounds should be in line with the gradient of challenge, thus placing more challenging features in places where users can choose to go or not to go (Fig. 12).

Familiarity

The outdoor environment appears to be a natural part of the healthcare setting (Whitehouse et al., 2001; Cooper Marcus, 2007). It is easy to familiarize oneself with the outdoor environment (Bengtsson and Carlsson, 2006, 2013; Cooper Marcus, 2007). Different parts of the outdoors are perceived to be connected in a whole (i.e., to have high coherence), which is important to familiarity (Bengtsson et al., in press). Garden features, plants and activities are familiar to users and help them feel at home (Bengtsson and

Carlsson, 2006, 2013). People in the environment are familiar to the users (Fig. 13).

Orientation and way finding

The distribution and design of paths, places, landmarks, nodes and edges are distinct and aid in understanding and orientation (Mc Bride, 1999; Zeisel and Tyson, 1999). For instance, it is important for users with orientation difficulties to have paths without dead ends and to have a variety of distinct places along these paths that offer different experiences and activities. There should be major landmarks, such as the doorway back into the building, that can be seen from everywhere in the garden. Boundaries between private places and public places need to be clear.

The balance of complexity and unity support the user's ability to orientate in the environment (Bengtsson et al., in press) (Fig. 14).

Different options in different kinds of weather

Paths and places should offer variation in terms of sun, shade, protection from the wind and shelter from the rain (Bengtsson and Carlsson, 2006, 2013) (Fig. 15).



Fig. 15. Different options in different kinds of weather. Possibilities for taking a walk in all kinds of weather.



Fig. 17. Joyful and meaningful activities. Playful features bring pleasure to children visiting the healthcare setting.



Fig. 16. Joyful and meaningful activities. This bridge blends into the environment and gives opportunities for walking training.



Fig. 18. Contact with surrounding life. View of city life from inside nursing home garden in Copenhagen.

Section B. 13 environmental qualities of “access to nature and surrounding life”

Section B begins with the more demanding qualities and moves down along the gradient of challenge to the less demanding qualities.

Joyful and meaningful activities

Activities provided in the garden correspond to the user’s wishes and needs and are in line with the gradient of challenge. There are areas for stationary activities (e.g., relaxing, drinking coffee and reading), social activities, physical activities, therapy activities and garden activities (Bengtsson and Carlsson, 2006, 2013). There are different walking routes: those for contemplative use as well as for exercise (Cooper Marcus, 2007). There are possibilities for children to visit the garden to play and interact with the environment (Whitehouse et al., 2001) (Figs. 16 and 17).

Contact with surrounding life

It is possible to engage in the life going on in the surroundings, e.g. things that move and change, pets, people, traffic and

city/community life (Bengtsson and Carlsson, 2006, 2013; Rodiek, 2008).

Consider the possibility of viewing the surroundings from different places in the garden and whether paths should connect the garden with the surroundings (Bengtsson et al., in press) (Figs. 18 and 19).

Social opportunities

There are places for amusement and pleasure where you can meet and look at people (Bengtsson and Carlsson, 2006, 2013; Grahn et al., 2010). There are plants and things to discuss. There are areas with outdoor tables and chairs for informal meetings (Cooper Marcus, 2007). There are possibilities to socialize in different ways, e.g. places where many people can gather, places for users and visitors to be together by themselves, and places that offer the possibility to interact with people from outside the healthcare setting (Bengtsson and Carlsson, 2013) (Figs. 20 and 21).

Culture and connection to the past

There are areas that offer fascination with human culture, and that show signs of people’s values and toil (Grahn et al., 2010). There are elements that stimulate memory, such as a clothesline, a hand



Fig. 19. Contact with surrounding life. View of marina life from inside a nursing home garden in Sweden.



Fig. 22. Culture and connection to past times. Finnish hospital garden enclosed by a traditional Scandinavian "gårdsgård" fence.



Fig. 20. Social opportunities. A flexible environment offering everyone an outdoor treat.



Fig. 21. Social opportunities.



Fig. 23. Culture and connection to past times. Decorations and playful elements give a cozy feeling and signify that the garden is taken care of.

pump or a barbecue (Zeisel and Tyson, 1999). Design and content give the environment its own special character and meaning and are something to be proud of (Cooper Marcus and Barnes, 1999c; Bengtsson and Carlsson, 2006, 2013) (Figs. 22 and 23).

Symbolism/reflection

There are elements that generate thoughts about the symbolism and metaphors existing between one's life and nature (Cooper Marcus, 2007; Tenngart Ivarsson, 2011). The experience of timelessness in relation to a stone covered with a blanket of moss is one example of such symbolism (Ottosson, 2001). However, to some users, nature's power of transformation displayed for instance in



Fig. 24. Symbolism. A tree in the evening sun.



Fig. 26. Space. A bridge from the oncology department straight into a verdant garden oasis.



Fig. 25. Prospect.



Fig. 27. Rich in species.

intense spring greenery is too overwhelming and even aggressive, since it does not reflect the user's own capacity for transformation (Ottosson, 2007) (Fig. 24).

Prospect

There are inviting green open spaces and views of well-managed nature, greenery and plants (Bengtsson and Carlsson, 2006, 2013; Grahn et al., 2010) (Fig. 25).

Space

There are areas offering a restful feeling of entering another world, a coherent whole (Grahn et al., 2010) (Fig. 26).

Rich in species

There are areas with a variety of species of animals and plants that offer diverse expressions of life (Grahn et al., 2010) (Fig. 27).

Sensual pleasures of nature

There are opportunities to see, feel, hear, smell and taste the gifts of nature, e.g. trees, plants, flowers, fruits, animals and insects. There are opportunities to experience natural elements such as the sun, sky, wind, water, dawn and dusk (Bengtsson and Carlsson, 2006, 2013; Cooper Marcus, 2007) (Figs. 28 and 29).



Fig. 28. Sensual pleasures of nature. Bushes along the walking path make it possible to touch and smell the lilacs.



Fig. 29. Sensual pleasures of nature. Enjoying the sun, sky, wind and water by the seaside.



Fig. 31. Serene. An undisturbed place for relaxation.



Fig. 30. Seasons changing in nature. Time to harvest.

Seasons changing in nature

There are opportunities to follow the seasons changing as reflected in plants, experiences and activities outdoors (Bengtsson and Carlsson, 2006, 2013), thus offering temporal cues to users with cognitive difficulties (Zeisel and Tyson, 1999; Sachs, 1999) (Fig. 30).

Serene

There are undisturbed areas that are not crowded. Well-maintained areas and calming elements such as water and greenery offer relaxation, peace and silence (Bengtsson and Carlsson, 2006, 2013; Grahn et al., 2010). The sounds produced by water are particularly soothing (Whitehouse et al., 2001; Sherman et al., 2005; Bengtsson and Carlsson, 2006) (Fig. 31).

Wild nature

It is possible to experience nature on its own terms. There are areas with plants that seem to be wild and to have developed without human influence (Grahn et al., 2010) (Fig. 32).

Refuge

There are enclosed and secluded, verdant places where users can potter and play, be alone, have private discussions or just sit and watch people from a distance (Bengtsson and Carlsson, 2006,



Fig. 32. Wild nature. Cherry trees in a freely growing meadow.

2013; Grahn et al., 2010; Tenngart Ivarsson, 2011). There are private spaces where staff can take breaks (Sachs, 1999; Sherman et al., 2005). Some users have a strong need to be alone with nature (Ottosson, 2001; Pálsdóttir, 2014) To particularly sensitive users, a design with two paths leading to the refuge places is important as it gives the possibility of escape if someone approaches (Pálsdóttir, 2014) (Figs. 33 and 34).

Outline of QET Columns 2, 3 and 4

Column 2 corresponds to the first step in the design process and involves an investigation of the qualities in the outdoor environment. In this step, every environmental quality in the target environment is investigated by a landscape architect. It is important that the landscape architect consider the whole environment and not only the particular garden because, for example, some qualities may be available only in the wider context of the neighborhood. The research has pointed out four essential aspects to investigate thoroughly as regards contact with the outdoors: (1) from inside the building, e.g. windows (Kaplan, 1981, 2001; Bengtsson and Carlsson, 2006; Cooper Marcus, 2007); (2) transition zones, e.g. winter garden, balcony or entrance area (Chalfont and Rodiek, 2005; Chalfont, 2008; Rodiek, 2008); (3) the immediate surroundings, e.g. park or garden (Cohen-Mansfield and Werner,



Fig. 33. Refuge. Refuge places in the Alnarp rehabilitation garden are designed to have two escape routes.



Fig. 34. Refuge.

1998; Ulrich, 1999; Bengtsson and Carlsson, 2006; Cooper Marcus, 2007); and (4) the wider context of the neighborhood (Kellet et al., 2005; Bengtsson and Carlsson, 2006, 2013). The availability of each quality as regards these four aspects should be noted.

In order to estimate the actual availability of the qualities, the landscape architect must be aware of the range of functional capacities among potential users. Functional capacity refers to aspects of both physical and cognitive abilities. Furthermore, the use of mobility aids such as a walker, wheelchair or cane needs to be taken into account. Although this will be followed up in step 2, the landscape architect's work will be more thorough if he/she has information in advance on the range of functional capacities among the users.

Column 3 corresponds to step 2 in the design process and involves an evaluation of each quality's importance to potential users: Awareness of the needs of the particular users is essential to the QET. Therefore, in step 2, all qualities need to be carefully considered with regard to the users. Comments from staff, residents/patients and next of kin/visitors at the particular healthcare setting should preferably be compiled by one person in charge and be added to the form in Column 3. These comments should cover the experienced availability of each quality, the estimated importance of each quality to the particular users and also expla-

nations of the way in which each quality is important. This information will give the landscape architect the knowledge necessary to complete Column 4.

In Column 4, which corresponds to the third step in the design process, the landscape architect balances steps 1 and 2 and estimates the measures needed to design or redesign the outdoor environment. The balancing of steps 1 and 2 in Section A leads to measures to achieve a comfortable design, and the balancing of steps 1 and 2 in Section B leads to measures to achieve an inspiring design. These suggested measures should then be verified by the users before the landscape architect takes them all into consideration when creating a master plan for the outdoor area. In this work, the gradient of challenge is intended to help the landscape architect situate the environmental qualities in a way that is beneficial to the healing process.

Discussion

Previous research on garden environments in healthcare settings has often focused on specific patient groups or people with particular needs (e.g., Whitehouse et al., 2001; Heath and Gifford, 2001; Sherman et al., 2005; Tenngart Ivarsson, 2011). Such research often aims at describing the experience and use of the outdoors or perceived benefits of using the outdoors, and the results often need to be reinterpreted to be generally applicable to the process of designing outdoor environments in healthcare settings. It is difficult to find practical design tools that are appropriate for the whole range of users – from people with general preferences and wishes related to the outdoors to people with particular needs – namely, tools that combine strategies of salutogenesis with those of pathogenesis and that are useful in a variety of settings. This discussion aims at describing the QET in relation to:

- Evidence-based design;
- Strategies of pathogenesis and salutogenesis;
- The healing process;
- The particular setting investigated.

The QET and EBD

Vischer and Zeisel (2008) defined EBD as a process of creatively applying rules of evidence to decision-making that is intended to result in high-quality design. The overall arrangement of the QET is based on the triangle of supporting environments (Grahn et al., 2010; Ottosson and Grahn, 2008; Stigsdotter and Grahn, 2002, 2003). Figs. 2–5 illustrate how this model is interrelated with theories, concepts and evidence from various research disciplines. In the QET, these theories and concepts, all of which are relevant to the general design of healthcare gardens, together with individual design features from different POE and EBD studies, have been transformed into one tool to be used in the process of developing and designing gardens in healthcare settings. It is our intention to use the QET in different studies and contexts in the future, to accumulate empirical experiences to revise the instrument and thus continuously improve its reliability and validity. Therefore, the QET is designed to be continuously developed in accordance with more evidence.

The QET and strategies related to pathogenesis and salutogenesis

The difference between the two views – pathogenesis and salutogenesis – is clear in the context of the physical environment. A health-promoting environment is not only accessible and usable. To optimize health, the environment also has to be interesting, attractive and stimulating (Bengtsson and Carlsson, 2013). This

claim has been confirmed by research showing that even views of nature through windows improve health and well-being (Ulrich, 1984; Tang and Brown, 2005); i.e. a person need not even go outside to benefit from the positive health effects of the outdoors. Thus, aspects other than accessibility and usability seem to be able to exert positive effects. Bengtsson and Carlsson's (2006, 2013) themes *to be comfortable in the outdoor environment* and *access to nature and surrounding life* are used as environmental counterparts to pathogenic and salutogenic strategies and constitute the two sections in the QET. The completion of step 3 of the QET (i.e., the collocation of measures needed to design or redesign the outdoor environment in a healthcare setting) in Section A involves compiling comfortable design measures to support qualities related to pathogenic strategies and in Section B involves compiling inspiring design measures to support qualities related to salutogenic strategies.

The QET and the healing process

Each specific target group, and even each person, has a wide range of preferences and needs during the healing process. Sometimes, a person needs room to deal with stress and difficult feelings and, at other times, room to find inspiration and an alternative to feelings of melancholy (Grahn et al., 2010). This justifies choosing one tool that can be used in a wide range of settings meant for different user groups. To support the healing process optimally, the QET is designed to account for salutogenic as well as pathogenic strategies, as described above. Furthermore, to ensure the satisfaction of and support for different people as well as to support different phases of the healing process, the range and order of qualities in Section B (*access to nature and surrounding life*) build on the gradient of challenge (Figs. 3 and 4). The gradient of challenge is intended as a guide for the general design of the garden that can help the designer deliberately situate these qualities in a manner that supports the healing process. Design that facilitates the healing process has been advocated by Cooper Marcus and Barnes (1999a) and Tenngart Ivarsson (2011). In addition, comfortable design, inspiring design and the gradient of challenge guide design that takes into account the range of preferences and needs found in patients with chronic illnesses or disabilities.

The QET's flexibility to particular settings and users

Because the QET is intended to be useful in a wide range of settings, understanding the particular conditions and needs of the setting and its users is essential in each individual case. According to Vischer and Zeisel (2008), EBD should give users and consumers an opportunity to participate in design-related decision-making. Evaluating the built environment at a children's convalescent hospital, Varni et al. stated that, to design environments "that potentially have positive effects on mood, health and satisfaction, it seems essential to involve the users of these facilities in the design process" (Varni et al., 2004, pp. 11). In the QET, steps 2 and 3 in particular involve the users in the design process. If the QET is used when designing healthcare gardens in new settings and the particular users have not yet been assigned, it is important to find people with relevant experiences and understanding of the planned activity. The views of residents, patients, next of kin and staff complement each other (Bengtsson and Carlsson, 2013) and should all be included to develop an environment that suits all users. The design also needs to consider future patients, and in this respect, staff members' comprehensive knowledge of various diagnoses (Bengtsson and Carlsson, 2006) is indispensable.

Although most of the qualities in the QET are easy to combine and can even enhance one another, a few of them may appear to be contradictory. For example, being intruded on by outsiders is not

conducive to being comfortable, although on the other hand, having contact with outsiders is relevant to having access to surrounding life. In such cases, it is important to consider the environment as a whole and design in line with the environmental gradient of challenge, starting from the closest surroundings and emphasizing aspects of comfort, and adding the more challenging qualities of access to surrounding life further away. Alternatively, for example, if the garden is secluded, contact with society outside the garden could take place via the main entrance to the building. Thus, the designer can solve this problem by providing choice and variety in the environment, so both sets of human needs can be met in the same garden. Different environmental contexts offer different possibilities and solutions, which needs to be professionally considered when using the QET.

The QET is not intended to assess whether all qualities exist in an environment, but is a tool for deciding which qualities to prioritize in a particular setting so that the outdoor environment can offer users environmental change and the possibility to choose depending on one's mood and activity preferences. In settings with limited outdoor areas, it is particularly important to obtain knowledge about which qualities should be prioritized. The QET is designed to assist in the process of prioritizing, primarily via the order of qualities based on the *gradient of challenge* (Figs. 3 and 4), since the gradient of challenge arranges the environmental qualities in relation to the users' needs and wishes. Furthermore, in Steps 1–3, each quality will be estimated in relation to the specific setting and its users, and also to the wider context of the neighborhood. In order to design a coherent and purposeful garden, the above-mentioned issues need to be considered in detail by a professional landscape architect.

Future research

The current article presents the first outline of the QET, a tool that integrates theories, models and evidence and that is intended to support the process of designing outdoor environments in healthcare settings. Two limitations of the present work, which we plan to address in future studies, are that we may have missed important evidence and that this initial version of the QET needs to be evaluated and developed. This could lead to future versions of QET focusing on different health conditions/diseases. Our goal is to achieve a protocol for using the instrument in actual practice: a protocol that clearly and thoroughly describes each main component of the process, and also how the components are used together. Thus, we would like to test the QET practically in healthcare settings that have different prerequisites in terms of users, health activities and physical environment. We would also like to collect data on experiences of how the different qualities of the QET function in different contexts in order to refine them further. This could lead to a practical manual with detailed examples and pictures of each quality in the QET that can be used in the field. Furthermore, the future development of the tool will include more diverse photographic examples of the environmental qualities, to correspond to and be useful in a broader range of climates and cultures. In conclusion, our goal is to undertake continuous development of the QET based on knowledge from research and practice and to achieve a kind of design of outdoor environments in healthcare settings that focuses not only on necessary measures but that also creates opportunities for well-being and enjoyment.

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