

*Creating increased understanding of the importance of pure experiences
of nature to human health*

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Abstract

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The aim of the present dissertation is to create a greater understanding of the importance of pure experiences of nature for human health. The dissertation consists of five articles and a frame story.

The first two articles report on an introspective study of my own experiences of the nature areas surrounding Orup Hospital, where I spent time rehabilitating after a brain injury. I describe a feeling for nature that was different from anything I had experienced previously. The interplay between human beings and the natural environment is described in detail, based on the interaction between the author and strong elements in nature, e.g. stones and water.

The findings from Article III and IV may be interpreted as follows:

- Elderly people, in general, recover more quickly from directed attention fatigue after having rested in a garden than after having rested indoors, as could be measured by different tests of concentration.
- Elderly people with low psycho-physiological balance were most affected by a stay in a garden, as could be measured by changes in heart rate and blood pressure.
- The study shows, first, that an outdoor visit is important for recovery from stress and fatigue and, second, that the improvement is especially significant for those who are most susceptible.

The findings from Article V may be interpreted as follows:

- *Experiencing nature* seems to have a more powerful influence on the rehabilitation potential of people greatly affected by a crisis.
- *Taking a walk* also has a significant influence, although not of equal importance.
- *The social factor* seems to have more influence on the rehabilitation potential of people affected by a crisis to a low/moderate degree.
- *Having access to nature* in everyday life can have a buffering effect on people's mental state. Individuals who have many experiences of nature are less affected by their crisis than are those who have few such experiences.

The above results are discussed and interpreted in the frame story by linking them to new and older research in the area of health and the physical environment. I suggest that stays in sound natural environments function as stays in enriched environments. Sound natural environments contain certain qualities that mediate an effectual emotional tone. The scope of meaning as well as brain research can provide explanatory models of the effects of nature experiences on emotions and recovery from a crisis.

Keywords: Restorative effects, affects, health, crisis, nature, gardens, elderly people, brain injury, introspection, enriched environment, emotional tone, scope of meaning.

I would most like to thank my wife Ebba and my four children Katarina, Henrik, Martin and Hampus. They have had to bear a heavy burden, but have never wavered in their support.

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List of papers

Paper I-V

The present thesis is based on the following papers:

- Paper I** Ottosson, J., 1997. *Naturens betydelse i en livskris*. Stad & Land 148. Movium, Alnarp.
- Paper II** Ottosson, J., 2001. The Importance of Nature in Coping with a Crisis. *Landscape Research*, 26, 165-172.
- Paper III** Ottosson, J. & Grahn, P., 2005a. A Comparison of Leisure Time Spent In a Garden with Leisure Time Spent Indoors: on Measures of Restoration in Residents in Geriatric Care. *Landscape Research*. 30, 23-55.
- Paper IV** Ottosson, J. & Grahn, P., 2005b. Measures of Restoration in Geriatric Care Residences: The influence of nature on elderly people's power of concentration, blood pressure and pulse rate. *Journal of Housing for the Elderly*, 19 (3/4), 227-256.
- Paper V** Ottosson, J. & Grahn, P., 2007. The role of natural settings in crisis rehabilitation. *Landscape Research*, accepted.

Preface

The present doctoral dissertation consists of five articles and a frame story. The frame story describes my problem formulation and the methods I have chosen, and it is here I summarize the observations made during the course of my dissertation work. By way of conclusion, I reflect on my results and try to position them in a theoretical framework. The five articles are included to the frame story.

My dissertation work was conducted within the research program Public Health – Animals and Nature in Urban Environments for Recreation and Health, in the core areas Work Environment, Economy and Environmental Psychology, Swedish University of Agricultural Sciences (SLU).

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Problem formulation

In the early stages, he knows that he took walks around the hospital grounds – short ones at first, staying close to the hospital – and longer and farther as he began to find his way. One of his problems after the accident was a state of confusion. There was always a risk that he might not find his way home. The need to be out of doors was countered by a fear of getting lost. However, this fear did not stop him, and, although he could not explain it, the daily walks seemed urgently important. (Ottosson, 2001, page 166).

Han vet att han gick promenader runt sjukhuset – först små och nära sjukhuset – och sedan promenader allt längre och längre bort, allt eftersom han lärde sig hitta. En av svårigheterna efter hjärnskadan var just orienteringsproblemen. Han riskerade hela tiden att inte hitta tillbaka. Behovet att vara ute i natur stod emot rädslan av att gå vilse. Det gällde att göra en lagom avvägning – att våga lagom. Rädslan av inte hitta tillbaka kunde dock inte stoppa honom. De dagliga promenaderna kändes som livsviktiga – varför visste han inte riktigt, men känslan var utan pardon (Ottosson, 1997, s. 12).

I have described my powerful experiences of the nature areas surrounding Orup Hospital, where I spent time rehabilitating after a brain injury, in my book entitled “Naturens betydelse i en livskris”, and in the article “The Importance of Nature in Coping with a Crisis: a photographic essay” (Ottosson, 1997, 2001). During rehabilitation, I sought out nature without any particular thoughts behind it – I simply did it.

To my great surprise and joy, the book was very well received, both by my colleagues and by the general public. I experienced a transition from being quite uncertain and afraid, regarding how my future would take shape following my brain

injury, to having accomplished something positive. Since its publication, the book has played a central role in my life and research. Although I have published other studies and research findings, people's interests have always been focused on the book. I have found strength in always being able to return to my own powerful experiences, which I am able to keep with me, thanks to my book.

Work with my dissertation has taken a great deal of time, owing to my disability, but this has also given me time for reflection.

The aim of the present dissertation is to create increased understanding of the importance of experiences of nature for human health and thereby our ability to function and/or be rehabilitated.

In my introspective study of my own experiences of the nature areas surrounding Orup Hospital (Ottosson, 1997, 2001), I describe a feeling for nature that was different from anything I had experienced previously. These personal experiences developed into an interest in the importance of nature for our well-being. I experienced a sense of calmness and harmoniousness in nature that was in sharp contrast to the insecurity and fear that often came over me when I was inside the hospital. My nature experience was dependent on my predicament.

Based on my experiences from my introspective study, three hypotheses were formulated:

1. Being in the outdoors affects different people to different degrees.
2. The impact and significance of being in the outdoors will vary, depending on the individual's life situation.
3. An individual's preferences for features of the outdoors (solitude or being in a group; a sunny summer day or a violent autumn storm, etc.) will vary according to his/her frame of mind, that is, his/her capacity to absorb and process the impulses the experience involves (Ottosson & Grahn, 2005a, b).

I was interested in investigating whether other groups, who could be expected to be in a difficult situation, had had similar experiences of nature's importance. One large and growing group of people who find themselves in a vulnerable situation are the oldest old. Therefore, it is natural to try to understand how this group is affected by experiences of nature.

Findings from my study on the elderly and my introspective study aroused questions and inspired me to continue investigating the importance of nature experiences for people reacting to a crisis. Here, a natural continuation involved working with a larger group.

Introduction

For thousands of years, spending time in natural surroundings has been assumed to have a positive effect on human health (Knopf, 1987; Stigsdotter & Grahn, 2002). Sunlight, fresh air and greenery per se are all believed to have beneficial qualities. This thinking was particularly central to both the so-called theories of miasma and pythogenesis, which were highly influential throughout the 18th and 19th centuries (Urban Parks and Open Spaces, 1983; Warner, 1998). These two schools of thought were the reason why hospitals and sanatoria were built in attractive natural settings, with pleasant gardens for the patients' recreation. In the 1930s, however (ibid.), a diametrically opposed theory gained currency, and throughout the Western world hospitals and therapeutic institutions were built without giving a thought to patients' access to the outdoors, which had been a basic principle up until that time. There are, however, exceptions to this rule. In psychiatry, activities for patients in gardens, parks and nature were still considered important at least up to the 1960s, and the area of Horticultural Therapy has grown in the US and England (Schmidtbauer et al., 2005; Grahn, 2005).

In recent decades, many studies have demonstrated the influence of sunlight on human health. Individuals' exposure to sunlight has been shown to have a bearing on disturbances to the diurnal rhythm, bone growth, vitamin status, etc. (Küller & Küller, 1994; Küller & Lindsten, 1992; Küller & Wetterberg, 1996; Boldeman et al., 2006). Similarly, in recent decades, a greater understanding of the value of fresh air has been achieved: in most cases, air outdoors is of better quality than air indoors, even in heavily trafficked urban areas (Grahn, 1992; Bramryd & Fransman, 1993; Wallace & Howard-Reed 2002; Matson, 2004). Wallace and Howard-Reed (2002) found that indoor air was 2 to 20 times more polluted than outdoor air in cases where activities were taking place indoors. Matson (2004) found that, with regard to the very smallest air particles, contents indoors were 1.5 to 2.5 times higher than outdoors if activities were taking place in the indoor environment. It was not until 1984, however, that the first measurable health effects of greenery per se – the visual access to nature (the view from a window) – were reported (Ulrich, 1984). This study was soon followed by others (Grahn, 1994; Kaplan & Kaplan, 1989; Küller & Küller, 1994; Ulrich et al., 1991; Ulrich, 1999; Verderber, 1986). Two effects of natural environments were apparent: stress reduction and improved concentration.

Starting from my hypotheses, the resources at an individual's disposal might influence his/her prospects of enjoying a rich and varied everyday life. Antonovsky (1987, 1991) considers that, in explaining health, we should not merely look at pathogenic factors, but to a greater degree focus on health-promoting, or so-called *salutogenic* resources. These resources may be seen as making up a salutogenic resource budget, which consists of different components (Grahn, 1991). These components define how satisfied people can be with their everyday life activities, but also the prerequisites of a healthful life. Based on the theories of Antonovsky (ibid.) and Grahn (ibid.), a *salutogenic resource budget* consisting of eleven components was defined:

- Capital resources (owning a house, a car, etc.)
- Operating resources (liquid assets, after necessary expenditures on rent, food, clothes, etc.)

- Social resources (position in society, education, language, ethnicity, profession, etc.)

These three resources are often defined together as *the socio-economic factor* (Swedish Socio-Economic Classification Reports on Statistical Co-ordination, 1995; Hogstedt, 2003).

- Time (time at one's disposal after work, commuting and household chores, etc.)
- Distance (to work, school, shops, bus and railway station, etc.)
- Physical condition (depending on age, physical health, physical handicap, etc.)
- Mental condition (depending on age, mental health, mental and/or linguistic handicap, etc.)

These four resources are often defined together as *the accessibility factor* (Wijk, 1996).

- Habit resources (e.g., what you eat and drink and how much; how much you work, rest, exercise and sleep)

The habit resources are increasingly in focus in discussions on public health, either as a single factor (Swedish National Institute of Public Health and National Food Administration, 2005) or as a most important factor together with the socio-economic factor and the social and physical surroundings you choose – *the lifestyle factor* (Swedish Medical Society, 2004).

- Social surroundings/network (friends, family, etc.)
- Mental energy/constitution (level of stress, coping strategies, etc.)
- Physical surroundings/network (e.g., if you live in a city or village, access to nature, type of nature)

Grahn (1991) defines these three resources taken together as a factor related to the *scope of meaning*.

Many of the above resources have been in focus in earlier studies trying to identify important prerequisites for a healthful life (Antonovsky, 1987, 1991; Währborg, 2002a). Few studies have focused on the importance of the physical surroundings/network for people's health (Grahn & Stigsdotter, 2003; Björk et al., 2007). Three of the above components and how they interact are of special interest in this context, namely the factor of a person's scope of meaning: mental energy/constitution, physical surroundings/network and social surroundings/network. If an individual is suffering from a crisis or is in poor psycho-physiological condition, it is of interest to discover whether the physical and social environment can have a therapeutic function.

Theories and earlier studies

The restorative environment

As mentioned above, the first measurable health effects of greenery *per se* – the visual access to nature (the view from a window) – were reported by Ulrich (1984). Five years later, Rachel and Stephen Kaplan published their findings in the book “The experience of nature” (Kaplan & Kaplan, 1989). Two effects of natural environments were apparent in these two works: stress reduction and improved concentration.

A theory regarding effects on the ability to concentrate, the Attention Restoration Theory (ART), was developed by Rachel and Stephen Kaplan (1989). According to

their theory, human beings are endowed with two kinds of attention: involuntary and directed. These two kinds of attention have been recognized since the late nineteenth century (James, 1890/1983). Involuntary attention requires little effort. We use it in response to flashes of light, sudden noises, a brightly colored flower or the sudden movement of a squirrel in a tree above. This is the kind of attention we use most when we are in natural surroundings (Kaplan & Kaplan, 1989). It is connected to the older parts of the brain, the limbic system and the brain stem. Today, the Kaplans use the concept "soft fascination" instead of involuntary attention (Kaplan et al., 1998).

We apply directed attention to carry out numerous tasks and functions that modern society demands of us, which requires effort. We use it, for example, in theoretical learning and in solving mathematical problems (ibid.). Our capacity for directed attention (CDA) is finite, and it is connected to the "modern" part of the brain, the cerebrum. We are forced to use this capacity to concentrate our attention on a main task and to filter out irrelevant information, like noise. We also use CDA to address problems in our private lives (Kaplan et al., 1998). Modern society, with its artificiality and myriad demands, often causes us to tax our CDA to its capacity. If we exceed a certain ceiling or upper limit, we lose the ability to focus our attention, and we suffer an "information collapse". Kaplan and Kaplan (1989) suggest that in order to regain the ability to concentrate, the individual needs to be able to spend time in settings that make no demands on his or her CDA. The environment has to be free from distractions and annoyances such as unpleasant noise, which requires active effort to filter out.

Yet the setting must contain some stimuli. Experimental studies in the 1950s have shown that environments without stimuli cause psychological disturbances that are summarized under the heading "sensory deprivation" (Doman, 1984). That is to say, the ideal environment should arouse awareness and curiosity, but without taxing the mind. There needs to be room for private reflections and thoughts. Nature, Stephen Kaplan (1990) posits, can do just this. It stimulates without commanding all of one's attention. In Kaplan's words, it exerts a "soft fascination". When our spontaneous attention is activated in the natural environment, our curiosity is aroused. In this way, we are regenerated, our powers restored.

Stephen and Rachel Kaplan (1989) base their theory on the findings of a research project known as The Wilderness Laboratory. In that project, the Kaplans studied individuals participating in an outdoor program and saw how contact with nature restored them. The subjects were suffering from mental fatigue, as exhibited by the following characteristics (Kaplan, 1990):

- they could not concentrate and were easily distracted;
- they found it difficult to make decisions;
- they were impatient and tended to make choices at random;
- they were irritable and not inclined to lend a helping hand;
- they had difficulty making plans and tended not to follow the plans they made.

After spending time in the wilderness of northern Michigan, the individuals appeared to have recovered from these symptoms. They also had a chance to reflect on their lives and felt generally better able to cope with their situations.

The fact that nature simultaneously offers rest and stimulates reflection is part of what makes it a "restorative environment" (Kaplan, 1990).

The theory has been tested and supported several times by Canin (1991), Hartig et al. (1991), Gilker (1992), Cimprich (1992, 1993), Hartig (1993), Tennessen and Cimprich (1995) Herzog et al. (1997) Kaplan, Kaplan and Ryan (1998), Hartig et al. (2003), and Hartig (2005).

The theory of Aesthetic and Affective Responses to Natural Environments and Stress Recovery, formulated by Roger Ulrich (1983), posits that human beings are biologically adapted to living in a natural environment. Modern society offers unnatural, artificial environments, where people have small possibilities to recover from stress. Ulrich has studied hospital patients and their responses to having or not having contact with nature, for example through hospital windows (Ulrich, 1984, 1999), and the differences regarding psychophysiological stress reduction were significant.

In physiological terms, affects are largely located in the older part of the brain, in the limbic system, which is the product of millions of years of evolution. Directly adjacent to the limbic system is an even older system, the brainstem (Bergström, 1992). Affects, particularly primitive impulses such as the impulse to flee or to seek food, have been important to the survival of the human race. These affects originate for the most part in the oldest parts of the brain. They give rise to very quick reactions in the nervous system, which in turn stimulate the autonomic nervous system and endocrine glands (Bergström, 1992; Hansson, 1996).

According to Tomkins (1995), sensation may be described as consisting of four stages. The first stage involves a stimulus, which can trigger a startle response, a perception of discomfort or pleasure. This is a primeval information system. The next stage is an elementary sensory stage, in which innate reflexes and affects are at work, mediated by the thalamus. All of the basic affects are revealed through distinct facial expressions (also in non-human primates and other mammals) from an early age. There are nine affects, two positive (interest/excitement; enjoyment/joy), one neutral (surprise) and six negative (fear/terror, disgust, anguish/distress, anger/rage, abhorrence and shame/humiliation) (Tomkins, 1995; LeDoux, 1998). Combinations of affects together with memory form particular emotion scripts in the individual (Tomkins, 1995). These scripts can later be gradually adjusted as the individual encounters relevant phenomena. Further processing of emotions by the intellect gives rise to the fourth stage, feelings, which is an intellectual interpretation of the phenomenon (ibid.).

Natural environments provide opportunities to react instinctively, on the basis of our reflexes. Examples of direct reflexes are our reactions to things like darkness, spiders, heights, snakes and blood. Such reactions are called innate memory-like processes (Coss, 1991). These objects/things are stressful. However, when we react instinctively and understandably, and immediately remove what causes the stress, these reactions disappear (Öhman & Birbaumer, 1993).

Open, light-filled natural spaces are thought to be particularly beneficial. Trees should stand relatively far apart from one another, like on savannahs or in northern European

pastures, and ideally, one should have at least a glimpse of water. There should also be some kind of "shield" at our backs – a stand of trees or bushes perhaps. When these features are in place, in free view, near water, and near shelter, they instill a sense of security in us; the environment "assures" us that we can survive here (Appleton, 1996; Coss & Moore, 1990; Ulrich, 1999; Coss et al., 2003). This also tells us that the danger has disappeared, which causes us to relax.

In artificial environments, we are forced to use our cognition and logic; we cannot rely on intuition to the same extent. When we are asked to do something new, unpleasant or exacting in purely artificial settings, this immediately arouses feelings of insecurity and stress, which give rise to a number of physiological responses called "fight and flight reactions": these catecholamine-based reactions affect blood pressure, heart rate, perspiration and muscle tension (Ulrich, 1993, 2001). Modern activities that can elicit this response are driving a car, traffic congestion and computer "glitches". However, artificial environments – like most indoor environments – do not tell our instincts that the danger has disappeared.

The above-mentioned theory presented by Ulrich has been supported by results from a number of studies (Ulrich et al., 1991; Ulrich & Parsons, 1992; Ulrich et al., 1993; Parsons et al., 1994; Hartig et al., 2003; Laumann et al., 2003; Ulrich, 2006).

The Kaplans' theory states that being outdoors in a green recreational environment causes people to be more focused, compared to being in a room indoors. Ulrich's hypothesis states that people experience stress reduction, i.e. as evidenced by changes in blood pressure and heart rate, if placed in an environment with many green elements.

A person's state of mind

Some research findings suggest that ailing individuals and elderly people are more dependent than are others on certain characteristics of the physical environment in their neighborhood. Roger Ulrich argues that "Persons who undergo medical treatment often feel psychologically vulnerable, which has been demonstrated to heighten their sensitivity to insecurity in an environment". And: "It seems likely that the restorative benefits of viewing nature are greatest when persons experience high levels of stress, such as those who are obliged to spend time confined in hospitals or other types of healthcare facilities" (Ulrich, 1999).

Lawton (1985) points out the importance of balance between familiar and new features in the environment. Whenever the unknown or the familiar is too dominant, we try to right the balance. According to Lawton, elderly people are more sensitive to this balance than are younger people. When an individual's flexibility (i.e., capacity to accommodate) declines, he/she has a greater need for compatible surroundings. Flexibility declines with increasing age, albeit with considerable individual variation. It is conceivable that this is also true for people affected by a crisis.

Searles (1960) points out that signals from nature spark creative processes that are important in the rehabilitation process. Complicated relations may be too much to handle. Most complex are our relations to other people, and the simplest relations are those between inanimate objects, such as stones, and us. Plants and animals fall somewhere in between. According to Searles, being able to master these relationships

helps us to recover from crises (Andersson & Olsson, 1982; Searles, 1960). Similarly to Lawton (1985), Searles (1960) has demonstrated the importance of a familiar environment for the unwell and aged.

Grahn (1991) presents a model, a pyramid, in which the physical and social environment is related to the individual's executive function. A person's executive function is his/her capacity to prioritize, plan and carry out a duty (Luria, 1980). The y-axis shows the executive function and the x-axis the degree of sensitivity to the social and physical environment. People have different preferences with regard to the environment, depending on the status of their executive function at the time. The same individual may have needs on different levels of the pyramid at different times. The amount of executive function determines the highest level in the pyramid of situations with which people can cope.

See figure in Ottosson and Grahn, 2005b, page 234

Küller (1991) points out three resources that should be taken into account in the planning of outdoor environments. They are medical, social and psychological factors, which together determine the individual's satisfaction with the environment. Küller (1991) has constructed a model showing how the resources interact.

See figure in Ottosson and Grahn, 2005b, page 232

The interaction between the resources differs according to the person's state of mind. The balance between activation and control varies over time. In order to maintain a feeling of harmony, the balance should not deviate too greatly from the person's needs for any considerable period of time.

The model includes four kinds of resources:

- the physical environment (home, neighborhood, community)
- occupational and recreational activities (household, leisure)
- social climate (partner, children, friends, neighbors)
- individual resources (constitution, experience)

Whenever changes occur in any of these resources, the overall balance changes for the individual in question. This gives rise to a need to change one or more of the other resources in order to restore balance. Change needs to be compensated for. The lower physical/mental capacity a person has, the more difficult it may be to make compensatory changes in response to unwelcome changes in his/her situation.

Methods

An explorative approach

In Figure 1, I have attempted to illustrate the course of my research. The first part is an introspective study of my own experiences of the importance of nature during a life crisis, in this case when I was admitted to Orup Hospital for rehabilitation following a brain injury. This initial study has constantly grown in importance to me and has permeated all of my research. Other people's interests have also been focused on my initial work. Through all the contacts I have made via lectures and mass media exposure, my own understanding of and feeling for the problem have grown

constantly. My research approach has been explorative (Wallén, 1996). Decisions as to how my research should develop have been made over time.

In the present frame story, I will pause, reflect on and discuss my present views on what I initially described as “The importance of nature in coping with a crisis”. Between the present and my first efforts, I have reported on three quantitative studies. My work with these studies has given me insight into the theoretical framework in use in this field of research. It has also given me an additional interface in relation to these questions.

My first study, “The importance of nature in coping with a crisis”, can be seen as the description phase and parts of the frame story as the interpretive phase of a long, on-going introspective study. It is common that these two parts are reported on simultaneously. See figure 1 – The course of my research

Triangulation

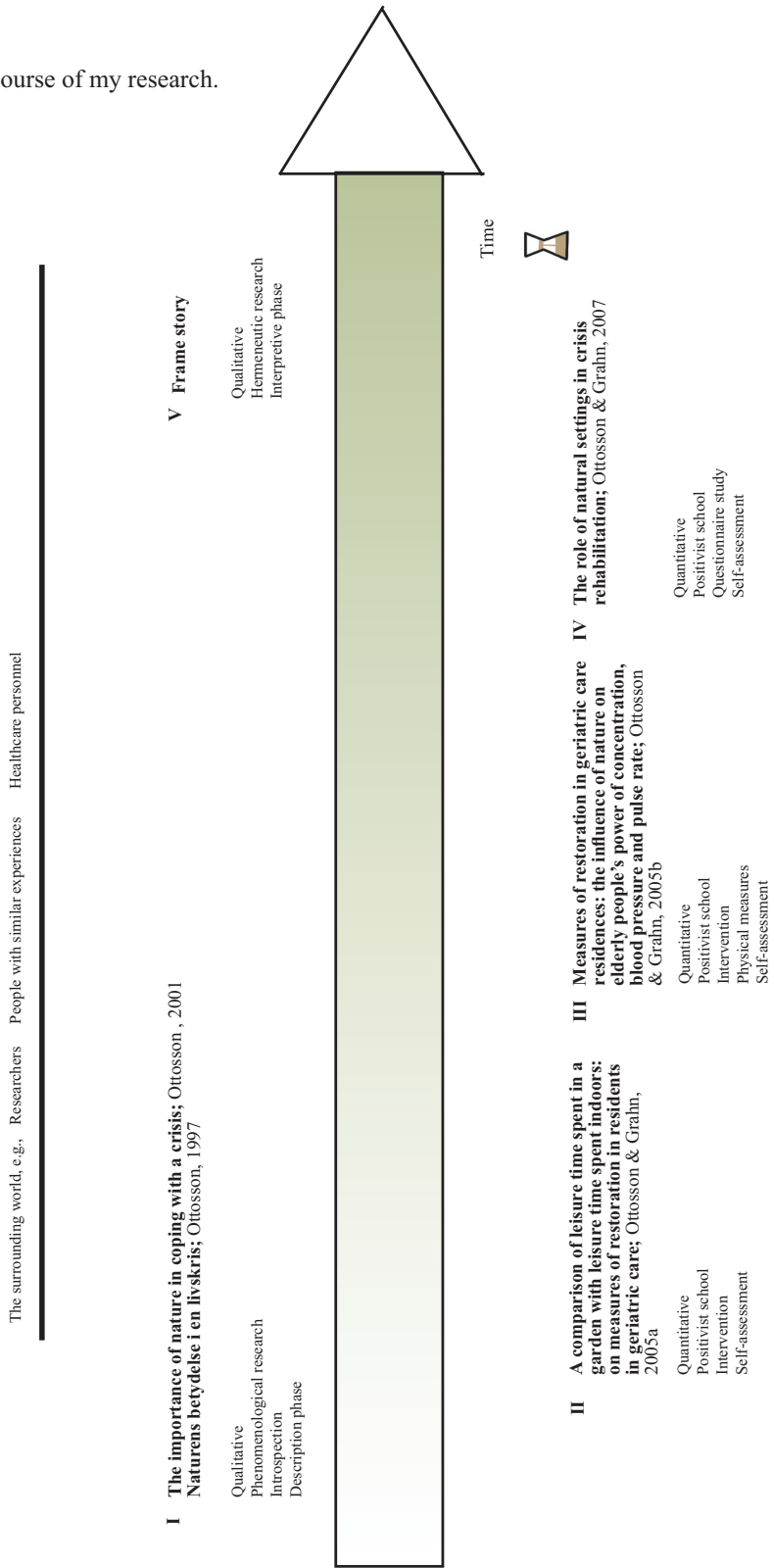
Approaching a problem from different directions and with different methods, theories and/or on different levels is called triangulation (Macheridis, 1995; Jick, 1979). The advantage of triangulation is that it gives us insight into the complexity of the problem. Different methods need not be pitted against each other, but can instead be viewed as complementing each other, resulting in convergence (Carlsson, 1996; Risjord et al., 2002). This enables a more profound understanding to emerge. If independent and different methods lead to the same conclusion or converge toward the same kind of explanation, then the results are reinforced (Risjord et al., 2002). Triangulation sanctions and encourages the use of both qualitative and quantitative methods (Risjord et al., 2002; Williamson, 2005). Thus, the researcher has the opportunity to combine different theories and methods; he/she is not limited by the respective weaknesses of the methods/theories, but benefits from their respective strengths. This means that the different methods can reinforce one another’s results (Risjord et al., 2002) and that they can give the explanatory model more depth and breadth (Williamson, 2005). In synthesizing the results, one must consider that the methods originate from different scientific/theoretical paradigms (e.g., introspection from the hermeneutic school and quantitative methods from the positivist school) with regard to, e.g., definitions of validity and reliability (Williamson, 2005).

Triangulation brings out the dynamics in research (Williamson, 2005). In hindsight, it is very clear to me how my research has gradually emerged and developed through my results and through my dialog with other researchers, other people with similar experiences and healthcare personnel. How my research was to develop in the next step has not been clear to me until that step was upon me. My goal – a greater understanding of the importance of nature for human beings – has always been clear, but the path beyond the next turn has been less certain. Personally, I feel that everything has come together in that I begin and end with the importance of nature in a crisis situation. Many different alternative paths have emerged over time, and these remain as possible research projects for the future. One difficulty for me has been to avoid getting distracted by all the many possible and interesting sidetracks.

Figure 1 – The course of my research.

Figure 1: The course of my research

- an explorative approach
- triangulation



The framing of a question should, in this approach, not be limited by the fact that the researcher only has access to one method, theory or level of analysis. In my research, I have used methodological triangulation, choosing three different methods: introspection, intervention (with both self-assessment and physical measures) and a questionnaire study (Creswell, 2003).

I have chosen the following levels of analysis:

1. The individual level for introspection.
2. The homogeneous, small group level for intervention.
3. A larger, directed study at the regional level for the questionnaire study.

Introspection provides a detailed picture of one event (Gustavsson, 2004), while studies of larger groups reveal patterns and general tendencies (Creswell, 2003).

In my research, I began with the highly qualitative method of introspection. Introspection gives a detailed description of a course of events, but says nothing about how generally or often such a course occurs (Gustavsson, 2004). I have gone on to use quantitative methods to investigate the phenomena I observed in my introspective study. My first quantitative study was with a smaller group and used both self-assessment and physical measures; my second was with a larger group and used a questionnaire. In the quantitative studies, I have chosen to look at a few more general variables derived from the qualitative study (condensation) (ibid.).

In my case, the choice of variables or questions is based on a dialog with those who have read or heard me talk about my introspective study *The importance of nature in coping with a crisis* (Ottosson, 1997, 2001). This has been a long process, entailing personal growth and an increased feeling for how I should approach the problem. Throughout the course of my work, this has greatly helped to increase my ability to understand the complex of problems, which has resulted in a broadening as well as condensation of the explanatory variables. I have tested these variables in the larger questionnaire study and used them as important components of the final theoretical section of my frame story.

The three quantitative studies in the area of environmental psychology have given me knowledge of and insight into the importance of nature. Throughout my work, I have tried to identify phenomena and processes that are relevant in relation to my introspective study.

The division into qualitative and quantitative studies has sometimes been questioned (Åsberg, 2001). I have chosen to use this division, as I believe it illustrates important differences in theory and methodology.

Triangulation of methods results in and requires triangulation of theories (Williamson, 2005). In the introspective study, I have used Searles' relational theory as a model for explaining my experiences (Searles, 1960). In the intervention study, the Kaplan's (Kaplan & Kaplan, 1989; Kaplan, 1990, 1995, 2001; Kaplan et al., 2004) and Ulrich's theories (Ulrich, 1983, 1984, 1993, 1999, 2001) are central, and Lawton's (1985), Grahn's (1991) and Küller's (1991) theories have also been used. The central theories in the questionnaire study are those of Searles (1960), Ulrich (1983, 1993), the Kaplan's (Kaplan & Kaplan, 1989; Kaplan, 1990, 1995, 2001) and Grahn (1991).

The different approaches chosen

In my four articles, I have used three different methods: introspection, intervention and a directed study on a larger group.

Introspection (Ottosson, 1997, 2001)

In Latin, “intro” means “inwardly” and “specio” “to look at”, thus “introspection” is the act of observing oneself (Gustavsson, 2004).

Introspection has long been a main method in hermeneutic research (Wallén, 1996). The purpose of such a method is to describe, interpret and condense the meaning of what has been experienced. Freud and Jung are among the well-known authors of introspective texts.

Here, the researcher him-/herself is the object of study. The aim of this method is to describe in more detail and understand why one reacts as one does. In order for other people to use and understand introspective texts, such texts must often disclose the researcher’s *ego* to a great extent. In a good introspective text, the reader can enter, see and understand complicated courses of events in a person’s life. These courses of events are made clear by the context in which they occur, and they can often be generalized to apply to many others who find themselves in similar situations (*ibid.*).

In *The Importance of Nature in Coping with a Crisis: a photographic essay* (Ottosson, 1997, 2001), I describe how I sought out nature automatically, without actually thinking about it. Several years later, I tried to describe exactly and in detail my own feelings. This process took a year for me to complete. Finding exactly the right description and wording was difficult and time-consuming. I would not have been able to make the same description today. A “window” was open at precisely that time. I was close enough to the experience to remember the feelings, but far enough to have some distance and to find the right words. At the time of writing, I was also told that my brain injury was worse than the doctors had initially thought which partly pulled me back into a life crisis.

The book is about me, but I wrote it in the third person (*he*). During the actual writing, I felt this was the only way to make the text real and effective. I have later seen that introspective texts are often written in the third person, as it gives a kind of distance. Looking back, I understand that this was a way of more easily describing experiences that felt odd and strange at the time. I did not have to take personal responsibility for the text, but could describe in increasing detail without feeling ashamed.

My book *The Importance of Nature in Coping with a Crisis* and subsequent lectures were met with great interest, which gave me the opportunity to make many new contacts. By making it easier for readers and audience members to contact me, I was able to test my own experiences through dialogs with them. I published my addresses in the book and encouraged people to contact me if they had views on or recognized my experiences. I have been careful to ensure that these addresses always function, regardless of organizational changes. I have given about 200 lectures, participated in about 10 TV programs and 5 radio programs, and also in these contexts, whenever possible, I have presented to the audience a way of reaching me. I have also tried to be available for discussions in connection with my lectures. It is surprising to see the strong feelings this subject matter gives rise to. I am very grateful for all the

descriptions and comments I have received, many of them highly self-disclosing. The experience of nature seems to strike a tone that causes complete strangers to want to tell about their own very personal experiences.

I have never been treated in a negative manner. There are some who feel nature experiences are not at all important, but no aggressive feelings seem to be aroused. It is important that we avoid trying to fit everyone into the same mold. It is easy to believe that what you have experienced yourself applies to everyone. Nevertheless, I have found that a large share of the people I have met have had very positive experiences of nature.

My book has been described or referred to in other books in very different areas, everything from books about rehabilitation after brain injury, philosophy of nature, gardens for the disabled, to books about garden art. Many of the newspaper articles about the book have also given me contact with people interested in the subject. Interviews with journalists have often taken the form of interesting discussions in which I have also learned about their experiences. The publicity has resulted in many letters from and conversations with individuals who have had similar experiences. In this way, I have gradually developed a feeling and impression of what would seem to be the more general aspects of people's experiences.

When readers and audience members have contacted me, it has become clear that reading and hearing about my experiences has been important for them. On a more personal level, I have also had a need for their acknowledgement. My background in the natural sciences and in the positivist scientific theoretical tradition has caused me to doubt the relevance of my own experiences. I have been constantly struggling with insecurity regarding how the people in my surroundings would react to my research.

2. Intervention (Ottoosson & Grahn, 2005a; Ottoosson & Grahn, 2005b)

These two studies are quantitative in their design, and the methodology used has its primary basis in the positivist school, namely in the hypothetical-deductive school, based on methodological induction. According to this school of thought, hypotheses must be falsifiable, that is, theories should state what cannot occur if they are true (Wallén, 1996).

The overall organization of these studies is as an intervention with a crossover design, where each subject in the study is randomly assigned to a specific treatment order.

Intervention studies commonly involve a separate intervention group and a control group. One problem associated with this kind of study is that it would be difficult for us to find an intervention group and a control group that are identical with regard to age, gender, socioeconomic status, medication and other background factors, not least the factors focused on in this study: home and garden. The solution to this problem in our research design is to use the same individuals in the intervention group and the control group. Half of the participants started in the intervention group, that is, they rested in the outdoor setting. The other half started in the control group, that is, they rested in the indoor setting. After a series of tests, the first half continued to the control group (they rested in the indoor setting) while the other half continued to the intervention group (they rested in the outdoor setting).

We tested our participants in the intervention group, immediately before and after they had spent time in the garden, and in the control group, immediately before and after they had spent time indoors.

The period of recreation between tests in both of the settings was roughly one hour. Half of the participants randomly started the tests in the outdoor settings first, and the tests in the indoor setting about a week later. The other half of the participants started the tests in the indoor setting first, and the tests in the outdoor settings about a week later.

Background data on the old people consisted of questions posed to the residents and the staff, concerning preferences regarding their surroundings, the residents' past homes and how the elderly felt in general. In this way, the participants could be divided into subgroups.

For the most part, the division into subgroups follows Küller's (1991) model with variables pertaining to "Occupational and recreational activities", "Social climate" and "Individual resources", respectively. In addition, we use Grahn's (1991) categorization of individuals' constitution in terms of "Physical condition" and "Mental energy". The variables used to fill out this framework were generated by us, and by staff members who both had extensive professional experience and were well acquainted with the aged participants. We took pains to ensure that the classification was made in a non-arbitrary manner. The form was structured so the variables would be easy to understand, to check and to fill out.

In time, we formed a list of variables that could be registered by indicating the presence or absence of the variable in question. Tolerance, for example, can be checked in terms of behaviors and events that occur/do not occur in conjunction with meals in the common dining room. Thus, the classification consists exclusively of notations of presence/absence of variables. The Recreation Director and the staff performed the classification.

The categorization of the participants produced a set of background variables (referred to as balance variables in the following text). For the sake of clarity, we sought to reduce the number of variables. Could they be clustered into meaningful groups? To find out, we applied a factor analysis procedure (SAS Statistics, 1996). The variant of factor analysis used was based on principal components, and was orthogonal, varimax rotated, with the number of factors decided by eigenvalues exceeding one (Manly, 1994). The analysis reveals relationships between the variables. In the present case, the analysis produced three groups or factors: social balance, psycho-physiological balance and physical balance.

The dominant variable in the second factor is the individual's level of tolerance. This is followed by frequency of visits to the hospital and how helpful the individual is. Stephen Kaplan (1990) writes that mental fatigue is basically a question of low powers of concentration. Among other things, "They are irritable and less likely than usual to help someone in distress" (Kaplan, 1990). The members of this group are not particularly "stable". Level of tolerance, frequency of visits to the hospital, and readiness to help others are the ingredients in this factor. We refer to this factor as "Psycho-physiological balance".

The tests were selected on the basis of a review of other research (e.g., Canin, 1991; Cimprich, 1990; Gilker, 1992; Kuo, 1992). Among the various tests of concentration that have been applied, the following measures were selected on the basis of their focus and demonstrated reliability and validity (Kuo, 1992): The Necker Cube Pattern Control Test (NCPC), Digit Span Forward (DSF), Digit Span Backward (DSB), and The Symbol Digit Modalities Test (SDMT).

The NCPC test has been developed at the University of Michigan Medical Center, as a direct measure of attentional capacity, i.e., the capacity to inhibit a competing pattern stimulus. The Necker cube allows two alternative interpretations, i.e., the perspective changes depending on which face of the cube is perceived to be closest. It has proven to be a sensitive indicator of change in attentional capacity, following an attention-demanding experience for healthy and ailing adults (Cimprich, 1990, 1992, 1993; Hartig et al., 2003; Laumann et al., 2003). The cube has long been used in studies of perception, since the rather early discovery that the perspective shifts at regular intervals (James 1890/1983; Orbach et al., 1963). The individual's ability to steer perception and see only one perspective is presumed to demonstrate his/her power of concentration (CDA). One characteristic of a high CDA is that it hinders stimuli that compete for our attention – in this case the alternative interpretation of the cube.

See figure in Ottosson and Grahm, 2005a, page 37.

The DSF and DSB tests are commonly used, standardized clinical measures of attention used for all kind of measures of healthy and ailing adults; they have been developed at various departments of neurology (Mesulam, 1985). Validity and reliability are high (Lezak, 1995; Mesulam, 1985).

The scores the DSF test produces have been proven highly reliable and valid. In clinical neurocognitive contexts, it is used in a battery of tests to measure powers of concentration (Lezak, 1995; Mesulam, 1985). The test measures the number of information bits a person can attend to at one time and reproduce in a given order within a brief span of time (Gilker, 1992). Normally, adults can repeat seven digits without difficulty (Mesulam, 1985).

See figure in Ottosson and Grahm, 2005a, page 37.

When using DSB, the performance involves mental tracking and manipulation of multiple stimuli and, thus, requires sustained attention. That is, the subject must both keep the digits in mind and reproduce them in reverse order. DSB involves mental tracking and manipulation of multiple stimuli and, thus, requires sustainable attention (Mesulam, 1985; Kuo, 1992; Gilker, 1992).

See figure in Ottosson and Grahm, 2005a, page 37.

SDMT has been developed as a specific diagnostic tool in the area of cognitive and cerebral dysfunction (Smith, 1973). It is a standardized test used in neurocognitive clinical contexts. SDMT involves a decoding task that requires subjects to apply their powers of concentration in a fashion that resembles stressful office work. It requires manipulation and inhibition of multiple distracting stimuli in order to correctly perform the task. It has proved to be sensitive in measuring reduced efficiency in

cognitive function in cases of unsuspected minimal brain dysfunction, as well as improvement in cognitive function (ibid.). SDMT has been administered to a large number of clinical and healthy adult populations, and mean scores for various groups are available for comparison (Smith, 1973; Lezak, 1995; Kuo, 1992). SDMT has proved to be valid and reliable in assessing healthy adults, psychiatric patients and patients with varying types of advanced cancer (Cimprich, 1990).

See figure in Ottosson and Grahn, 2005a, page 39.

In addition, we tested for level of stress: systolic and diastolic blood pressure and heart rate. These were among the tests Ulrich et al. (1991) used, and they were also used by Hartig et al. (1991), Hartig et al. (2003) and Laumann et al. (2003). Moreover, we calculated pulse pressure (Chang et al., 2003) and rate pressure product (Währborg, 2002b). Blood pressure is the pressure the blood exerts against the artery walls. It is highest during ventricular contractions of the heart, at systole, and lowest between ventricular contractions, at diastole. It is expressed as systolic pressure over diastolic pressure; for example, a healthy adult might have a blood pressure of 120/80 mm Hg. The product between heart rate and the systolic blood pressure is labeled Rate Pressure Product (Währborg, 2002b). This product has proven to be reliable and valid in clinical studies on persons in stressful situations (ibid.). Pulse Pressure is the difference between systolic pressure and diastolic pressure. The reliability and validity of Pulse Pressure measures in old people are high (Chang et al., 2003.) These kinds of cardiovascular measures record activity that is controlled by the autonomic nervous system. The autonomic nervous system is subdivided into the sympathetic nervous system and the parasympathetic nervous system. The major function of the sympathetic system is to mobilize the body for action, so that challenging or stressful situations can be dealt with efficiently. Sympathetic activation consumes energy and is, accordingly, physically taxing and non-restorative; it includes increased heart rate, contracted the blood vessels in the skin and increased blood pressure, both systolic and diastolic (Ulrich et al., 1991).

The different subgroups, defined in terms of the balance factors or questionnaire responses, performed differently on the concentration tests and measures of blood pressure and pulse rate.

3. Directed questionnaire study of a larger group (Ottosson & Grahn, 2007).

We were interested in studying how people suffering from a crisis responded to experiences of nature, compared to people who had been affected by a crisis to a lesser degree or who had not been affected at all. We were interested in finding validated protocols for

- measuring the degree to which people are affected by a crisis
- measuring restorative experiences, restorative activities and mood
- measuring people's potential for rehabilitation

Nyström and Nyström (1995, 1996) have developed a protocol that is validated to measure people's symptoms in reaction to a crisis: people's ability to cope with the crisis and their potential for recovery.

We have used the following parts of the SCI 93 protocol:

- Questions concerning 35 different symptoms of crisis retention, such as jaw muscle tension and insomnia. The different symptoms are then divided into three parts: “muscular symptoms”, “autonomic symptoms” and “mental symptoms”. We have used these three parts as well as two specific symptoms: attention (from “mental symptoms”) and heart rate (from “autonomic symptoms”).
- Questions concerning the impact of the crisis on the person’s everyday life.
- Questions concerning the person’s reorientation.
- Questions concerning the person’s potential for rehabilitation.

Research projects within leisure sciences have defined different types of recreational activities (e.g., Anambutr, 1989; Frankenberg, 1980; Tinsley & Johnson, 1984; Thibodeaux & Bundy, 2000; Nilsson & Fischer, 2006). Two main types of activity clusters have often emerged: social activities and nature-related or “green” activities. The literature suggests that nature-related activities more than others offer restorative experiences (e.g., Kaplan, 1973; Kaplan, 2001; Hartig et al., 1991; Ulrich, 1999; Grahn & Stigsdotter, 2003; Norling & Jägnert, 1986).

In her study of 36 recreational and therapeutic activities, Canin (1991) found that they could be clustered using factor analysis into eight different kinds of activities. Some activities were not especially restorative and others, such as “Community involvement” and “Focused relaxation techniques” (yoga, massage), were not in focus in this study. Of special interest in this study were three groups of activities: “Green activities” such as observing the landscape, clouds and animals, “Quiet activities” such as spending time visiting friends and “Active/nature aesthetic activities” such as walking, hiking and boating.

Cimprich (1990) and Gilker (1992) developed a protocol they call the Restorative Activities Survey: RAS (Gilker, 1992, page 88-90). The protocol contains both social and nature-related activities. We chose three questions to be part of the present study and translated them into Swedish. These questions were related to “green activities”, “quiet activities” and “active/nature aesthetic activities,” respectively:

Listed below, please circle the number that best describes how often you have done the activity during the past month, using the following scale:

“Walking in a natural setting (yard, park, neighborhood): 0=not at all; 1=rarely; 2=sometimes; 3=often; 4=very often”

Below are listed some things that might be done many times during the day. Please circle the number that best describes how frequently you usually do these activities during the course of the day.

“Looking at a natural scene/wildlife (trees, clouds, water, squirrels, birds): 0=not at all; 1=rarely; 2=sometimes; 3=often; 4=very often”

“Talking/being with friends:” 0=not at all; 1=rarely; 2=sometimes; 3=often; 4=very often”.

On the other hand, we wanted to include a question that measures a symptom that is the opposite of being restored. According to Maslach (2001), people in the health and social service professions often become mentally exhausted, as do hospital patients

(Ulrich, 1999). What characterizes such mentally fatigued individuals (Kaplan, 1990) is that they may be expected to react more strongly in a social context, especially if they do not have opportunities for restoration: They are irritable and less likely than usual to help someone in distress (Kaplan & Kaplan, 1989). Canin (1991) used a protocol to measure *Fatigue*, including items such as impatience and irritation (Canin, 1991; Maslach & Johnson, 1981). This questionnaire resembles a self-rating questionnaire – The Profile of Mood States, *POMS* (McNair et al., 1981; Gilker, 1992). From this protocol, we have chosen the following question and translated it into Swedish:

Over the past few weeks, how often have you felt:

1=never5=all the time

Critical of others: 1 2 3 4 5

The above question batteries (RAS, POMS and Fatigue) have been used in US studies with a design similar to ours (Canin, 1991; Gilker, 1992; Cimprich, 1990).

The questionnaire was completed by participants in various courses, the teachers of which we had contact with. The forms were sent to the teachers, who ensured that they were distributed to course participants, filled out and collected. The questionnaires were later sent back to us. A cover letter explaining how the questionnaire should be filled out was also included.

In total, there were 19 groups for nursing staff (124 respondents), students of medicine or nursing (278 respondents) and patients and or people living in nursing homes (145 respondents). All in all, there were 547 respondents, 454 female and 92 male (1 missing).

The Venues (Ottosson & Grahn 2005a, b)

In Ottosson and Grahn (2005a, b), measures have been made and questions posed in relation to the respective outdoor and indoor environments in which the participants lived and stayed. Thus, the quality of these environments has been essential in evaluating the results (ibid.).

It was difficult to find a nursing home with staff who were interested in participating in the study. Mass media reports on the poor quality of care in nursing homes in general had made them distrustful of us. We were entirely dependent on staff cooperation. After some searching, however, we did locate a facility with staff and management who were interested in getting involved.

At four nursing homes located in an area known as Mårtenslund in the city of Lund in southern Sweden, staff was interested in helping us. Both management and others in a position to help us found the study interesting.

The Mårtenslund complex consists of a cluster of four relatively independent nursing homes housed in separate buildings on a single block. In the complex, residents live in rooms of their own with their own personal furnishings. (See Figure 5 in Ottosson & Grahn, 2005b, page 237). Outside the room, a corridor links a number of rooms on the same floor. Some such rooms share spaces for gatherings, dining rooms and kitchen facilities.

All in all, the Mårtenslund area is home to several hundred elderly residents. All of whom require care – inasmuch as only those who cannot manage a household on their own are eligible to live there. Due to the infirmities of old age, it was at first difficult to find enough residents who were both willing and able (especially concerning visual handicap) to carry out our tests.

Although Mårtenslund is centrally situated in the city, the buildings are surrounded by an extensive park (See Figure 4 in Ottosson & Grahn, 2005b, page 237). Each building has a sheltered terrace near the entrance. The center of the area is a lawn with several old fruit trees – apple and pear. The lawn itself contains many flowers: daisies, buttercups and veronica. The side of the block facing a road has a tier of trees and bushes that shelters the block against traffic noise, which at times is quite heavy (see Figure 3 and 4, in Ottosson & Grahn, 2005a, page 31).

We asked the participants to respond to a questionnaire. They did this verbally, which meant that the questions posed functioned as a guide in a personal interview situation. The questionnaire asked participants about their gender, age and other background information and asked them to judge to what extent they believed their residence and garden “felt like home”. The ratings were made on a seven-point scale, where 7 was ‘quite at home’ and 1 ‘not at all’. The participants’ assessment of the garden at Mårtenslund was rated nearly as high as possible: on a scale from 1 to 7, it was given a rating of 6.9. All but one of the participants gave it the highest rating. The indoor environment did not receive as high a rating: 5.5. Even this score indicates a fairly high degree of satisfaction, however.

One important factor in this study (Ottosson & Grahn, 2005a, b) was that both the outdoor environment and the indoor environment at the home were highly valued by participants. We do not know how the results would have been affected if the participants had valued their overall environment less.

Overview of the Articles

Abstract 1: Naturens betydelse i en livskris

Abstract 2: The importance of Nature in Coping with a Crisis: a photographic essay

This paper describes the author’s perceptions during a period of rehabilitation following a traumatic head injury. The approach is based on ‘introspection’, where the researcher is the object of study, and where an attempt is made to represent the person’s behavior and reactions in as detailed a manner as possible. The interplay between people and their natural environment has been explored by Harold Searles (Andersson & Olsson, 1982; Searles, 1960). Searles’ experiences and descriptions of people in crisis and their interaction with the environment coincide with the introspective experience described in the paper. Searles maintained, contrary to contemporary mainstream thought, that nature plays an important role in our mental health. People in crisis need ‘stable’ environments in order to feel well. In situations of crisis, the individual may need to revert to simpler relations. More complicated relations may be too much to handle. Most complex are our relations to other people, and the simplest relations are those between us and inanimate objects, like stones. Plants and animals fall somewhere in between. Searles argues that an individual in crisis needs to master the simpler relationships (objects, then plants), before gradually

advancing to take on more complex relationships (animals, then people). The higher up the scale, the more difficult and complex the relationship.

In Searles' experience, contact with animals and nature can contribute substantially to people's recovery from critical situations of various kinds. Such contact sparks creative processes that are important in the rehabilitation process. This, says Searles, helps to: reduce anxiety and pain; restore the sense of self; improve our perceptions of reality; and promote tolerance and understanding. Our brains contain basic prehistoric elements that play a part in our subconscious interplay with nature in the present. We receive signals from nature that are very important, even though we may not consciously perceive them.

Article 1 contains the entire introspective text in Swedish. Article 2 contains a shortened version published in the refereed journal *Landscape Research*.

Abstract 3: A comparison of leisure time spent in a garden with leisure time spent indoors: on measures of restoration in residents in geriatric care

During the past 20 years, findings have indicated that nature plays an active role in helping people recover from stress and fatigue. Two of the most cited theories in this field are Rachel and Stephen Kaplan's theory of recovery from Directed Attention Fatigue in nature and Roger Ulrich's theory of aesthetic and affective responses to natural environments and stress recovery. One aim of the present study is to test whether being outdoors in a green recreational environment causes people to become more focused, compared to being in a room indoors (in line with hypotheses suggested by the Kaplans). Another aim is to test whether people experience stress reduction, i.e. as evidenced by changes in blood pressure and heart rate, if they are placed in an environment with many green elements (in line with hypotheses suggested by Ulrich). The overall study design is that of an intervention study. Fifteen elderly persons living at a home for very elderly people participated. Their power of concentration, blood pressure and heart rate were measured before and after an hour of rest in a garden or in an indoor setting. Seven elderly people were randomly chosen to have their first series of tests in a garden, while eight elderly people had their first series of test indoors. The results indicate that powers of concentration increase for very elderly people after a visit to a garden outside the geriatric home in which they live, compared to that after resting indoors in their favorite room. The results did not show any effects on blood pressure or heart rate. It is suggested that having a one-hour rest outdoors in a garden setting plays a role in elderly people's power of concentration, and could thereby affect their performance of activities of daily living. One important factor in this study was that both the outdoor environment and the indoor environment at the home were highly valued by participants.

Abstract 4: Measures of restoration in geriatric care residences: the influence of nature on elderly people's power of concentration, blood pressure and pulse rate

In this paper, we have studied how the same group of elderly people's frame of mind influences their response to experiencing nature, measured in terms of blood pressure, pulse rate, concentration and results from protocols. Two theories concerning the importance of psychological balance have been put forward earlier by Lawton and

Küller, who both maintain that the surrounding environment in everyday life is one of the keys to harmonious existence. We present findings supporting the theory that the positive experience of natural surroundings per se has a balancing and healing effect.

We have found that people who were most affected by their surroundings are those with the greatest psycho-physiological imbalance. When the balance tilts, the balancing effect of the green experience can restore the individual to a state of better harmony. Time spent in the outdoors is, thus, especially important for individuals who easily lose their equilibrium or find it difficult to make compensatory changes to restore harmony on their own.

The research project is an intervention study, in which fifteen elderly individuals living at a home for very old people participated. Their power of concentration, blood pressure and heart rate were measured before and after an hour of rest in a garden and in an indoor setting, respectively. Seven elderly people were randomly chosen to have their first series of tests in a garden, while eight elderly people had their first series of tests indoors. The results indicate that power of concentration increases for very old people after a visit in a garden outside the geriatric home in which they live, as compared to resting indoors in their favorite room.

The results did not show any effects on blood pressure or heart rate.

When we compared these results with the background variables, we found interesting correlations. Background variables included how often they took part in social activities, showed helpfulness toward other residents in group activities and tolerance/critique of other residents. After a factor analysis, the background variables formed three distinct factors, one of which showed significant correlation with blood pressure and heart rate: the factor *psycho-physiological balance*, with the variables “degree of tolerance”, “degree of helpfulness” and “frequency of hospital visits”. Elderly people with low psycho-physiological balance, that is low tolerance of other residents, who were not helpful in group activities and had a high frequency of hospital visits, were most affected by a stay in a garden, as could be measured by changes in heart rate and blood pressure. The results may be interpreted as showing that a garden can restore an elderly person with low psycho-physiological balance to a state of better harmony.

The study shows, first, that an outdoor visit is important for recovery from stress and fatigue and, second, that the improvement is especially significant for the most susceptible. Thus, it is of particular importance that weak groups, such as elderly in great need of care, have access to an outdoor space. In such groups, there are likely to be many people in a state of psycho-physiological imbalance.

Abstract 5: The role of natural settings in crisis rehabilitation

We compare people greatly affected by a crisis with those less affected to explore how level of crisis influences their response to experiencing nature. A questionnaire comprising a validated protocol to evaluate frequency of stress conditions, level of crisis retention, reorientation and rehabilitation potential was answered by 547 individuals. The questionnaire also comprises items on everyday activities.

Our findings may be interpreted as follows:

- *experiencing nature* has a more powerful influence on the rehabilitation potential of people greatly affected by a crisis.
- *taking a walk* also has an influence, although not of equal importance
- *the social factor* has more influence on the rehabilitation potential of people affected by a crisis to a low/moderate degree.
- Individuals who have many experiences of nature are less affected by their crisis than are those who have few such experiences.

We suggest that the rehabilitative effect of nature is tied to its function as an enriched environment. During stays in natural settings, an interaction takes place between sensory stimulation, emotions and logical thought – an interaction that leads to a new orientation and new ways of seeing one’s self and one’s resources. This seems to largely be a question of how we human beings take in and process information.

Interpretation of experiences described in the introspective study: *The importance of nature in coping with a crisis*

This chapter deals with how I now see my experiences, which I have earlier described in Ottosson (1997, 2001). Thus, it constitutes the interpretive phase of my introspective study. Here, my first study, *The importance of nature in coping with a crisis* (Ottosson, 1997, 2001), can be seen as the descriptive phase of a long, on-going introspective study.

My outlook on and understanding of my own experiences, described in Ottosson (1997, 2001), have changed and deepened during the 10 years that have passed. I have now chosen to rearrange the material from the descriptive phase (ibid.), taking it to an interpretive level and in this process using Searles’ (1960) relations theory, including the four phases Inanimate objects, Plants, Animal and People, as well as Grahn’s (2005) theory of changes in the scope of meaning.

The different phases are described below. In order to clarify and exemplify them, I have chosen:

- Citations from Ottosson (1997, 2001).
- Descriptions from literature that my audience members and readers have identified with.
- Parts of letters from audience members and readers showing how their experiences resemble the different phases.
- Ottosson and Grahn (2005a, 2005b, 2007)

The material is grouped as follows:

- Phase I, Inert objects
- Phase II, Plants and greenery
- Phase I + II, Nature
- Phase III, Animals
- Phase IV, People
- Scope of meaning – change

Text originally in Swedish is presented here both in Swedish and translated to English. *The Swedish source text is written in italics.*

Phase I, Inert objects

According to Searles (1960), people at the lowest level of mental strength derive most help from simple relations, those to inert objects, e.g., water and stones. The most complicated relations, those to other people, are more difficult to manage. In order to feel good, one must be involved in relations that one can deal with. Such relations, according to Searles, increase self-confidence and lead to positive thinking, which allows us to move on to more demanding relations. If one does not have the opportunity to find rest in relations that are adapted to one's emotional state, then one will not feel well and recovery will be hindered.

When a person is in this phase, with little mental strength and ability, nature is important in providing the initial security that enables him/her to move beyond crippling horror/fear and to instead begin to develop positive thoughts (Searles, 1960). When the fight-flight reaction is completely predominating, we are not receptive to cognitive impulses, e.g., a physician's calming words in relation to diagnosis of a serious illness (Uvnäs-Moberg, 2000). Here, one possibility for achieving a change could be by confronting the sensory organs with external signals indicating that the danger is over and that the environment is safe.

Stones

The intense relationship in Phase I is described in Ottosson (2001). The description of the experience is one of affects and emotions concerning the relationship with different parts of nature. First the stone:

When he thinks back to the early days, right after the accident, he is surprised by how many of his impressions from the natural surroundings are connected with stones. The untouched stone with its blanket of lichen and moss in various shades of green and grey gave him a sense of security through its timelessness, its calm and harmony. It was as though the stone spoke to him: 'I have been here forever and will always be here; my entire value lies in my existence and whatever you are or do is of no concern to me'. The stones did not speak to him in words, but in feelings, which made the relationship both deep and strong. The feelings calmed him and filled him with harmony. His own situation became less important. The stone had been there long before the first human being had walked past. Countless generations, each with lives and fates of their own, had passed by." (Ottosson, 2001 page 167).

När han tänker på den första tiden efter sin skada förvånas han över att en så stor del av upplevelsen i naturen var bunden till stenen. Den helt vilda stenen med dess täcke av lavar och mossor i naturens olika nyanser av grönt och grått, gav trygghet genom att utstråla tidlöshet, lugn och harmoni. Han tyckte att stenen talade till honom: "jag har funnits här alltid och kommer alltid att finnas här, mitt hela värde är att jag finns till och vad du än

är eller gör har ingen betydelse för mig”. Stenarna talade inte till honom i ord utan i känslor, vilket gjorde kontakten väldigt nära och stark. Känslan ingav honom lugn och harmoni. Hans egen situation blev mindre viktig. Stenen hade funnits här långt innan den första människan vandrat här. Otaliga generationer, alla med speciella livsöden hade passerat förbi (Ottosson, 1997, s 15).

This intense experience of the relation to stones was new and remarkable to me. I had to make an effort to dare to describe and stand for it. To my surprise, it was this part of my description of my feelings that was met with the greatest interest. It was clear that it was this people identified with, appreciated and wanted to write about. I allowed the journalists to publish pictures from the book free of charge. The picture of the stone was by far the one most used. After the book came out, I have learned that many people share this experience, but that it is one people do not talk about.

The following citation is from a psychotherapist in training:

”Regarding the stone”

Reflection

- This part talks about nature’s existence.
- It is just the same as human existence.
- When a person can feel deep down that she is worth something intrinsically, a new dimension of life begins.
- Psychotherapy can achieve this when it is at its most stimulating.
- As a therapist, it is a miracle to witness when a person finds herself.”

”Angående stenen”

Reflexion

- *Detta stycke talar om naturens varande.*
- *Det är likadant med mänskligt varande.*
- *När en person i djupet kan känna att hon är värd något i sig börjar en ny dimension i livet.*
- *Dit når psykoterapi när den är mest utvecklande.*
- *Det är ett under som terapeut att bevittna när någon landar i sig själv.”*

It has gradually become clear to me that this aspect and this interpretation are important: not being judged, but being accepted for one’s basic human dignity.

Primarily older people who have read my book (Ottosson, 1997, 2001) or heard my lecture have used the following poem as an example of the importance of stones.

Eight years I have longed for home.
In sleep itself I have felt this longing.
I long for home. I long for it wherever I go
– yet not for people! I long for the ground, for the stones that lie where I
played as a child.

(von Heidenstam, Pilgrimage: the Wander Years, 1888)

*Jag längtar hem sen åtta långa år.
I själva sömnen har jag längtan känt.
Jag längtar hem. Jag längtar var jag går
- men ej till människor! Jag längtar marken,
jag längtar stenarna där barn jag lekt.*

(von Heidenstam, 1888 i Vallfart och Vandringsår)

I find it interesting that precisely these lines are so well known and remembered, among the many works of this poet. This simple description of a longing for home would seem to have captured the attention of a large number of people. My audience and readers have given me many descriptions of the importance of the stones of childhood.

One person who heard my lecture sent me the following letter.

.....My childhood was marked by long hospital stays where I was exposed to contacts with unfamiliar hospital staff in new and horrible situations that I was not prepared for and did not understand the benefit of. (Age 0-10 years)

During your presentation, a memory was aroused of a capacity for recovery through that which actually was and is. Concrete, visible things that you can see, touch, feel become with time a natural connection to what I am and do today.

The stones... ... When I encountered them outside Fogaröd in Höör while wandering alone, in spring 1994, I stopped. They were lying on a wooded hillside among great old trees, large, immovable, severely rigid and summoning. They rested heavily in their environment and could do nothing else. They moved like an emotional shock right into my heart and made my pulse rise. They opened me up for memories of things that have been too big, difficult and just too much for me to tackle myself. Things that have existed so long that the moss has had time to grow peacefully and almost succeeded in hiding the immovable hardness that has given them their weight.

I saw faces in them through the shadows, which are then associated with people and events that have aroused these feelings in me.

These were such strong feelings that tears ran down my face and my whole body reacted. These were my very own stones! The stones within me cried out ...

I sometimes return to this experience when I come in contact with that feeling. It makes my emotions more manageable in a conscious and secure way.

I had several similar experiences on a walk through the woods. My emotional life and my intellectual ability were in a dialog with nature. I was one with nature, absorbed in that which is. Like a child ...

.....*Min barndom kantades av långa sjukhusvistelser där jag var utelämnad i kontakt med främmande sjukvårdspersonal i nya och otäcka vårdssituationer som jag inte var förberedd på och inte förstod nyttan av.* (Ålder 0-10 år)

Under din presentation väcktes minnen av en förmåga till återhämtning genom det som faktiskt var och är. Det konkreta synliga som går att se, ta på, känna blir i förlängningen en naturlig anknytning till det jag är och gör idag.

Stenarna... ... När jag mötte dem utanför Fogaröd i Höör under en ensam vandring, våren 1994, stannade jag upp. De låg i en skogsbacke bland gamla mäktiga träd, stora, orubbliga, allvarligt stränga och uppfordrande. De vilade tungt i sin miljö och kunde inget annat. De tog sig som en känslomässig stöt rakt in i mitt hjärta och fick pulsen att öka. De öppnade mig för minnen om sådant som varit för stort, tungt och övermäktigt att försöka ge mig på själv. Sådant som funnits så länge att mossor lugnt hunnit växa ifred och nästan lyckats dölja den orubbliga hårdhet som gett dem sin tyngd.

Jag såg ansikten i dem genom skuggor som jag associerade vidare till människor och händelser som väckt dessa känslor i mig.

Det var så starka känslor att tårarna rann och hela kroppen gick igång. Det var mina egna stenar! Mina egna stenar inombords ropade...

Jag återvänder ibland till denna upplevelse då jag kommer i kontakt med känslan. Den gör känslorna hanterbara på ett medvetet tryggt sätt.

Jag gjorde flera liknande upplevelser längs skogsvandringen. Mitt känsloliv och min intellektuella förmåga var i dialog med naturen. Jag var ett med naturen, uppslukad i det som är. Som ett barn...

I am constantly surprised by the strong feelings the relation to stones can arouse. It still surprises me that others have also had similar experiences.

From the Bible, Luke:19:38-40

[38] saying, "Blessed is the King who comes in the name of the Lord! Peace in heaven and glory in the highest!"

[39] And some of the Pharisees in the multitude said to him, "Teacher, rebuke your disciples."

[40] He answered, "I tell you, if these were silent, the very stones would cry out."

och de sade:

[38] "Välsignad vare han som kommer, konungen, i Herrens namn.

[39] Frid vare himmelen och ära i höjden!"

Och några fariséer som voro med i folkhopen sade till honom: "Mästare, förbjud dina lärjungar att ropa så."

[40] Men han svarade och sade: "Jag säger eder: Om dessa tiga, skola stenarna ropa."

I have sometimes been asked whether my experience of nature can be likened to a religious experience. This question is difficult to answer, as I have not found any good definition of religious experience. On a purely subjective level, I do not feel my experience is religious, although the comparison is a common one. It is said that, for many Swedes, church is nature (Bråkenhielm, 2005). In the Bible citation above, the stones serve as a symbol for the incorruptible, those who speak the truth without regard to people's power or position. This absolute lack of importance of anything

other than a person's basic human dignity instills security: "whatever you are or do is of no concern to me" (Ottosson, 2001 page 167)

Water

According to Searles (1960), Phase I consists of inert objects, of both stones and water as described below.

From Ottosson (1997, 2001).

Without his being able to explain it, his feelings for the furious sea resembled his feelings about the mossy stone and the stone slap. Perhaps primeval force was what they had in common (Ottosson, 2001, page 171).

Utan att kunna förklara varför, påminde känslan av ett ursinnigt hav honom om känslan till stenarna och stenhällarna. Kanske var det urkraften som förenade (Ottosson, 1997, s. 26).

Strong affects and emotions are attached to the sandy beach.

The untouched sandy beach, clean and devoid of life, but with the constant motion of waves, called to him. Once there, he found it hard to leave. The waves that washed over the sand seemed like some eternal pulse, something that had always been there and always would be. The sound and sight of the waves against the sand filled him with calm and a sense of security – like the heartbeat of the mother to an infant child. This feeling was so basic that he could never lose it, and knowing this reinforced feelings of security and eternity (Ottosson, 2001, page 171).

Den orörda sandstranden med sin absoluta renhet och avsaknad av liv men med sina aldrig upphörande vågor drogs han till. Var han väl där hade han svårt att gå därifrån. Vågorna som sköljer upp på sandstranden var för honom en urtidspuls, som alltid funnits och alltid kommer att finnas. Ljudet och åsynen av vågorna mot sandstranden gav honom ett lugn och en trygghet – som en moders hjärtslag för ett spädbarn. Denna känsla var så grundläggande att han aldrig kunde förlora den. Det gav honom en trygghet att det var på detta sätt – oföränderligheten tyckte han om (Ottosson, 1997, s. 27).

As I indicate in the text above, the sandy beach was "clean and devoid of life". This detail is important to me. The natural environment around me was to be as lacking in demanding relations/elements as possible. In my thoughts, I ignored the possibility of life in the water or on the beach.

Liking and thriving on being near the sea is something familiar to many. The relation to the sea is here compared with the relation between an infant and its parents. An infant lying in its mother's/father's arms knows instinctively that it is safe – it knows this through the warmth, heartbeat, smells and soft impressions it perceives. The soft pulsing of the waves can create this feeling in the same immediate way. Perhaps some of the processes mentioned by Searles can be found in this relation. Here, we can also make the comparison with the common expressions 'Mother Earth' and 'Mother Nature'.

Phase II, Plants and greenery

According to Searles' theory, our relation to greenery is the next simplest one. In Phase II, the person has sufficient mental energy to move beyond Phase I. The rate of this development depends on the quality of the nature experience (Otto & Grahn, 2007). Individuals may have different requirements with regard to the content of their natural environment, depending, e.g., on where they grew up. At this phase, however, it is still the external environment that is most important, and human relations do not have the same significance.

Large trees constitute an important element in this phase. They are of great symbolic value and have the ability to fascinate. In my case, stones were most important, but many of my readers/audience members have stated that trees are the most important part of their experience of nature. My experience and interpretation of their reactions is that trees are associated with a more positive experience, while stones are more often tied to profound, more traumatic crises.

From Otto (1997, s. 20 & 2001, page 168).

The first individual plants that he developed a special feeling for were big trees. The similarity between a stone and a big, old tree was something he felt without knowing why; perhaps it was the timelessness. The sensation varied with species of trees. Firs, for example, hardly aroused any feeling at all – they were soft, cool and welcoming, but with no individuality – whereas the old oak inspired the same sense of reliability and security as a big, old stone.

De växtindivider som han i denna helhet först fick en speciell känsla för var de stora träden. Likheten mellan en sten och ett stort gammalt träd kände han utan att kunna förklara varför. Kanske var det tidlösheten? Denna känsla var extra stark för till exempel den gamla eken, avenboken eller fruktträdet men nästan obefintlig för granarna. Granarna var för honom som ett jättelikt "björnmosstäcke" – mjukt, svalt och välkomnande men utan individer. Den gamla eken däremot utstrålade nästan samma trygghet som en stor gammal sten. Övriga träd låg för honom på en skala däremellan.

In a study entitled "Responses to scenes with spreading, rounded, and conical tree forms" (Lohr & Pearson-Mims, 2006), it has been shown that trees with spreading canopies are more attractive and give rise to more positive feelings than do rounded and columnar trees. The authors relate their findings to the savannah hypothesis, which proposes a preference for trees with spreading canopies. Both a large oak and fruit trees have this canopy-like shape. Also, I have never heard any of my readers/audience members say that an individual fir tree is important. A forest of firs, on the other hand, was important for some and often associated with the forests of youth.

The text below is taken from the book *Simon and the Oaks* (Simon och ekarna, Fredriksson, 1993).

-A common, bloody oak, said the boy to the tree. Hardly fifteen meters tall, that's not much to brag about.

-And you're not a hundred thousand years old either.
Named, measured and compared, the tree estranged itself from the boy.
But he could still hear how its great crown sang, sadly and reproachfully.
Then he resorted to violence and threw the round stone he'd long carried
in his trouser pocket straight at the trunk.
- That will keep you quiet, he said.
At that moment, the great tree fell silent and the boy knew something
essential had happened. He swallowed the lump in his throat and didn't
acknowledge his regret.

It was on this day he said farewell to his childhood.
(page 7).

*- En vanlig jävla ek, sade pojken till trädet. Knappt femton meter hög,
det är inte mycket att vara malligt för.
- Och inte är du hundratusen år heller.
Namngivet, uppmätt och jämfört fjärmade sig trädet från pojken.
Men än kunde han höra hur det sjöng i den stora kronan, vemodigt och
förebående. Då tog han till våld och dängde den runda stenen, som han
sparat länge i byxfickan, rakt in i stammen.
- Där fick du så du teg, sade han.
I det ögonblicket tystnade det stora trädet och pojken som visste att
något väsentligt hade skett, svalde klumpen i halsen och kändes inte vid
sorgen.*

*Det var den dagen han tog avsked från sin barndom.
(s. 7).*

Karin sat a long time under the oaks and mourned over the fact that she
had always pushed ahead, done everything in her life just to be finished
quickly. What had she done later, with the time she had saved? She
couldn't remember.
But the oaks comforted her, as usual, they knew as well as she did that it
was stupid to mourn over things that can't be undone. When she left for
home she had no memory again and was strangely free (page 306).

*Karin satt länge under ekarna och sörjde för att hon alltid jagat vidare,
gjort allt i sitt liv för att raskt få det färdigt. Vad hade hon gjort sedan,
med tiden som hon hade arbetat in?
Det kunde hon inte minnas.
Men ekarna tröstade henne som vanligt, de visste ju som hon att det är
dumt att sörja sådant som aldrig kan göras ogjort. När hon gick hemåt
var hon utan minnen igen och besynnerligt fri. (s. 306).*

The following is a letter from a person who attended one of my lectures:

Who am I and where am I emotionally in all of this? Am I one of the
trees in this well-ordered forest, who's been able to thrive because I have
earning potential in the consumer culture that prevails here and now? Am
I like a beech tree... lumberable and available for disposal... ?

Or am I like the dying apple trees... Dying from the slow suffocation of neglect and lack of nourishment.

Or am I like a shooting, seeding wild plant that has had the advantage of finding the right soil, humus, light and warmth?

Well... which tree I identify with is important to my attitude, my choices and my visions of the future...

Vem är jag och var finns jag känslomässigt i allt detta. Är jag ett av träden i denna välordnade skog som fått frodas för att jag har en vinstpotential i den brukarkultur som råder här och nu? Är jag som ett bokträd...avverkningsbar och till förfogande...?

Eller är jag som de döende äppelträden...Döende på grund av långsam kvävning av vanskötsel och näringsbrist.

Eller är jag som en spirande frösådd vildplanta som haft förmånen att finna rätt jordmån, mylla, ljus och värme?

Ja...det har betydelse för mitt förhållningssätt, mina val och mina framtidsvisioner vilket träd jag identifierar mig med.....

Another letter:

Grandma, who I grew up very close to, lived until 1985. She had a strong feeling for nature and particularly the large trees around the farm itself, and she passed this feeling on to me. I remember clearly how sad and upset she become if a tree had to be felled because it was old or to make room for the wider tools and machines of today. She had a special place in her heart for the big beech tree. This tree was admired by most, because even though it grew in a forest of mostly old, big beeches, it stood in such a special place and was so big that it was conspicuous. All the dogs that had lived on the farm were buried under it, which is proof that the tree is important to the people who have lived here.

To me, this tree radiates a special calm, a kind of security. I like being under it, close to its big trunk, enjoying its beauty, but mostly the sensation of a living thing that has lived relatively unchanged and for so long. It's hard to put the feeling into words, some kind of primitive power ...

When my son was born in 1999, I used to take walks with him in his carriage so he could take a nap. He wasn't very many months old when he expressed his joy and delight when we walked under the big tree crown that filtered the sunlight. This great beech even gives him a special feeling. When he was old enough to express it in words, he often wanted me to take the carriage by the big beech, and once there I got to stand for a long time, keeping the carriage still. He wanted to be "with

the tree” for a long while. He lay still on his back in the carriage and looked up at its huge crown. He became peaceful here and often fell asleep. To me, these were moments of harmony with nature, present and past, generations to come and that have been, reflection upon life and pure happiness...

Farmor, som jag växte upp väldigt nära, levde till 1985. Hon hade en stark känsla för naturen och i synnerhet för de stora träden kring själva gården, och denna känsla förde hon över till mig. Jag minns tydligt hur ledsen och upprörd hon blev, om något träd behövde fällas för att det var för gammalt eller måste ge utrymme för moderna tidens allt bredare redskap. Alldeles speciell plats i hennes hjärta hade den stora boken. Den beundrades av de flesta, för trots att den växer i en skog bestående mestadels av gamla stora bokar har den ett läge och en storlek som gör den iögonenfallande.

Under den är alla hundar som levt på gården begravda, ett bevis på att trädet är betydelsefullt för de människor som bott här.

För mig utstrålar detta träd en särskild ro, en form av trygghet. Jag tycker om att vara under det, nära den stora stammen, njuta av skönheten hos det, men framförallt förnimmelsen av ett levande väsen som så förhållandevis oförändrat levt och funnits här så länge. Det är svårt att sätta ord på känslan, någon form av ursprunglig kraft...

När min son föddes 1999 brukade jag ta promenader med honom i vagnen när han skulle sova middag. Han var inte många månader gammal då han gav uttryck för glädje och förtjusning när vi gick under stora trädkronor som solljuset strilade ner genom. Den stora boken ger även honom en speciell känsla. När han blivit gammal nog att förmedla sig med ord, ville han ofta att jag skulle ta vägen förbi den stora boken, och väl där fick jag stå länge med vagnen stilla. Han ville vara ”hos trädet” en lång stund, låg stilla på rygg i vagnen och tittade upp i den stora kronan. Här blev han rofylld och föll ofta i sömn. För mig var dessa stunder ögonblick av samklang med naturen, nutid och dåtid, generationer framåt och bakåt, reflektion över livet och ren lycka...

In my experience, liking trees is less controversial than having a relation with stones. According to Searles, the need for a relation with greenery is not associated with the same, profound depressed state as is the need for a relation with stones. My readers/audience members have often revealed very strong feelings when telling about their own experiences with stones and water, but not quite as strong when telling about their interaction with greenery.

Phase I + II, Nature

The raw forces of nature appealed to him. In the face of such tremendous power we are all small, helpless creatures. His own situation was not much different from that of others. Face to face with Nature, we are all equal – even the strongest has to give in. While out on his walks he did not feel inferior to anyone. Nature treats us all the same, and he was reminded of his injury less often than when in the company of people.

Sometimes he even felt that the injury had given him deeper insight into the meanings of life and a stronger sense of communion with Nature (Ottosson, 2001, page 171).

Naturens raseri tyckte han om. Inför dessa krafter är vi alla små och hjälplösa. Hans egen situation var då inte så annorlunda jämfört med andras. Ställda mot naturens urkrafter är vi alla lika. Detta kan inte ens den starkaste sätta sig upp emot. Ute på sina promenader kände han sig inte underlägsen någon annan. Alla blir behandlade lika av naturen och hans hjärnskada gjorde sig mindre påmind. Ibland kunde han till och med trycka att skadan givit honom en större insikt om livets villkor och en större samhörighet med naturen. (Ottosson, 1997, s. 29).

Somewhat later in life, when he discusses his experiences with other brain-injured people, he meets several who have had similar experiences. He thinks particularly about Lii (a young female journalist) who to him coined the phrase "Nature makes no demands," when she wanted to explain why she sought out nature.

Lite senare i livet när han diskuterar sina erfarenheter med andra hjärnskadade träffar han fler med liknande upplevelser. Han tänker speciellt på Lii (en ung journalisttjej) som för honom myntade uttrycket "Naturen ställer inga krav", när hon ville förklara varför hon sökte sig till naturen Ottosson, 1997, s. 30).

Many of the difficulties he experienced and still experiences after the accident are due to the demands of our technologized and achievement-oriented culture. Out in Nature – to which people have been attuned since time immemorial – he has more basic experiences and signals that go more directly into his consciousness. He didn't understand this until much later, when he systematically tried to explain his actions and feelings to himself and to others (Ottosson, 2001, page 171).

Många av de svårigheter som han som hjärnskadad upplevde och upplever beror på krav från vårt högteknologiska och högpresterande samhälle. Ute i naturen – som människan sedan urminnes tider är anpassad till – får han mer grundläggande upplevelser och signaler som går mer direkt in i hans medvetande. Detta förstod han inte förrän långt efteråt när han systematiskt för sig själv och för andra försökt förklara sitt handlande och sina känslor. (Ottosson, 1997, s. 30).

From A. J. Cronin (1937):

During their walks they did not speak. Often they walked the whole day long with no more than a few words passing between them. At the beginning Andrew was quite unconscious of the countryside through which they tramped, but as the days passed the beauty of its woods and rivers, of its sweeping bracken-covered hills penetrated gradually, imperceptibly, through his numbed senses.

The progress of his recovery was not sensationally swift, yet by the end of the first month he was able to stand the fatigue of their long marches, eat and sleep normally, bathe in cold water every morning and face the future without cowering. He saw that no better place could have been chosen for his recovery than this isolated spot, no better routine than this spartan, this monastic existence. When the first frost bit hard into the ground he felt the joy of it instinctively in his blood (page 353-354).

The above citation describes a young physician's recovery after a severe shock and overpowering life crisis, when his young wife died in a traffic accident. It is only after his friends take him out into the Scottish moorlands that he is able to start processing his feelings and come out of his crisis. With this simple, sparse natural environment as background, he could recover something that probably would not have occurred in the crowds of people in town.

Nature and the experience of nature can be likened to a catalyst that can start a reaction otherwise impossible in the prevailing situation. A catalyst is something that causes a process to go faster without expending itself. In some situations, a catalyst is required for a reaction to occur at all. My hypothesis is that if a person's emotional level is far too low, no reaction will occur. The person will not move on, but instead remain in this low phase if he/she does not have access to nature experiences.

The citation below describes nature's ability to participate and help without being expended.

It is as though the stone could absorb sorrow, share it without being used up; tears that fall on a warm stone slab evaporate, disappear and, with them, part of the sorrow. (Ottosson, 2001, page 168).

Det är som om stenen också kunde absorbera sorgen. Dela den utan att själv förbrukas. Tårarna som hamnar på en varm stenhäll förångas, försvinner och delar av sorgen med den (Ottosson, 1997, s. 17).

In our study *The role of natural settings in crisis rehabilitation* (Ottosson & Grahn, 2007), we found that:

- *Experiencing nature* has a more powerful influence of the rehabilitation potential of people greatly affected by a crisis.
- *Talking a walk* also has an influence, although not of equal importance.
- *The social factor* has more influence on the rehabilitation potential of people affected by a crisis to a low/moderate degree.

Phase III, Animals

This phase has not been part of my studies. According to Searles' theory of our ability to deal with various relations, the relation to animals falls in between that to plants and that to other people. There is, however, mention of animals in my book *The Importance of Nature in Coping with a Crisis*. Here, this is only a matter of traces of wild animals. Various animals, wild and tame, and the distance/relation to the animal must make a great difference in how demanding/close the relation is. The animal contact I mention in the book must be among the least demanding.

From Ottosson (1997, s. 21 & 2001, page 169).

The path is created through an interplay of creatures (including people) and nature; it respects the demands, nature makes; it leaves no scars but runs like a natural nerve through the whole. The path gave him practically the same feeling and sense of security that he associated with the stones. One path created by animals and people with love for nature instills a sense of security – a timelessness almost as great as the stones

Ett omistligt inslag i naturen är stigen och vägen – den stig som är skapad i samklang mellan djur/människa och natur. Stigen följer de krav som naturen har – den gör inga sår utan är en naturlig nervtråd i helheten. Stigen gav honom nästan samma känsla som känslan för stenarna. En stig skapad av djur och människor med kärlek till naturen inger trygghet – en tidlöshet nästan lika stor som stenarnas.

This is only a question of traces of wild animals that are created on nature's terms, but that can be enjoyed by people.

Slightly more than 10 years after my brain injury, I have been able to personally experience the great importance a pet can have, in my case a dog. I did not grow up with animals, so I had no knowledge of or feeling for this relation with me. I have been greatly surprised about how strong the ties between a dog and a human being can be and about the ability a pet has to create a positive atmosphere. In the situation I was in, which I describe in my book, I do not feel I would have been ready for or aided by a pet. I would not have been able to give the care and attention a dog needs, but I cannot be sure of how I would have reacted.

There is a difference between the relation nature-human and the relation animal-human. Descriptions of the relation to animals are almost non-existent in the responses from my readers/audience. It seems as though people are not reminded of or do not think about animals in connection with discussions of the relation to nature.

Phase IV, People

According to Searles (1960), the most demanding relation is that to other people, here called Phase IV. The various steps of this relation are described in Grahn (1991). In my book, *The Importance of Nature in Coping with a Crisis*, there are only two places in which relations to other people are described positively. These concern relations to one's own small children, who are relatively easy to deal with, and relations to fellow patients, who found themselves in the same weak situation as I did.

It was easiest to walk in the company of his own children, especially the youngest. Their spontaneous and uncomplicated reactions were most compatible with his own feelings. The innate, and as yet intact, feeling for nature, untainted by the need for knowledge or intellectual commentary, suited him best (Ottosson, 2001, page 170).

Lättast var det dock att vandra med de egna barnen i naturen, speciellt de yngre. Deras spontana och enkla sätt att vara i naturen harmoniserade bäst med hans egen upplevelse. Den nästan medfödda

och ännu oförstörda naturkänslan, utan krav på kunskap eller intellektuella synpunkter, passade honom bäst (Ottosson, 1997, s. 23).

As pointed out above, the relation to my own children lacked intellectual views, but was instead about sharing a feeling.

One of his new friends, a fellow patient in the clinic, was a young naval officer. They spoke daily of the lake and the sea, a subject of which neither of them tired. It reminded them of their active lives and it bolstered their self-confidence to talk about something they both knew well (Ottosson, 2001, page 170).

En av hans nyvunna vänner på hjärnskadeavdelningen var en ung sjöofficer. Med honom talade han dagligen om sjön och havet, ett för dem båda outtömligt ämne. Det påminde dem också om deras aktiva tid och det stärkte deras självkänsla att få tala om något som de kände till (Ottosson, 1997 s. 24).

I did make contact with fellow patients. They were as weak as I was. On a ward for rehabilitation after brain injury, what predominate are feelings.

A frequently reoccurring topic in Ottosson (1997, 2001) involves thoughts about previous generations. Such thoughts could be said to be among the least demanding of the relations to other people. Here are a few examples:

The details from the past – the mossy stone fences or dykes, nearly totally overgrown foundations of former cottages, lichen-covered wild apple trees, the vague contours of a once well-kept crofter's garden – gave him a special feeling of security and familiarity (Ottosson, 2001, page 166).

Spåren från gamla tider med sina mossöverbuxna stengärdesgårdar, nästan helt överbuxna husstengrunder eller lavatäckta, förvildade äppelträd – där man bara kunde ana rester av en välskött torparträdgård – gav honom en speciell känsla av trygghet och igenkännande” (Ottosson, 1997, s. 13).

His own situation became less important. The stone had been there long before the first human being had walked past. Countless generations, each with lives and fates of their own, had passed by. (Ottosson, 2001, page 167).

Hans egen situation blev mindre viktig. Stenen hade funnits här långt innan den första människan vandrat här. Otaliga generationer, alla med speciella livsöden hade passerat förbi (Ottosson, 1997, s. 15).

Why the path inspired such feelings he did not know. Perhaps it was some innate feeling of belonging that goes back to our beginnings. Paths have always been our friends – strands leading from one secure point to

another, a gift passed from one generation to the next. (Ottosson, 2001, page 169).

Varför stigen ingav honom dessa känslor visste han inte – kanske var det en nedärvd samhörighetskänsla som sträcker sig långt tillbaka till människans ursprung. I alla tider har stigen varit människans vän – ett grensystem som leder mellan olika trygga punkter. En gåva från generation till generation (Ottosson, 1997, s. 21)

He preferred walking on a path to walking freely in nature, even in places where he could find his way. Seeing the path in front of him was a primitive aesthetic experience that lay deep in his subconscious. This feeling caused him to keep to the paths, which was probably the idea. This preference has been important to human survival from time immemorial. What he experienced as beautiful was previous generations' way of transferring their experiences to him. He liked this primitive, innate feeling.

Han ville hellre gå på en stig än fritt i naturen, även på ställen där han hittade väl. Att se stigen framför sig var en ursprunglig skönhetsupplevelse som låg djupt i hans undermedvetna. Denna känsla gjorde att han höll sig till stigarna, vilket kanske var meningen. Sedan urminnes tider har denna preferens varit viktig för människans överlevnad. Vad han upplevde som vackert var tidigare generationers sätt att föra över sina erfarenheter till honom. Denna ursprungliga känsla tyckte han om (Ottosson, 1997, s. 21-23).

In Ottosson (1997, 2001), my inability to deal with and appreciate human relations predominated. These are examples of when one cannot manage or is not ready for Phase IV.

He wanted to keep the stones to himself or possibly share them with a very close friend, when he felt happy. But most of all, he wanted to be alone with them: the calm an ancient stone imparts is easily lost (Ottosson, 2001, page 168).

Med stenarna ville han vara ensam eller möjligen med en mycket nära vän, när han kände sig på gott humör. Men helst ville han vara ensam med stenarna och stenhällen. Det lugn som en gammal sten utstrålar går lätt förlorat (Ottosson, 1997, s. 17).

Not liking any of the things he used to love was a remarkable feeling. It was also difficult for those around him when things they used to have in common were no longer so.

He feels that his family and friends mourned some of this change. So as not to seem too odd and to make people he liked feel happy, he could eventually "get himself together" and participate among the throng.

He had long known how to do it, but to him it became a role in a play that he had mastered well.

He felt great joy when he was able to play the role well and that his family and friends were happy when they thought it was the "old" Johan. But his earlier enjoyment and feeling for the crowd no longer existed. He mourned this loss.

Att inte tycka om någonting som han tidigare älskat var en underlig känsla. Det var också besvärligt för hans omgivning när saker som man tidigare hade gemensamt inte fanns kvar.

Han tror att hans nära sörjde en del av denna förändring. För att inte verka alltför udda och för att tillfredsställa dem han tyckte om, kunde han så småningom "ta sig samman" och medverka i vimlet.

Han visste sedan gammalt hur det gick till, men för honom blev det en teaterroll som han behärskade väl.

Han kunde glädjas mycket åt att han kunde spela rollen väl och att hans nära blev glada över vad de trodde var den "gamle" Johan. Men den tidigare glädjen och känslan för vimlet fanns inte längre. Han sörjde förlusten (Ottosson, 1997, s. 28).

In the later stages it was possible for me to deal with human relations, but this required a great deal of energy and gave little in return. Descriptions of human relations are also found under the heading "Change - Scope of Meaning" below. Here, people constitute a disturbing element and are too predominating, as compared with nature.

Change - Scope of meaning

In the introduction chapter, I claimed that a vital part of our salutogenic resource budget consists of the following three resources:

- Social surroundings/network (friends, family, etc.)
- Mental energy/constitution (level of stress, coping strategies, etc.)
- Physical surroundings/network (e.g., if you live in a city or village, access to nature, type of nature)

I also stated that these three resources could be connected to what Grahn (1991) labels "scope of meaning". Grahn (1991, 2005) suggests that human beings possess this resource, which he defines as an aspect of the self's communication with the external environment, such that the external environment sometimes seems to be firmly tied to the informant's self, to the identity. The self is extended into the physical space. This is particularly clear when the informant feels stressed and sad, i.e., when the executive function is low. In such a situation, when one feels almost "skinless", the sensibility for the quality of the physical environment is very high. The concept scope of meaning suggests that objects, as well as a person, can change in meaning when there is need and scope for such change, depending, among other things, on the mental and physical resources one possesses at the time. The scope of meaning may be seen as being made up of all our experiences – bodily/sensory and affective as well as feelings and thoughts – and all our values – how we communicate with the surrounding world in order to function and survive in it. There are people and objects that are defined as bad or good, wholesome or unwholesome, valuable or worthless, dangerous or safe, pleasant or unpleasant. Thus, everything of importance to our functioning in everyday life figures into the scope of meaning (ibid.).

We usually talk about the self as something that lies deep within us, in our cognitive consciousness. Our physicality senses and affects are not always mentioned. Social context is sometimes included, but rarely physical context. Yet already in infancy, we learn to deal with sensory impressions from our body and surroundings, which we then struggle to master and integrate. In contact with our apparatus of logical thought, these impressions gradually develop to form our personality and emotional intelligence (Ayres, 1983; Hansen, 1998; Gardner, 1993; Goleman, 1995). In order for this to succeed, we must have contact with the surrounding world: Communication between the self and the surrounding world is constantly ongoing and is a necessary process, enabling us to develop and maintain our identity (Frosch, 1990). During a life crisis, communication between the surrounding world and us becomes difficult. Our feelings for objects and people in our scope of meaning change, which changes their cognitive significations and our own scope of action.

It is important that a person has opportunities to adapt his/her scope of meaning to his/her needs and abilities. This can be made possible, if the person's surrounding environment is suitable for such a process. That is, if he/she has contact with certain qualities in nature: qualities signaling a serene and positive atmosphere. This is of particular importance for people with low psychological strength. In such a state, people are highly sensitive to changes in their surrounding environment.

Daniel Stern (2003), among others, has described how the environment can signal a calm, positive and secure feeling. He provides examples of how children develop a pre-linguistic communication with their parents: For example, they can be sad or happy together. He refers to this pre-linguistic communication through the emotions as vitality affects.

I propose that a type of vitality affect also can develop in relation to natural elements, such as water, stones, trees, etc. Therefore, the concept is broadened here to also encompass nature. Physician and psychotherapist professor Poul Bjerre (2004) talks about how important it is for people in a crisis to enter a positive frame of mind, so that they may be influenced by new perspectives and thereby work through the crisis, find a new orientation and grow as individuals. According to Bjerre (ibid.), in order to be receptive, one must be secure – anger, fear, etc. must not get the upper hand. Instead, positive affects such as joy and curiosity must have the advantage. Bjerre considers that impressions from certain natural environments, such as mountain landscapes and archipelagos, as well as from certain works of art and social contexts, can bring about a feeling, a chiaroscuro (ibid.), that makes people more receptive to reorientation. This mechanism, together with Stern's (2003) vitality affects, is referred to here as the *emotional tone*.

Below are examples of the negative feelings that unwelcome changes can give rise to.

In Ottosson (1997, 2001), I relate how nature was transformed into a mere backdrop when people or other strong elements appeared. This may be interpreted to imply that the scope of meaning is like a scene populated by strong and weak elements, where people constitute strong elements. When people are present, the emotional tone related to nature does not quite reach us. In the following passage, I describe how I, during

my acute crisis, suffered from a feeling of not having the energy for and being negatively affected by social interaction: I needed to find solitude and I sought it.

He preferred to be alone when out in the wild. The feeling of communion, calm and harmony was too subtle, too delicate to compete with the company of other people. For him, the experience of being “alone with nature” was different from when he shared the experience with others. This strong need for solitude in nature was something new to him. He found it difficult to describe this need, this feeling, and could not compare it with anything. This state of affairs was not without its problems. It was difficult to explain to others that he wanted to be alone without hurting their feelings. When he had company, nature assumed a different and more passive role, and the landscape was transformed into a backdrop. (Ottosson, 2001, page 170).

Han ville helst vara ensam i naturen. Den känslan av samhörighet, lugn och harmoni var inte så stark att den klarade konkurrensen från andra människor. För honom var upplevelsen “ensam i naturen” annorlunda än när den delades med andra. Detta starka ensamhetsbehov i naturen kände han inte igen sedan tidigare. Detta behov och denna känsla hade han svårt att förklara och jämföra med något. Att det var på detta sättet var inte helt problemfritt. Det kunde vara svårt att förklara för andra att man ville vara ensam, utan att de tog illa upp. När han var i naturen tillsammans med andra fick den en annan roll. Den starka känslan mellan honom och naturen bleknade eller försvann helt. Naturen blev bara en kuliss, som passerade förbi (Ottosson, 1997, s. 23).

and

Prior to the accident, he liked crowds of people – on trips, at parties, in town, at work or in other contexts. After the accident, he could not understand why he had ever liked crowds. He experienced situations he was sure he would have appreciated before the accident, but now he did not understand why. He could seek out or create situations with many people whose company he had previously enjoyed, but now it just felt strange.

Före olyckan tyckte han om vimlet med många människor – på utflykt, på fest, i staden, på arbetet eller i andra sammanhang. Efter olyckan kunde han inte förstå varför han hade tyckt om det. Han kunde uppleva situationer som han var säker på att han uppskattade före olyckan. Nu förstod han det inte. Han kunde uppsöka eller skapa situationer med många människor som han tidigare trivdes med, men det kändes bara konstigt och främmande nu (Ottosson, 1997, s. 28).

I told no one about my intense nature experiences. My scope of meaning was so fragile, skinless, that only one negative comment seemed impossible to deal with. Even views about my scope of meaning changed their content.

Ur Ottosson (1997, s. 14).

This could sometimes result in him coming late to scheduled treatments, but he doesn't remember that these delays were irritating. He never explained why he was late or what he was thinking – he was afraid of not being understood. He wanted to keep this to himself. He was afraid that someone, by making a careless remark, would destroy the breathing hole he had found. "The spell" would be broken if he were forced to intellectually try to explain how he felt. He was afraid of letting someone into these newly acquired "domains".

Detta kunde ibland resultera i att han kom för sent till avtalade behandlingstider, men han minns inte att dessa förseningar irriterade. Han förklarade aldrig varför han var försenad eller vad han tänkte – han var rädd för att inte bli förstådd. Han ville behålla det för sig själv. Han var rädd att någon med en oförsiktig kommentar skulle förstöra de andningshål som han hade hittat. "Förtrollningen" skulle brytas om han intellektuellt skulle tvingas försöka förklara hur han kände. Han var rädd att släppa in någon på dessa nyvunna "domäner".

The following is yet another example of the need for a stable environment:

The sound and sight of the waves against the sand filled him with calm and a sense of security... This feeling was so basic that he could never lose it, and knowing this reinforced feelings of security and eternity (Ottosson, 2001, page 171).

Ljudet och åsynen av vågorna mot sandstranden gav honom ett lugn och en trygghet ... Denna känsla var så grundläggande att han aldrig kunde förlora den. Det gav honom en trygghet att det var på detta sättet – oföränderligheten tyckte han om (Ottosson, 1997, s. 27).

In Ottosson (1997, 2001), I describe how I took walks every day, but that the walks per se were not of primary importance. As in Ottosson and Grahn (2007), the experience of nature had the strongest effect on people suffering from a crisis. It was the experience of nature, the emotional tone I found there, that was fundamental and that gave me a feeling of harmony. This emotional tone, however, was easily undermined and could change in character when the natural environment changed. The following describes the effect of trees coming into leaf in the spring:

When spring comes and greenery with it, nature takes on a new dimension that makes her richer, but also hides some of her primeval power. He did not like the greenery. It was the change itself that was unwelcome; it reminded him of his own weakened condition. Spring comes and displays a fantastic power of transformation, which he did not feel part of. His frame of mind was in better harmony with the naked landscape, without the billowing greenery. (Ottosson, 2001, page 168).

När våren kom och grönskan med den, får naturen ett ytterligare innehåll som både ger mer men samtidigt också skymmer en del av naturens urkraft. Han tyckte inte om att grönskan kom. Förändringen i

sig var inte välkommen och påminde honom om hans egen svaga situation. Våren kommer och utstrålar en otrolig kraft av förändring, som han inte kände sig delaktig av. Hans sinnesstämning harmoniserade mer med det enklare landskapet utan prunkande grönska (Ottosson, 1997, s. 18).

From Ottosson (1997, 2001).

The green was so intense that it seemed to blind him. This piercing, blinding green was something new. He could not recall having experienced it before. The greenery was overwhelming and aggressive (...) The air felt thick and he missed freshness and light (Ottosson, 2001, page 168).

Den gröna färgen kändes så stark att den bländade honom. Denna starka, bländande, gröna färg kändes ny. Han kunde inte påminna sig att han upplevt den så här tidigare. Grönskan gav på detta sättet nästan ett överväldigande, alltför påträngande intryck (...) Luften kändes tjock och han saknade friskheten och luftigheten (Ottosson, 1997, s. 18-19).

One poem sometimes mentioned by my readers/audience members is Karin Boye's – *Ja visst gör det ont*. A common interpretation of this poem is that a young person is being likened to an unopened bud, but here an alternative interpretation is that the change in nature itself is painful.

Karin Boye; Of course it Hurts - *Ja visst gör det ont*.

Of course it hurts when buds burst.
Otherwise why would spring hesitate?
Why would all our fervent longing
be bound in the frozen bitter haze?
The bud was the casing all winter.
What is this new thing, which consumes and bursts?
Of course it hurts when buds burst,
pain for that which grows
and for that which envelops.

...

(Translation: Jenny Nunn)

*Ja visst gör det ont när knoppar brister.
Varför skulle annars våren tveka?
Varför skulle all vår heta längtan
bindas i det frusna bitterbleka?
Höljet var ju knoppen hela vintern.
Vad är det för nytt, som tär och spränger?
Ja visst gör det ont när knoppar brister,
ont för det som växer – och det som stänger.*

...

A letter from a person who attended my lecture:

Since 1991, I have had the privilege of interacting, in different ways, with people with special needs, often people diagnosed as autistic.

Every spring, when the trees were leafing and when the flowers began to shoot up in the garden and in nature, the whole group became uneasy. As part of the group, I felt that the change in nature was difficult for everyone to bear. All of this beauty was dangerous. This often manifested itself in intense outbursts of aggression. Like ripping the leaves off the trees or pulling up the flowers by the roots and screaming out your anxiety. Others did not react aggressively, but instead had other burdens of anxiety to bear. On the other hand, autumn gave most of them a peaceful calm.

The sea always gave tranquility.

Jag har sedan 1991 haft förmånen att på olika sätt få vistas bland människor med särskilda behov, ofta med diagnosen autism.

Varje vår, i samband med lövsprickningen och när blommorna började spira i rabatten och naturen, blev det en oro i hela gruppen. Som medlevare upplevde man att förändringen i naturen var svår för alla att bära. Att allt det vackra var farligt. Det kunde ofta ta sig uttryck i häftiga aggressivitetutbrott. Som att slita bladen från träden eller att dra upp blommorna med rötterna och skrika ut sin oro. Andra reagerade inte med aggressivitet, utan hade andra bördor av oro att bära på. Däremot hösten gav ett stillsamt lugn åt de flesta.

Havet gav alltid ro.

Discussion

Hypotheses and findings

Hypotheses

The aim of the present dissertation is to create a greater understanding of the role of pure experiences of nature for human health.

The foundation of the dissertation is the introspective study (Ottosson, 1997, 2001). In that study, I have tried to give detailed descriptions of my experience of nature during my rehabilitation after a brain injury. Such a detailed description is possible in a qualitative study, but is more difficult to achieve using a quantitative approach. To be able to compare and test the relevance of the introspective study in a quantitative way, it was necessary to consolidate the result, first into hypotheses, then into specific questions that could be used in questionnaires.

Based on my experiences from my introspective study (Ottosson, 2001), three hypotheses were formulated:

1. Being in the outdoors affects different people to different degrees.
2. The impact and significance of being in the outdoors will vary, depending on the individual's life situation.
3. An individual's preferences for features of the outdoors (solitude or being in a group; a sunny summer day or a violent autumn storm, etc.) will vary according to his/her frame of mind, that is, his/her capacity to absorb and process the impulses the experience involves (Ottosson & Grahn, 2005a, b).

Based on my experiences from my introspective study (Ottosson, 2001) and the intervention study (Ottosson & Grahn, 2005a, b), two hypotheses were formulated:

1. Being in a natural environment influences people greatly affected by a crisis more than people who are less affected.
2. Having contact with other people influences people greatly affected by a crisis more than people who are less affected (Ottosson & Grahn, 2007).

Findings

In the "Methods" section, I stated that I use an exploratory approach with triangulation of methods and theories. The methods involve introspection, an intervention study and a larger questionnaire study. I stated that different methods can reinforce one another's results (Risjord et al., 2002) and they can give the explanatory model more depth and breadth (Williamson, 2005). Finally, if independent and different methods lead to the same conclusion or converge toward the same kind of explanation, then the results are reinforced (Risjord et al., 2002).

Here, in the discussion chapter, I will try to synthesize my results, and see if they do in fact converge. In this process, I will consider that the methods originate from different scientific/theoretical paradigms, such as the introspection method coming from the hermeneutic school and the different quantitative methods coming from the positivist school.

An introspective text enables us to understand complicated courses of events. These courses of events are made clear by the context in which they occur, and they can often be generalized to apply to many other people who find themselves in similar situations (Wallén, 1996). The result gives a detailed description of a course of events, but says nothing about how generally or often such a course occurs (Gustavsson, 2004). To discover whether any generality exists, I have used quantitative methods to investigate the phenomena observed in my introspective study. These more general variables derived from condensation of the introspection study (ibid.).

The findings from Ottosson and Grahn (2005a, b) may be interpreted as follows:

- Elderly people generally recovered more quickly from directed attention fatigue after resting in a garden than after resting indoors, as could be measured by different tests of concentration.
- Elderly people with low psycho-physiological balance that is low tolerance of other residents, who were not helpful in group activities and had a high frequency of hospital visits, were most affected by a stay in a garden, as could

be measured by changes in heart rate and blood pressure. The results may be interpreted as showing that a garden can restore an elderly person with low psycho-physiological balance to a state of better harmony.

- The study shows, first, that an outdoor visit is important for recovery from stress and fatigue and, second, that the improvement is especially significant for the most susceptible.

The findings from Ottosson & Grahn (2007) may be interpreted as follows:

- *Experiencing nature* seems to have a more powerful influence on the rehabilitation potential of people greatly affected by a crisis.
- *Taking a walk* also has a significant influence, although not of equal importance.
- *The social factor* seems to have more influence on the rehabilitation potential of people affected by a crisis to a low/moderate degree.
- *Having access to nature* in everyday life can have a buffering effect on people's mental state. Individuals who have many experiences of nature are less affected by their crisis than are those who have few such experiences.

I find that the three quantitative studies largely support the description of my own experience in the introspective text. Together, these studies help to increase my ability to understand the complex of problems. Here, in the discussion chapter, I will use them as important components of the final theoretical section of my frame story.

A graphic illustration of the results based on triangulation of methods and theories

Development depending on the surroundings: salutogenic factors

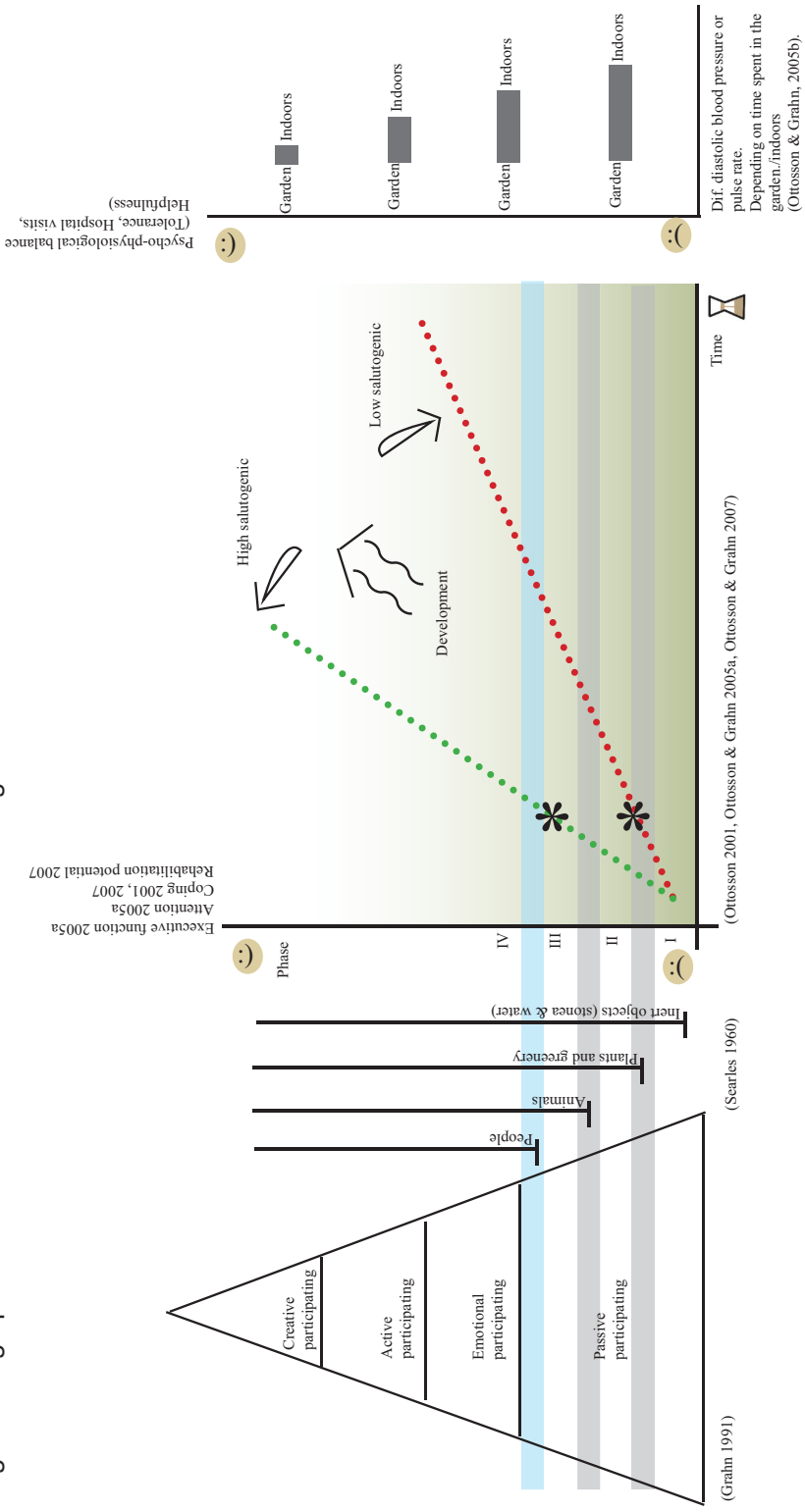
The figure below (Figure 2) consists of two diagrams and two illustrations. I have compiled the results of Ottosson (2001), Ottosson and Grahn (2005a) and Ottosson and Grahn (2007) in one diagram, and those of Ottosson and Grahn (2005b) in the adjoining diagram to show any common tendencies. The figure (2) was created to illustrate how a person's development is dependent on his/her surroundings: salutogenic factors.

The diagram based on Ottosson (2001), Ottosson and Grahn (2005a) and Ottosson & Grahn (2007) has a time axis (x) and a coping axis (y), consisting of coping from Ottosson (2001), attention/executive function from Ottosson & Grahn (2005a), and rehabilitation potential/coping from Ottosson & Grahn (2007). The direction and slope of the lines in the figure show the relative rates of development in relation to the level of exposure to salutogenic factors. Note that the slope only indicates relative directions. It constitutes an attempt to visually represent a very complicated process.

Results from the study by Ottosson and Grahn (2005b) are illustrated separately in the figure.

In order to relate the diagram to previous research on similar phenomena, two illustrations have been included for the sake of comparison; these originate from Grahn (1991) and Searles (1960).

Figure 2: A graphic illustration of the results based on triangulation of methods and theories



The diagrams in relation to Searles' relational theory

In the figure, four different phases are marked that can be compared to Searles' relational theory (Searles' 1960). At the bottom is the relation to inert objects, stones and water. This relation is the least demanding, and according to the figure and Searles' relational theory, the one that is best suited to a person with an extremely low executive function. A somewhat more demanding relation is that to plants and greenery. Taken together, these two phases cover what we usually call nature. The relation to other people is the most difficult and demanding, according to Searles' theory, and can here be compared with Phase IV. This phase can only be dealt with by a person with a relatively high executive function. Searles places the relation to animals between that to plants and other people. I have not studied the importance of this relation, but nevertheless included it in the figure as Phase III.

I have previously described how certain people, such as small children and other patients, were easier to relate to than others were. Similarly, we can assume that certain animals, such as wild animal, are easier to relate to than, e.g., demanding dogs or horses. Traces of the activities of human beings or animals can likewise be among the least demanding relations in each group. Thus, there are differences within groups. This is why I have marked the bars in the illustration as long.

The diagrams in relation to Grahn's developmental triangle

The diagrams can be compared with Grahn's developmental triangle. Grahn (1991) presents a model in which the physical and social environment is related to the individual's executive function. The y-axis shows the executive function and the x-axis the degree of sensitivity to the social and physical environment. The figure shows that people have different preferences with regard to the environment, depending on the status of their executive function at the time. The same individual may have needs on different levels of the pyramid at different times. The amount of executive function determines the highest level in the pyramid of situations with which people can cope.

At the bottom of the pyramid, we find introspective involvement. In my figure, this represents Phase I and II. The individual wishes to be left alone. Given somewhat more mental energy, the individual may wish to be a bit more active. At this level of executive function, he/she will desire visual contact with other people, but from a distance. This stage can be compared with the first part of Phase IV in my figure.

The next step upward in the pyramid is the level of active participation, for example, taking part in a group activity. At the top of the pyramid is the extrovert involvement level, where mental power is strong. These two parts of the developmental triangle correspond to the end of Phase IV in my figure.

However, one can be in several phases simultaneously. The quality of the human relation can affect the individual at the same time as the quality of nature is still important. The different salutogenic factors work together. According to the figure, the previous phases one has passed through are still important to the individual.

The diagram in relation to Ottosson and Grahn's intervention study

In Ottosson and Grahn (2005b), differences in diastolic blood pressure and heart rate have been measured in a group of the oldest old in relation to their psycho-physiological balance (Tolerance, Hospital visits, Helpfulness) and surroundings

(indoors or in the garden). In the group with low psycho-physiological balance, there was a difference in diastolic blood pressure and heart rate depending on whether the individual was in the garden or indoors for one hour. In the groups with the best psycho-physiological balance, there was no appreciable difference between being in the garden or indoors for one hour. In accordance with other theories (Grahn, 1991; Searles, 1960; Ottosson, 2001; Ottosson & Grahn, 2007), the intervention study showed that the effect of the natural environment was dependent on a person's state of mind. In this case, psycho-physiological balance is not directly tied to the different phases in my figure (Inert objects, Plants, Animals, People). However, the importance of the environment one is in, depending on one's state of mind, shows the same tendency.

Ottosson and Grahn (2005a) describe how the effect of a restorative garden on the cognitive system (in line with Kaplan and Kaplan) was found in a group of the oldest old. We found no differences within this group with regard to the various background factors. It may be the case that this difference in how the environment exerts influence depends on differences between the cognitive and the emotional systems. In the diagram, the indoor environment represents the lower level of salutogenic exposure, while the outdoor environment represents the higher level of salutogenic exposure. The two levels of exposure in this study are marked in the diagram by two stars, representing two different levels.

Examples of interpretations of the diagram Ottosson 2001, Ottosson & Grahn 2005a and Ottosson & Grahn 2007.

A nature experience that is good for the individual (high salutogenic) causes recovery to occur.

If this is followed by positive human contacts in the right amount, the positive development will continue, but if opportunities for nature experiences decrease, the rate of development will also decrease.

A nature experience that is less good for the individual (low salutogenic) or limited access to nature causes the individual's well-being to develop more slowly. If opportunities for nature experiences increase, the rate of development will also increase.

Scope of meaning

Roger Ulrich talks about the restorative power of the environment (Ulrich, 1983). He argues that the visual impact of the environment itself may signal danger or safety. An article he published in *Science* indicates that the view from a hospital over nature and green open spaces has a positive influence on recovery after surgery (Ulrich, 1984). His supporting findings (Ulrich et al., 1991; Ulrich, 1993, 1999, 2001) show that the body reacts spontaneously, within fractions of seconds, to natural elements, whereas artifacts such as houses, streets, etc., do not trigger the same quick and strong reactions. However, of special interest in this context are two statements he put forward in an article in 1999: "Persons who undergo medical treatment often feel psychologically vulnerable, which has been demonstrated to heighten their sensitivity to insecurity in an environment."

And: "It seems likely that the restorative benefits of viewing nature are greatest when persons experience high levels of stress, such as those who are obliged to spend time confined in hospitals or other types of healthcare facilities" (Ulrich, 1999).

Some other research findings also suggest that ailing individuals are more dependent than are others on the surrounding physical environment. Both Küller (1991) and Searles (1960) have demonstrated the importance of a familiar environment to people experiencing ill health. If an individual is allowed to use his/her own furniture and familiar objects after moving to an institution, his/her sense of well-being will be heightened. Diary studies reported by Grahn (1989) demonstrate that the need for familiar surroundings applies to the outdoor environment as well. Lawton (1985) points out the importance of balance between familiar and new features in the environment. Whenever the unknown or the familiar is too dominant, we try to right the balance. When an individual's flexibility (i.e., capacity to accommodate) declines, he/she has, according to Lawton (ibid.), a greater need for compatible surroundings. The need for compatible surroundings to right the balance is very dependent on a person's frame of mind.

Havnesköld and Risholm Mothander (1995) consider that interest in the physical surroundings can be viewed as a fundamental driving force in human beings. They define this as the pursuit of competence – being able to increase one's physical and mental understanding and competence regarding the environment. For this driving force to function, it should be accompanied by a positive frame of mind and positive feelings, so that an exchange with the surroundings can emerge that is both pleasurable and marked by curiosity. This playful relationship to the surroundings is said to emerge spontaneously and from birth (ibid.).

Could it be the case that natural environments, more than others, are compatible, start processes of pursuit of competence, and/or are able to bring up memories through all the senses that are activated in such environments? Some environments speak to us in a familiar way, such that we feel the presence of something that affects our innermost world. We do not simply experience the trees, flowers and gravel roads that are visible. We do not just move through an area containing countless impressions of smells, sounds and sights. A garden or a clearing in the woods cannot merely be described as the sum of all these impressions: Every sensory impression we have – of trees, stones, berries or beaches – occurs in relation to a personal background that is both spatial and temporal. Our experiences are interwoven into our entire life history.

Findings show that effects of the physical environment are not just a question of sensory impressions and mental recovery. Our memory and history play an important part (Grahn & Bengtsson, 2005). Moreover, this is also a matter of reflection, of being able to view reality in a new way and find some form of reorientation. Thus, we no longer only talk about restorative effects, but also instorative effects, in which reorientation based on previous experiences also plays an important part (Stigsdotter & Grahn, 2003).

Grahn's concept *scope of meaning* (1991, 2005) can be discussed in this context: This resource concerns the self's communication with the external environment. It can be seen as a part of a person's identity being extended into the physical space. Sometimes, the external environment seems to be firmly tied to the informant's self,

to the identity. The theory implies that a person, as well as an object, can change in meaning when there is scope for such a change. This depends, i.e., on the mental and physical resources one has at the time, and it is especially obvious when a person feels stressed, upset and sad. In such a situation, the emotional response to the quality of the physical environment is very strong. It is suggested that the structure of the scope of meaning is partly created through innate memory-like processes – such as biophilia behavior (Kellert & Wilson, 1993) – partly through attachment processes – such as those establishing our reality constancy (Frosch, 1990), and our relation to the external world (Searles, 1960). Moreover, the scope of meaning is also based on how we perceive affordances and security in the environment (e.g. Gibson, 1979; Appleton, 1996).

The scope of meaning may be seen as being made up of all our experiences and values – how we communicate with the surrounding world in order to function and survive in it. Experiences that build our scope of meaning may be bodily/sensory and affective as well as related to feelings and thoughts (Grahn, 2005). Values are connected to both people and objects. Thus, everything of importance to our functioning in everyday life figures into the scope of meaning. According to this theory, in order to maintain and develop our identity, we must have contact with the surrounding world: Communication between the self and the surrounding world is what develops us (Grahn, 1991, 2005). This communication is constantly ongoing and is a necessary process, enabling us to develop and maintain our identity (Frosch, 1990). During a life crisis, communication between the surrounding world and us becomes difficult. Our way of thinking about people, objects and the whole environment in our scope of meaning is transformed, which alters their cognitive significations and our own scope of action.

Scope of meaning and its effect on senses and body awareness

Two interesting studies of the effects of natural environments on the entire body have been presented by Sunvisson and colleagues (Sunvisson et al., 1997; Sunvisson & Ekman, 2001), who have shown that Parkinson's patients are positively affected by spending time in non-demanding, mildly stimulating environments, with impressions from nature and a lack of demanding, urgent impressions. They carried out an intervention involving a one-week mountain hike taken during three consecutive years. Results showed that, after the intervention, participants were better able to coordinate their movements and movement speed. The studies also showed that a favorable environment enabled movements to be managed without mental control; the body did not make itself felt. The environment affected participants' experience of how the disease limits their abilities as well as their trust in their own abilities. In an environment perceived as unfavorable, participants' attention was directed at the body, and movements had to be controlled more or less consciously, which resulted in slow and fumbling movement patterns. However, in a favorable environment, the need for conscious control was reduced, and the body did not make itself felt. The favorably perceived mountain environments gave participants a feeling of satisfaction with life and an awareness of the environment's effects on their perception of the disease. This caused them to seek out similar natural environments after completion of the intervention.

Ayres (1983) claims that a child's development depends on how the senses are activated and integrated. The somatic senses – touch, temperature, pressure, balance,

movement and muscles position – are considered most important, as their integration gives us a feeling of being a separate body in space, a body awareness: proprioception. This awareness is of great importance for the feeling of being a self-contained individual. Proprioception must also be integrated with vision, hearing, the sense of smell and taste as well as the visceral sense (sensations from internal organs). Yet according to Ayres (1983), humans develop throughout the life span, meaning that even adults can be treated by activating and integrating the senses. If this is to succeed, however, the individual must have a feeling of security. Then he/she can develop integration among the senses, thereafter his/her body awareness and finally his/her ability to connect to other people. In Ayres' treatment model, the individual's curiosity is to be stimulated. Therefore, the environment in which treatment takes place is adapted so that it places increasingly challenging demands.

An effectual emotional tone

Daniel Stern (2003) defined vitality affects as pre-linguistic communication through the emotions. He described how the environment can signal a calm, positive and secure feeling. He gives some examples of how children develop this pre-linguistic communication with their parents, and this type of communication is likely of great importance to what Bowlby (1969) describes as a process of attachment to the parents.

As stated above, I suggest that a type of vitality affect also can develop in relation to natural elements, such as water, stones, trees, etc. Therefore, the concept is broadened here to also encompass nature, and labelled the *emotional tone*. I suggest that harmonization of the inner world, as our findings have shown (Ottozon & Grahn, 2005a, b, 2007), occurs through this emotional tone. Nature, urban parks and gardens with certain qualities mediating this calm, positive and secure feeling have an *effectual emotional tone*, which can support reorientation and will be accompanied by positive affects (Tomkins, 1995) such as curiosity and joy. A restful and secure natural environment, thus, can bring about this effectual emotional tone, which collaborates with the senses.

I suggest that positive natural environments can help the brain connect emotional and logical information. This involves finding and experiencing an effectual emotional tone that can help support recreation of an individual's scope of meaning. The secure background constituted by nature may be a factor that can facilitate this connection. If the proper emotional tone does not emerge, communication between the senses, the affects and logic will not function. In such a condition, the individual finds it difficult to evaluate his/her situation and make the right decisions.

When a person is affected by a severe crisis, his/her scope of meaning is extremely fragile and "skinless." At this point, dialog and reflection occur in and through the scope of meaning primarily via sensory impressions and affects, such that the physical environment acts as the counterpart to the dialog. In order for rehabilitation and reorientation to occur, they must be accompanied by an effectual emotional tone. This emotional tone could hypothetically emerge more easily when the physical surroundings consist of natural elements, which we have been adapted to deal with through evolution.

The effectual emotional tone is brought about in the scope of meaning by previous experiences, which may be highly personal, such as childhood experiences of nature,

as well as by more universal, for most people positive, elements, such as water and light woods, which give rise to innate reflexes (Coss, 1991; Coss et al., 2003). This is largely a question of the threats and demands made by the surroundings. We receive all these signals from nature, which are very important in this critical phase, although we might not consciously perceive them (Searles, 1960).

An individual who is greatly affected by a crisis may feel that, when everything else fails, nature is still accessible: stones, the sea, etc. It may be especially important to be able to find this sort of comfort every day. This may partly explain why having access to nature in everyday life can have a buffering effect on people's mental state (Ottozon & Grahn, 2007). Individuals with many experiences of nature are, according to our results, less affected by their crisis than are those who have few such experiences (ibid.). Having a constant dialog via the scope of meaning may help the individual more easily find his/her role and define his/her identity.

During the later phases of working through a crisis, people seem to have a greater need for reflection and dialog in their scope of meaning through their own activities, thoughts and creative elements (Ottozon & Grahn, 2007). At this point, the scope of meaning is recreated to consist of a physical and a social environment.

Of primary importance are those people and objects in our surroundings to which we have tied a large part of our identity: people and objects we have become affiliated with and that can validate us (Grahn 1991). This core of our scope of meaning constitutes fundamental parts of our identity. The notion that places can play a great and important role in people's lives has been described in several studies and capsulized in the concept "place bonding" (Hammit et al., 2006). I suggest that the mechanism underlying and supporting this communicative process is the scope of meaning. Tornstam (1997, 1998) suggests a theory that is connected with the same phenomena: Considering people's relationship with their environment, including the outdoor environment, he emphasizes the importance of what he calls "consensual validation". He suggests that, whereas all people have a definite idea of their identity, they require confirmation – validation – from features in their surroundings. When the person's self-image is confirmed by signals from the environment, consensus is established: What I perceive to be my identity has to be confirmed by my surroundings – otherwise I become uncertain of my identity – of who I am.

Grahn (1991) suggests that humans relate to themselves using a kind of dialog with and through the scope of meaning, involving activities, not least playful activities and art. This dialog represents the pursuit of competence. Ekvall (1988) describes two aspects of the pursuit of competence that characterize human development from infancy:

- 1) The pursuit of *autonomy* – an expansion and independence instinct whereby we wish to understand and master the surrounding world to avoid falling victim to unpredictable or unknown forces. This instinct entails, e.g., our thirst for knowledge, desire to create and ambition to attain a position of authority.
- 2) The pursuit of *homonomy* – affiliation with a group, clan, family, work community, association, church or some other form of fellowship with God or the cosmos.

These two aspects are crucial when a person strives to find and maintain his/her identity, attempting to develop a certain degree of function or balance, in terms of both autonomy and homonomy in relation to him/her self and the social environment (ibid.).

Here, I want to add the relation to the physical environment as well, concerning both autonomy and homonomy.

Enriched environments and plasticity of the brain and the sensory system

Tranel et al. (2000) found that when informational impulses from the emotional center cannot be correctly linked to centers of logic in the brain, people have great difficulty making rapid and sound decisions: Among other things, they misinterpret signals from other people. This means that people who are stressed suffer from imbalance: They obey the affects and cannot link them to logical information. Goleman (1995) and Gardner (1993) consider feelings to be essential parts of the human intellect. Feelings help us to orient ourselves in the world around us and to communicate, both with others and with ourselves. Thus, our logical intelligence must be connected to our emotions if well-founded decisions are to be made (Hansen, 1998; Gardner, 1993; Goleman, 1995; Tranel et al., 2000). Here, an effectual emotional tone can promote interaction. Empathy involves the ability to communicate with others and understand why other people behave and react in the way they do (ibid.).

Humans can generally manage moderate stress levels well and can also manage considerable stress for a limited period of time. However, we have known for decades that sustained stress, in which time for recovery has been scarce or absent, may have severe harmful effects on the cardiovascular system, causing cardiovascular diseases (Atkinson et al., 1996). Hansson (1996) discusses the clear links between the psyche and physiological status, specifying psychological reactions within the framework of psycho-neuro-immunological theory. He points out a well-documented relationship between stress and infection: The systems are highly integrated. The immune system is able to sense potentially threatening bacteria and viruses that the nervous system cannot register. At the same time, the nervous system can intervene in the immune system. Following the introduction of this theory, scientists have tried to explain how mental stress can affect other bodily systems, not only immunological reactions, but also diseases of and pathological changes in muscles, the digestive system, other internal organs, nerve pathways, the hormonal system and the brain (Malt, 1999; Doctare, 2000; Währborg, 2002a; Uvnäs-Moberg, 2000; Uvnäs-Moberg & Petersson, 2004).

Research on non-human animals has shown that early development in stressful environments can entail dramatic effects on brain development. Jewelfish that had developed in a cramped environment with far too many of their own species were compared with other jewelfish that had developed in isolation or in appropriate surroundings. Both the cramped and the isolated environments led to abnormal brain development (Coss, 1991). Studies show that the brains of adult rats and mice are also affected by stress (Eriksson & Wallin, 2004). The hippocampus is particularly sensitive. This part of the brain is responsible for sorting incoming stimuli, for certain memory functions and, not least, plays an important role in the degree to which depression arises or does not arise. Studies on rats show that, during prolonged

periods of heightened stress, the dendrites of hippocampal neurons degenerate greatly and, in some cases, entire nerve cells die. Prolonged stress is interpreted to cause cessation of neurogenesis – the process by which neurons are created from stem cell deposits – in the brain. This could explain why hippocampus shrinks (Eriksson & Wallin, 2004).

Komitova et al.'s (2005) study of brain plasticity (the brain's ability to adapt and heal itself) in rats shows that, after experimentally induced brain injury, neurogenesis of nerve cells seems to be activated by stem cells in the brain. Moreover, the study indicates that these newly formed nerve cells are recruited to the injured area and attempt to repair this area. Following injury, factors such as having an "enriched environment" as well as social contacts and physical and cognitive challenges were shown to stimulate what appeared to be a cell regeneration. According to Komitova et al (2005), physical exercise alone, impaired regeneration of brain cells. The authors consider that the combination of social contacts and a physically stimulating environment that promotes feelings of security, an enriched environment, could be an important component in rehabilitation of brain-injured patients (ibid.).

Research on humans is limited. In a study on children in school environments, Sapolsky (2003) shows that sensitive children react strongly to intense stimuli in the physical environment; such stimuli cause stress in these children. This results in an increase in cortisol from the adrenal cortex. Prolonged exposure to cortisol can damage the hippocampus, which can lead to impaired learning ability (ibid.). Research results also indicate that the physical environment can stimulate growth in parts of the brain (Maguire et al., 2000). Moreover, research results by Eriksson & Wallin (2004) are interpreted as showing that neurogenesis occurs in the human hippocampus. These findings have led Eriksson and Wallin (2004) to hypothesize that depression and fatigue reactions may result from impaired neurogenesis.

In physiological terms, affects are largely located in the older part of the brain, in the limbic system, which is the product of millions of years of evolution. Directly adjacent to the limbic system is an even older system, the brainstem (Bergström, 1992). Affects, particularly primitive impulses such as the impulse to flee or to seek food, have been important to the survival of the human race. These affects originate for the most part in the oldest parts of the brain. They give rise to very quick reactions in the nervous system, which in turn stimulate the autonomic nervous system and endocrine glands (Bergström, 1992; Hansson, 1996).

According to Tomkins (1995), there are six negative affects but only one neutral and two positive affects, because, with regard to human evolution, it has been most important for survival and procreation to avoid dangers and toxins as well as to develop socially acceptable behavior. If danger is signaled, for example by the presence of a predator, a message is sent to a specific area in older parts of the brain, where the affects and the sympathetic nervous system are activated. This triggers, among other things, the circulatory system and causes the release of a number of hormones, such as cortisol and catecholamines, and simultaneously shuts down kidney and digestive functions. The entire organism is mobilized for an emergency. This emergency reaction has been in place in the brains of mammals for a hundred million years and is of vital importance for survival (Tomkins, 1995; Bergström, 1992). But this basic reaction, intended for flight and/or attack, is also triggered by

psychosocial challenges or by the threats we are exposed to in modern society. When the individual is challenged, the central nervous system takes command, which leads to a stress or fight/flight reaction (Atkinson et al., 1996).

Jean Ayres (1983) argues that severe stress causes our entire informational apparatus – comprising senses, emotions and cognition – to function poorly, which makes us feel insecure, which in turn causes us to become even more stressed. To change this, we must perceive ourselves as being safe and secure, thus causing the senses to become more integrated. This security is signaled particularly via the 'remote' senses of hearing, smell and vision (Ayres, 1983). Stress causes the cognitive brain to be less active, and the individual relies more on and is more controlled by affects. When under stress, he/she is more susceptible to signals that sustain or counteract these affects (Ayres, 1983; Ulrich, 1999). Signals may sometimes consist of innate reflexes (Coss et al., 2003) and, thereby, give rise to very rapid reactions. The primeval home of humans was located in protective green surroundings; it was restful, without disturbing sounds and smells, and commanded a view of water and the surrounding terrain – predominantly lightly forested, open fields (Appleton, 1996; Coss et al., 2003). In our study (Ottooson & Grahn, 2007), we also found that experiencing nature seems to have a more powerful influence on the rehabilitation potential of people greatly affected by a crisis.

Natural environments may be seen as being specially enriched with physical objects. Several studies have shown that natural environments affect people who are stressed and depressed (Burls & Caan, 2005; Ulrich, 1999, 2006). One kind of study has explored nature's ability to rapidly reduce stress via our most primitive emotions, our affects, and according to Ulrich (1999), this indicates that the visual impact of the environment itself may signal danger or safety, and that this is most important when "persons experience high levels of stress".

In our study (Ottooson & Grahn, 2007), for those affected greatly by a crisis, experiencing nature seemed to promote restoration better than did the other inputs studied. Ottooson and Grahn (2005a) compared the effect of outdoor stays on wheelchair-bound as compared to non-wheelchair-bound people who were among the oldest old. There was no difference between how these two groups were affected by being out-of-doors. Thus, the difference in physical activity did not affect the results. The nature experience per se influenced their concentration ability. Elderly people using wheelchairs received the same stimulation from going out into the garden as did those without wheelchairs.

Our results from Ottooson and Grahn (2007) may also be compared with our results from Ottooson and Grahn (2005b), where we showed that one group of elderly people could be defined as having "low tolerance of other residents", being "not helpful in group activities" and having "a high frequency of hospital visits". These older individuals were most affected by a stay in a garden, as measured by changes in heart rate and blood pressure. In Ottooson and Grahn (2005b), we interpreted the results as follows: "It is conceivable that a positive experience of natural surroundings in itself has a balancing or buffering effect. (...) The experience can restore the individual to a better state of harmony. Time spent in the out-of-doors is, thus, especially important for individuals with a low psycho-physiological balance, individuals who easily lose

their equilibrium or who find it difficult to make compensatory changes to restore harmony on their own.”

Moreover, Hartig and Staats (2006) found that the more fatigued their study participants were, the more they favored a restorative walk in a natural environment, compared to a walk in a city center.

My interpretation of the findings from all studies (Ottooson 1997, 2001; Ottooson & Grahn, 2005a, 2005b, 2007) concerning how nature affects people in crisis can be summarized as follows: During stays in an enriched environment (that is, nature with qualities mediating an effectual emotional tone), an interaction takes place between sensory stimulation, emotions and logical thought – an interaction that leads to a new orientation and new ways of seeing one’s self and one’s resources.

The interplay that emerges between our senses, affects/emotions and cognitive thought is complicated. Information about the surrounding world is taken in through all of our sensory organs. Impulses from sensory impressions are later integrated and processed in the brain, in a complex recurrent network, and the activity in each part is intimately dependent on the activity of many other modules. Processing occurs in the limbic system, thalamus, hippocampus, amygdala and cerebrum, via different informational paths. Finally, the information is linked together in the frontal lobes (Fellous & Arbib, 2005; Tranel et al., 2000).

What has been found recently is that affects/emotions as well as cognition are equally important in decision-making (Tranel et al., 2000), and further that affects/emotions are dynamic modes of functioning (Fellous & Arbib, 2005). Neither affects, emotion nor cognition could be said to be located at one or two single locations in the brain; the interaction here are quite complex (ibid.). And as Stern (2003) suggested, emotions temporally wax and wane as internal (e.g., memory driven) or external (e.g., perceptions) events occur (Fellous & Arbib, 2005). Affects/emotions can occur on short time scales, as with fear, or long time scales, as with moods or depression. As such, it is much more useful to think about emotional flow rather than emotional states, and emotional flow should hypothetically be more open to effectual emotional tones in the surrounding environment.

Conclusion

Since the beginning of this research project, through the introspective study, Searles’ theory has been the guiding star in my work. Through the theory, my experiences, which at first felt strange, became comprehensible, and this comprehensibility helped me accept that my feelings were relevant.

Searles (1960) theory can be summarized as follows: People in crisis need stable environments in order to feel well. In situations of crisis, the individual may need to revert to simpler relations. Most simple relations are toward inert objects such as stones or water. The next step to more complex relations concerns plants and greenery. Further steps concerns animals, then people. Of particular significance in this perspective is Searles’ conception of nature as a more stable link between the conscious and the subconscious: Contact with nature can be a factor that contributes substantially to people’s recovery from critical situations of various kinds. Signals from nature spark creative processes that are important in the rehabilitation process.

This, and being able to master these relationships, says Searles, helps to reduce anxiety and pain, restore the sense of self, improve our perceptions of reality and promote tolerance and understanding (Searles, 1960).

In my quantitative work, the Attention-Restoration Theory (Kaplan & Kaplan, 1989) and the Aesthetic-Affective Theory (Ulrich, 1983) have served as guiding stars. The third paper (Ottoosson & Grahn, 2005a) showed that Attention-Restoration Theory seems to hold true, in that the older people's concentration ability recovered more quickly after a stay in a garden. The fourth paper (Ottoosson & Grahn, 2005b) supported the Aesthetic-Affective Theory, by showing that pulse rate and blood pressure recovered more quickly after stays outdoors, at least for those elderly with the lowest psycho-physiological balance.

In the frame story, I have tried to move on and find parallels and explanations for my own experiences (Ottoosson 1997 & 2001) and for my results on the oldest old by looking at other areas of research. The final paper (Ottoosson & Grahn, 2007) introduces the theory of enriched environments, which I here elaborate on and integrate with the theory of "the scope of meaning" (Grahn, 1991, 2005). The scope of meaning as well as brain research can provide explanatory models of the effects of nature experiences on emotions and recovery from a crisis.

I suggest that stays in sound natural environments function as stays in enriched environments (Komitova et al., 2005). Sound natural environments contain certain qualities that mediate an effectual emotional tone. In the dissertation, I have put forward natural elements that have a simple relation to people, such as stones and water. This could also involve some of the eight recreational characteristics found by Grahn and colleagues (Berggren-Bärring & Grahn, 1995; Grahn, 2005; Stigsdotter & Grahn, 2003), characteristics that have been connected to various health parameters (e.g., Björk et al., 2007).

Certain qualities in nature can constitute an important link to an enriched environment that can provide the harmony required not only to make people function and feel better, but perhaps also to help the body succeed in repairing a disrupted process of neurogenesis in the brain: Current research indicates that people suffering from severe crises often show symptoms of acute stress and hippocampal effects. Recent studies on non-human animals with hippocampal damage are promising. The results are interpreted as showing great effects of regeneration in the damaged regions in animals that are allowed to stay in enriched environments (Komitova et al., 2005). Our theory suggests that the rehabilitative effect of nature is tied to its function as an enriched environment.

Nature may be seen as a supportive background to various other forms of treatment. To be receptive, one must be secure, but also find the environment tempting and attractive. Moreover, nature could be a prerequisite for building a starting point, a bridge between emotion and intellect, which can facilitate how one works through a crisis. Thus, it is of particular importance that weak groups, such as elderly in great need of care, have access to an outdoor space. In such groups, there are likely to be many people in a state of psycho-physiological imbalance (Ottoosson & Grahn, 2005a, b, 2007).

When the rehabilitation process has progressed, social aspects play an increasingly important role. Our study shows that for those affected by a crisis to a low/moderate degree, the social climate seems to be most important: It has more influence on their rehabilitation potential (Ottosson & Grahn, 2007). We suggest that, given somewhat more mental energy, the individual's need for nature will become less indispensable and specific, and his/her social needs and skills will become more apparent. Human beings have a fundamental striving to be part of a social context (Ekvall, 1988). Feelings of belonging are in focus.

I hope that my dissertation will provide new ideas for continued research in this field of study.

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- Translation of Karin Boye: Jenny Nunn

Appendix

Concepts in the dissertation

Coping: refers to the ability to logically deal with and survive difficult circumstances without succumbing to one's immediate emotions (Kaplan, 2001).

Crisis: From answers in the SCI-93 protocol: Have you experienced any difficult event, divorce, a death or any other severe loss where you felt you had been left alone/abandoned or lost something of value to you? (Nyström & Nyström, 1996).

Enriched environment: refers to housing conditions, either home cages or exploratory chambers that facilitate enhanced sensory, cognitive and other stimulation related to standard housing conditions (Nithianantharajah & Hannan, 2006).

Emotional tone: Daniel Stern (2003) defined vitality affects as pre-linguistic communication through the emotions. He described how the environment can signal a calm, positive and secure feeling. He gives some examples of how children develop this pre-linguistic communication with their parents, and this type of communication is likely of great importance to what Bowlby (1969) describes as a process of attachment to the parents. However, I stated that a type of vitality affect can also develop in relation to natural elements, such as water, stones, trees, etc. Therefore, the concept is broadened here to also encompass nature, and labelled "the emotional tone".

Executive functions: refers to the individual's ability to deal with the decision chain

- being able to see one's own situation and what one wishes and/or needs to do
- being able to prioritize among what one wishes and/or needs to do
- having the will and daring to carry it through
- being able to plan how to do it
- finally, being able to carry it through

People who are going through a life crisis – who are depressed – operate at a low level in the decision chain; they have a low-functioning executive function (Luria, 1980; Lezak, 1995).

Health: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948).

Nature: That part of the surrounding reality that is not created by man, with emphasis on the visible part: plants, minerals, etc., sometimes also animals (The Swedish National Encyclopedia Dictionary, 1996). See figures in Ottosson 1997, 2001.

Outdoor environment: The environment in which I find myself when I leave a house/building and close the outer door behind me.

Pursuit of competence: Interest in the physical surroundings can be viewed as a fundamental driving force in human beings. Havnesköld and Risholm Mothander (1995) define this as the "pursuit of competence" – being able to increase one's physical and mental understanding and competence regarding the environment. For

this driving force to function, it should be accompanied by a positive frame of mind and positive feelings, so that an exchange with the surroundings can emerge that is both pleasurable and marked by curiosity. This playful relationship to the surroundings is said to emerge spontaneously and from birth.

Scope of meaning: The scope of meaning may be seen as being made up of all our experiences and values – how we communicate with the surrounding world in order to function and survive in it. Experiences that build our scope of meaning may be bodily/sensory and affective as well as related to feelings and thoughts (Grahn, 2005). Values are connected to both people and objects. Thus, everything of importance to our functioning in everyday life figures into the scope of meaning. The factors of a person's scope of meaning are: mental energy/constitution, physical surroundings/network and social surroundings/network.

