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Restorative effects of visits to urban and forest environments in patients with exhaustion disorder

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ABSTRACT

This experimental study investigated differences in perceived restorativeness, mood, attention capacity and physiological reactions when visiting city and forest environments. Twenty female patients diagnosed with exhaustion disorder visited three different forest environments and one city environment in randomized order. They performed a standardized 90-min test procedure in each of these environments. Evaluation of the environments and psychological effects in mood were studied with self-administered questionnaires. Attention capacity was studied with Necker Cube Pattern Control task. Physiological responses were measured with regularly scheduled controls of heart rate and blood pressure, and a single test of heart rate recovery. Visits to the forest environments were perceived as significantly more restorative, enhancing mood and attention capacity compared to the city. This also applies to the results of heart rate and to some extent to the results of the diastolic blood pressure. The results from this experimental study support our hypothesis that short visits to forest environments enhance both psychological and physiological recovery and that visits to forest environments are likely to be beneficial when suffering from exhaustion disorder.

Introduction

Mental and behavioural disorders are a rising burden to the society and one of the greatest contributors of years living with disability according to The Global Burden of Disease Study 2010 (Murray et al., 2012). New strategies need to be developed to meet the challenge of relieving the individual burden for those affected and also to ebb the consequences for the society. Long-term mental strain affects both mental and physiological processes, with negative health effects as a consequence (McEwen, 1998). Exhaustion disorder (ED) has been used, instead of burnout, as a clinical diagnosis in Sweden since 2003. ED is a result of a long-term mental strain with lack of recovery resulting in reduced mental, physical and cognitive performance, sleep deprivation and negative emotional reactions (Glise et al., 2009). Studies on intervention and rehabilitation of ED, or the burnout syndrome, are few and the results have been modest (Stenlund, 2012; Adevi and Mårtensson, 2013). It seems important to find ways to help body and mind to recover as a whole. Physical activity (Rovio et al., 2005; Hillman et al., 2008), meditation (Brown et al., 2007), animal interaction (Souter and Miller, 2007; Handlin et al., 2011), and cultural activities (de Manzano et al., 2010) are some examples how this salutary interaction between body and mind can promote health.

The scientific literature shows evidence of the positive effects of greenery on public health and on people suffering from temporary mental strain (Bowler et al., 2010; Van den Berg et al., 2010; Annerstedt and Währborg, 2011). Greenery is perceived as pleasant in outdoor recreational activities and contributes to recovering from the daily wear and tear (Korpela and Kinnunen, 2011; Stigsdotter and Grahn, 2011). Visiting or looking at pictures of natural green environments or environments with water have beneficial impacts on emotions, general well-being and cognitive performance and seems also be to beneficial for the cardiovascular system (Hartig, 2003; Wells and Evans, 2003; Chang et al., 2008; Lee et al., 2009; Kjellgren and Buhrkall, 2010). However, access to greenery might decrease when the internal migration from rural

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areas to cities increases (Statistiska Centralbyrån, 2012). The need for new housing areas with short commuting distances competes with preservation of parks and other nearby green environments (Grahn and Stigsdotter, 2003).

There are two leading frameworks emphasizing that nature might help both body and mind to find balance: the Attention Restoration Theory (ART; Kaplan and Kaplan, 1989; Kaplan, 1995) and the Aesthetic Affective Theory (AAT; Ulrich, 1983) also called the Stress Reduction Theory. The ART mainly focuses on cognitive processes while the AAT concerns emotional and physiological responses. Even if focusing on different aspects of recovery, both theories hold that natural green environments are especially beneficial for restoration. The ART proceeds from the idea that restorative environments support and enhance the recovery of diminished capacity in directed attention through four conceptual properties: *fascination*, *being away*, *extent* and *compatibility*. *Fascination* is described as effortless attention. *Being away* can be sensed either through visiting a physical or imaginary place different from the everyday environment. *Extent* contains dimensions such as scope and coherence which help us to remain engaged and *compatibility* includes the notion that the environment should support and fit the needs and inclinations of the user. The Perceived Restorativeness Scale (PRS; Hartig et al., 1996) was developed with the intention to evaluate the restorative potentials in different environments. The PRS aims at investigating people's perception from the four ART properties and has been used in several studies (Purcell et al., 2001; Tenngart Ivarsson and Hagerhall, 2008).

The AAT focuses on the green environments' salutary effects through aesthetic (preference) and affective (emotional) responses and emphasizes stress reduction through psychophysiological recovery. The framework proceeds from our visual congenital responses to scenery, which are expected to affect our thoughts and physiological reactions through our emotions. Ulrich (1983) suggests that vegetation and water are important for us from an evolutionary point of view and generate positive feelings within us and make us tuned to such environments. Our earlier study (Sonntag-Öström et al., 2011) also showed preference for forest areas with closeness to water as well as bright instead of more enclosed areas.

Patients with ED can show tendencies of being sensitive to mental strain years after onset (Glise et al., 2012; Stenlund et al., 2012), and in severe cases ED may be considered as a chronic disease. Therefore they need rehabilitative measures to learn new behaviours and how to cope with their disorder. Previous environmental psychological research on young and healthy adults has shown positive effects on physiological, mental and cognitive reactions and performances from spending time in the nature (Hartig et al., 2003; Lee et al., 2009). Given these results together with the theories on restorative environments, there is reason to believe that patients with ED could benefit from visits to forest environments as compared to a visit to the city. Moreover, based on both ART and AAT, visits to different natural environments could result in different outcomes. Also, further knowledge is requested in rehabilitation medicine on how to benefit from nature-assisted therapy.

The present study was designed to investigate differences in perceived environmental restorativeness, psychological and physiological responses, and attention capacity in female patients with ED when visiting urban and forest environments.

Based on the ART and the AAT we hypothesized that forest environments would be perceived as more restorative and that visits to forest environments would result in more positive psychological, physiological and cognitive salutary outcomes compared to visits to the urban environment. Furthermore, based on the notion of human preferences of environments with water in the cited theories (Ulrich, 1983; Kaplan and Kaplan, 1989) and the results from our earlier study (Sonntag-Öström et al., 2011), we hypothesized that the forest environment with proximity to water would result in the most positive outcomes among the different forest environments.

Methods

Procedure

This experimental study has a randomized cross-over design. Information on perceived restoration, mood, attention capacity, heart rate, systolic and diastolic blood pressure and heart rate recovery were gathered for each participant in five different environments; first test session in an office (for the participants to get accustomed to the oncoming procedure in the outdoor environments: data not shown), thereafter in random order; in a city environment and in three different forest settings. Each participant visited and was individually tested in all four different types of outdoor environments.

The order of visits to the environments was randomly selected. Each participant was asked to draw one envelope that contained a single list of computer randomized order of outdoor environments. This individual order was practiced throughout the experiments.

The experiment that was initiated in September 2009 ended in September 2012 and was conducted in Umeå in Northern Sweden. The experiment was conducted between May 10 (the earliest date in the spring season) and November 11 (the latest date in the autumn season). Sunrise for the corresponding dates is approximately 3.30 am and 7.50 am, and sunset approximately 9.30 pm and 2.50 pm respectively. The mean temperature in Umeå is approximately +12 °C in May and −2 °C in November.

Twelve participants completed testing during the autumn season and eight during spring season. All test occasions for one participant were completed either during one spring or one autumn season. The uneven distribution of completed tests was caused by a short spring period (May-June) and a longer autumn period (August-November). The relatively long study period was mostly caused by restrictions in the recruitment period which lasted only a few months each year. Snow-covered landscape (late November to April) and the mosquito season (late June to July) were avoided. The sequence of five tests was always accomplished either in the morning or in the afternoon and always in daylight with each test occasion taking approximately three hours to complete. No tests were performed in heavy (continuous) rain. Tests in different environments were not performed more often than every other day to prevent increased fatigue. Some participants worked part-time which also limited the amount of available testing days.

Each test occasion started at the participant's home with baseline measurements of heart rate, systolic and diastolic blood pressure, and attention capacity. Thereafter, the participant was transported with the test leader by car to the test environment. The one-way transportation varied between 30 and 60 min depending on the distance between the participant's home and the test area. The test leader avoided any therapeutic discussions with the participant but otherwise discussed general topics initiated by the participant. The participants spent the first 10 min in each environment moving around in slow pace in order to get acquainted with it. This was followed by a period of sedentary sitting for 40 min to be able to evaluate effects on heart rate and blood pressure in a stable resting condition. The test leader checked the heart rate and blood pressure every 10 min after entering the environment. In previous studies the effects of nature environments on physiological variables have mostly been fast and shown within minutes (Laumann et al., 2003; Lee et al., 2009). The resting time was limited in this study to 40 min in order to avoid the participants getting cold or bored, which may affect physiological and psychological reactions.