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Place, green exercise and stress: An exploration of lived experience and restorative effects[☆]

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ABSTRACT

This paper reports on inter-disciplinary research designed to investigate the stress-buffering effects of green exercise, and the importance of the context in which exercise takes place. This investigation of *context effects* examines both individual physiological responses (salivary cortisol) and the phenomenological interpretation of *lived experiences* of the intervention, reported by a subsample of participants in a randomized, controlled trial, in which healthy, physically inactive university students were randomly allocated to three activities: walking on a treadmill in a gym, walking in semi-natural recreational area, and sitting and watching nature-based videos on TV. The study found clear indications of context effects, notably in the connections between positive appraisals of perceived circumstances, enjoyment in the enacted context, and physiological stress-reduction.

1. Introduction: exploring environment and stress

This paper draws on the findings of an interdisciplinary research project designed to investigate the idea that natural environments¹ have the potential to perform as affective landscapes that ameliorate or counteract the effects of stress in human physiology and experience. To date, restorative health effects of exposure to nature have been quantified in cognitive measures of mental fatigue (attention performance) and/or the physiological changes related to stress (cardiovascular measures and/or cortisol), as well as in the self-reported changes in perceived stress and mood (as assessed by questionnaires) (Valtchanov et al., 2010). A series of studies suggest a connection between exposure to nature and psychological benefits compared to equivalent effects in urban environments (see Health Council of the Netherlands (2004), Bowler et al. (2010), Thompson-Coon et al. (2011)). Tests in the context of *green exercise* – that is physical activity with direct exposure to nature (Pretty et al., 2003) – confirm that green exercise benefits people more than exercise in less natural environments (see for example Mitchell (2013) on mental health, Marselle et al. (2013) on perceived stress and negative emotions/mood). Other studies (Gladwell et al., 2012; Park et al., 2010; Lauman et al., 2003; Li et al., 2011; Ulrich, 1981) report greater physiological stress-reduction in relation to physical activity in natural as opposed to

urban settings (as assessed by changes in heart rate, blood pressure and/or cortisol). Systematic reviews of this literature suggest that physical activity or inactivity in nature compared to urban settings is associated with improved mental health and wellbeing, but over-emphasis on self-reporting and insufficient physiological evidence makes the confirmation of stress-buffering health effects in nature-rich places difficult (Bowler et al., 2010; Thompson-Coon et al., 2011). More research is, therefore, needed, and the scope of current research can usefully be widened to include investigations of lived experience. Physiological stress-responses are mobilized by perceived physical or psychological threats (the “fight-flight response” - Cannon, 1936) that make demands on the organism (Selye, 1955, 1979), which the brain discerns as an emergency and seeks to deal with immediately. Yet, as extensive research on stress appraisal over the last five decades has demonstrated, individuals have the capacity to respond very differently to a given stress situation, depending on their cognitive appraisal (Lazarus and Folkman, 1984). The mindfulness of individuals is, therefore, crucial to the outcome of stress exposure, and the inclusion of personal narratives in research aids the investigation of individual thought-processes, and the identification of appraisals and experiences that arise in the studied context, thereby augmenting and helping to explain physiological outcomes.

In environmental psychology the notion of *restorative environ-*

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¹ Our use of the terms “nature” and “natural environments” suggests outdoor environments, usually beyond the city.

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ments (Hartig, 2004) has been widely used. According to this notion, the diminution of psychological and physiological resources and capacities by the demands of everyday life can be counteracted and restored by access to the environment (Korpela et al., 2014). These restorative effects have been interpreted in the context of: (1) *Attention Restoration Theory* (ART; Kaplan and Talbot, 1983; Kaplan and Kaplan, 1989; Kaplan, 1995) that uses the concepts of attentional recovery and mental fatigue, and associates restoration with psychological connections between fascination and the restored ability to direct attention; (2) *Psychophysiological Stress Reduction Framework* (PSRF; Ulrich, 1981, 1983 see also 1984; Ulrich et al., 1991; Parsons et al., 1998) that focuses on the immediate stress-reducing effects of the environment and frames restorative effects in terms of psychophysiological stress-reduction that occurs when humans encounter non-threatening environments. Both theories suggest that nature-rich places are more likely to facilitate restoration than other places, and imply that attraction to nature and the felt therapeutic effects of “being there” are rooted in biological and psychological processes that may be examined with context and mind-set dependent interactions with the environment. ART argues that recovery from mental fatigue and enhanced ability to focus relies on entering a specific mode of attention – a mode of captivating fascination – involving a four-step process where the mind has been distracted from focusing on the circumstances that promoted tired/exhausted/stressed reactions, and instead flows effortlessly in different directions (Kaplan and Talbot, 1983; Kaplan and Kaplan, 1989). According to PSRF (Ulrich, 1981, 1983 see also 1984; Ulrich et al., 1991; Parsons et al., 1998) stress-reduction involves perception and acknowledgement of places as non-threatening so as to enable the person to relax and recuperate.

Previous studies suggest a need to be sensitive to the context in which restoration takes place. When in need of restoration, individuals show preference for places they believe will have such an effect (Staats et al., 2003) indicating that activity can be understood as a kind of self-regulation when requiring a restorative breather from the taxing everyday (see also Korpela (1991), Korpela and Hartig (1996)). Drawing on PSRF, Ottosson and Grahn (2008) suggest that one of the reasons for restorative effects is that time spent in nature allows people to see themselves and their lives from a different perspective and this *per se* seems to prompt a sense of well-being. Brymer and Gray's (2009) phenomenological study on the lived experience of extreme green sport show that part of the attraction, and the rewarding outcomes concerned, is linked to the meaningful person-specific relationship their study participants had developed with nature through their athletic adventures.

The current study examined whether green exercise (walking) has greater stress-buffering effects than the same exercise indoors or sedentary and representational exposure to nature. To attend to the mindfulness of individuals, context effects were also considered (Di Blasi et al., 2001) by exploring the ways in which stress-buffering effects are influenced by personal, cultural and space/place contexts in which exercise/practices are performed. This study deliberately draws on two very different methodological frameworks. The first, in the genre of environmental psychology and psychophysiology, draws on restoration theories and uses a randomised, controlled intervention trial design to assess psychophysiological responses to standardised tasks involving non-exercise and exercise in indoor and outdoor settings. The second draws on socio-cultural ideas practiced in human geography using qualitative research to explore the individual lived experiences of participants during the experimental period. To engage with responses to context effects within the personal narratives, and to tease out and understand the perception and appraisals of circumstances therein, we draw on the notions of *positionality*, *situated knowledge* and *lived experience*. Positionality (Hartsock, 1987) acknowledges that people perceive the world through the filters of the socio-cultural milieu in which they have been brought up, socialised, educated and familiarised. People exist, therefore, with norms and

values that produce both specific styles of perception and different readings of and relations to the world, including the natural world (Rodaway, 1994). Situated knowledge (Haraway, 1991) provides a sensitivity to how individual differences and specificities are drawn on, intellectually and emotionally, in specific circumstances. Thus understanding of the studied event will be co-produced by the activity, its context, and the ways in which individuals situate their engagements within personal systems of interpreting knowledge and experience. Finally, drawing on ideas from phenomenology (see Heidegger (1962)) that articulate the individual as a relational being – as a mind-body-environment entity – an emphasis on the lived experiences of research participants allowed us to acknowledge that experience results from interactions between individuals and settings, and to delve into the co-constitutive creativity emerging from individual participation in the studied events. Together, attention to positionality, situated knowledge and lived experience helped us to identify individual appraisals of the circumstances under study in order to help explain individual physiological responses.

Although these two approaches appear distinct and subject to very different codes of ontology and epistemology, and in some circumstances could be deemed to be oppositional in nature, the research design has remained open to the broad idea that the two distinct sets of findings can work to some degree in tandem, reflecting a co-production of knowledge about the inter-relations between place, exercise and stress. Detailed quantitative results from the research are published elsewhere (Olafsdottir et al. submitted). The purpose of this paper is to examine how the qualitative elements of the research bring additional resources to this co-production of knowledge; how a detailed understanding of the life-experiences of particular participants can both contextualise and help explain their responses to scientific experimentation, and to introduce wider understandings of the performative specificities that occur when everyday lives intersect with scientific interventions.

2. Materials and methods

2.1. Research procedure

The study took place in Reykjavik, Iceland. An ethical approval was granted from the Ethics Research Panel of the University of Luxembourg and the Icelandic Bioethics Committee (ref. no.12-210-GR). Ninety healthy, physically inactive student participants, were randomly allocated to one of three 40-min activities: walking-in-nature, walking-in-the-gym, or watching-nature-on-TV. The settings involved a sign-posted circular-route in a recreational nature-park (walking-in-nature), a treadmill in a popular gym (walking-in-the-gym), and a “sitting-room” in a university laboratory (watching-nature-on-TV). The quantitative data were collected on-site in a cabin situated right next to the footpath, a gym-customer interview-room and an adjoining laboratory respectively (Fig. 1).

Individuals participated in two identical, individual experimental sessions, first during a relaxed non-examination period (January-February) and then again during a more stressful examination period² (April-May). Afternoon appointments ensured optimal timing for cortisol measurements in terms of the circadian rhythm of hypothalamic-pituitary-adrenal cortex (HPA) activity. Participants were instructed not to arrive hungry or thirsty, but to refrain from food or drink intake 1 h prior to the appointment. After explanation of the study protocol and agreed informed consent, psychophysiological effects of the activities were measured by collecting information on mood (PANAS; Crawford and Henry, 2004), heart rate and heart rate variability (ECG), salivary cortisol and attention performance (Necker-

² Academic stress is used in stress research as a naturalistic stressor (Lewis et al., 2008; Ignacchiti et al., 2011).

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