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The effect of the physical environment and levels of activity on affective states

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ABSTRACT

The physical environment and physical activity can independently improve positive affect. The current studies investigated the effects of two opposing environments (urban versus natural) and levels of activity (walking and sitting) on affective states in either a laboratory (study 1) or an outdoor setting (study 2). While doing each activity (walking and sitting in each environment), participants watched film clips of urban or natural outdoor settings (study 1), or were naturally immersed in an urban or a natural environment (study 2). Measures of affect were administered pre, mid and post each condition. Findings highlighted the benefits of being immersed in a natural outdoor environment with physical activity being key for positive effects on energy. Short bouts of sedentary behaviour increased state negative affect, tiredness, and decreased energy levels. Attempts by policy-makers, urban planners and public health promoters should encourage greater use of natural open space to promote acute psychological well-being.

1. Introduction

The natural environment is known to provide positive effects on affect and well-being (Ward Thompson & Aspinall, 2011). The positive impact on psychological well-being after being exposed to natural, as opposed to urban, environments has been associated with a restorative effect (Kaplan & Kaplan, 2011; Tzoulas et al., 2007). Restoration research highlights the potential of natural outdoor environments (for example, trees, lakes, mountains) for reducing stress, fatigue, and improving mood. Such effects can be accrued without being physically immersed in the natural setting. For example, in an investigation of environmental preferences of a university based population, Van den Berg, Koole, and Van der Wulp (2003) found that merely looking at images of natural (versus urban) environments was associated with mood restoration and also reductions in feelings of stress and depression. Attention restoration theory (Kaplan, 1996; Kaplan & Kaplan, 1989) suggests that natural environments are characterised by a variety of different and novel objects of interest that can replenish depleted energy and attention. Attention restoration is thought to be promoted when observing the environment and the aesthetically pleasing features within it as it requires effortless attention, or fascination (Kaplan & Kaplan, 2011). When an individual is fascinated they are less likely to direct attention with effort and consequently attentional capacity does not become fatigued. It is important for urban planners to understand the differences in attentional demands, and their influence on affect, in both the natural and built-up environments and consider their unique elements in relation to design and construction of our surroundings (Coombes, Jones, & Hillsdon, 2010).

Restorative effects have often focused on positive, low energy states (e.g., relaxation following stress; Groenewegen, van den Berg, de Vries, & Verheij, 2006). The present study examines a fuller range of affective states including low and high energy states (i.e., energy, arousal, tension). This range reflects those affective states seen in Russell (1980)'s circumplex model of affect. According to the circumplex, the affective space is defined by an affective valence dimension and an activation dimension. The model is divided into quadrants to produce the following four areas: (1) unactivated pleasant affect (relaxation and calmness); (2) unactivated unpleasant affect (boredom, fatigue, or depression); (3) activated unpleasant affect (tension and distress); and (4) activated pleasant affect (energy, excitement, and enthusiasm) (Ekkekakis, Hall, VanLanduyt, & Petruzzello, 2000). Building on previous work on the restorative effects of nature, a multi-study paper by Ryan et al. (2010) highlighted the vitalising effects (high energy state) of being in nature, and found that natural elements can create

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a feeling of well-being and energy particularly whilst participating in physical activities in natural settings. Ryan et al. (2010) suggested that future research should address the range of elements that make up outdoor and natural environments.

It is well documented that physical activity provides psychological and physical benefits (Fortier, Duda, Guerin, & Teixeira, 2012; Murphy, Nevill, Murtagh, & Holder, 2007). According to public health recommendations, individuals are encouraged to accumulate 150 min (2.5 h) of moderate-intensity physical activity (i.e., walking) per week, in bouts of 10 min or more. However, over two thirds of the population in the UK, 60% of adult males and 75% of adult females, are insufficiently physically active to accrue or maintain health (Department of Health, 2011). There is increased focus on physical inactivity and sedentary behaviours (i.e., sitting) as a growing problem regarding its associated health problems and links to mortality (Wen et al., 2011). Lee et al. (2012) recently quantified the negative effects of physical inactivity, finding that inactivity causes 9% of premature mortality, or more than 5.3 of the 57 million deaths that occurred worldwide in 2008 (World Health Organisation, 2012). Much less research has examined sedentary behaviour and its associations with psychological well-being, in particular affective states (Webb, Benjamin, Gammon, McKee, & Biddle, 2012). The majority of research on sedentary behaviour has focused on its longer-term effects on mental well-being, for example, self-esteem (Tremblay et al., 2011) and self-perception (Webb et al., 2012). Small, direct associations showed that sedentary behaviour may be important to aspects of mental well-being (self-perception and physical competence) independent of moderate to vigorous physical activity engagement (Webb et al., 2012). It could be argued that a reason why individuals engage in large amounts of sedentary activity is that it is perceived to be pleasant. Conversely, as Ekkekakis (2000) suggests, many individuals may not participate in regular activity because they perceive it to be unpleasant. Adding to the extant research on the effects of physical activity intensity and its impact on affective responses, the aim of this study was to directly compare moderate-intensity physical activity (brisk walking) to a sedentary alternative (sitting) within two contrasting environments (natural and urban). Through contributing to a better understanding of physical activity, sedentary behaviour and the effect of the surrounding environment within an inactive population, this study can contribute to the future prediction of the burden of physical inactivity (Lee et al., 2012).

Physical activity can increase subjective well-being, affect, improve sleep and reduce stress (Ekkekakis, Parfitt, & Petruzzello, 2011; Netz, Wu, Becker, & Tenenbaum, 2005). In regard to walking specifically, Ekkekakis et al. (2000) investigated the effect of short walks (10–15 min) on affective states and found that walking was the most 'pleasurable' physical activity in terms of affect and that feelings of pleasure are experienced at sub-threshold intensities (low/moderate intensity i.e., walking) for most individuals. Pleasure is reduced mainly above the ventilatory threshold or at the onset of blood lactate accumulation (i.e., moderate/vigorous physical activity, Ekkekakis et al., 2011). Both laboratory experiments and field tests have shown that walking at a self-selected intensity is associated with shifts towards increased activation and more positive affective valence, albeit these tend to be short lived (Ekkekakis et al., 2000). Ekkekakis et al. (2000) also showed that a 10–15 min recovery period following a walk was associated with decreases in tension and increases in calmness which left participants in a pleasant low-activation state. However, these levels were no different to baseline and the role of the physical environment on the relationship between affect and physical activity was not examined. Williams et al. (2008) explain the importance of basic affective variables (good/pleasure versus bad/displeasure) and how these possess motivational qualities. Williams et al. (2008) found that when previously physically inactive participants reported more positive affective responses to a single bout of moderate-intensity physical activity at baseline they also reported engaging in more minutes of physical activity both 6 and 12 months later. There is general agreement (Thompson Coon et al., 2011; Williams et al., 2008) that how an individual feels during and following brief bouts of walking can influence the likelihood that they will walk for exercise in the future. This is thought to be particularly true in an outdoor setting (Focht, 2010) however, previous research examining the role of physical activity on affect has exhibited a number of methodological problems and confounding variables. One example is including a favourable social environment (walking with a friend) which could cause positive affective responses and increased exercise participation (Annesi, 2002). Few studies have administered measures of well-being during a walking task (Focht, 2010) in order to further understand any changes that may occur during the activity which cannot be detected using only pre/post measures (Ekkekakis et al., 2000; Ekkekakis, Hall, & Petruzzello, 2005b; Johansson, Hartig, & Staats, 2011). We aimed to address these limitations.

Links have been made between psychological restoration and physical activity behaviour (Johansson et al., 2011). Bowler, Buyung-Ali, Knight, and Pullin (2010) suggest the link could be explained by natural elements relieving mental stress, and such places in turn, encourage people to walk or be more active. Using information from the Scottish Health Survey 2008, Mitchell (2012) carried out an observational study to examine associations between different environments and physical activity. The study concluded that physical activity in natural environments was associated with a reduction in the risk of psychological illness to a greater extent than physical activity in other environments, but also that activity in different environments may promote different psychological responses. This research (Mitchell, 2012) focused on long term effects and repeated exposure to these environments. More research is needed to examine the acute responses to these environments as such responses are likely to be critical for repeated behaviour (Williams et al., 2008).

Despite findings suggesting that brief walks result in affective benefits, the literature remains unclear as to the influence of the physical walking environment on affective states (Gay, Saunders, & Dowda, 2011). The effects of an urban environment are particularly inconclusive (Johansson et al., 2011). Research on environmental stress has indicated that urban conditions such as noise and crowding can overwhelm the ability to direct attention and in turn create further negative emotions/affect or drain attention (Evans & Cohen, 1987; Kaplan & Kaplan, 2011) which can hinder restoration. Sellers et al. (2012) found that parks better facilitated the achievement of reaching the recommended levels of physical activity because participants were less interrupted than when in a busy built-up environment. Due to the attentional demands of monitoring vehicles, signs, other people, and the aversion to noise, urban streets may counteract psychological benefits of walking. In a study investigating the restorative effects of urban and rural settings amongst adults with variable mental health, Roe and Aspinall (2011) found that although affective and cognitive restoration occurred in both health groups, those individuals with poor mental health benefitted the most in a rural setting. However, differences between health groups were found in the urban setting with more benefits apparent in the group with poor health (Roe & Aspinall, 2011).

Weather has been identified as a perceived barrier to participation in physical activity undertaken outdoors (Chan & Ryan, 2009), however, to our knowledge, which adverse weather conditions are most important, and the extent to which they contribute