



Analyzing the mediators between nature-based outdoor recreation and emotional well-being



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ABSTRACT

The evidence concerning the relative importance of physical activity, restorative experiences, and social interaction as mediators between exposure to nature and well-being has been inconsistent. We investigated whether there is a relationship between the average time used for nature-based recreation and emotional well-being and whether it is mediated through restorative experiences, social company and the perceived duration of the most recent nature-based recreation visit.

A sample of 3060 Finnish people (38.3% response rate) aged 15–74 years participated in a survey using an internet and a mail questionnaire.

Multiple mediation analysis using bootstrapping revealed an association between the self-reported participation in nature-based recreation and emotional well-being through restorative experiences when adjusting for age, gender, household income, the level of leisure time physical activity, and the frequency of active transportation. The amount of social company or the duration of the most recent nature-based recreation visit did not mediate the association between the average time spent on nature-based recreation and emotional well-being.

The result accords with the evidence of the restorative and well-being effects of nature exposure but more evidence of causality and studies comparing different mediators in different population groups are needed.

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1. Introduction

There is plenty of evidence that access and exposure to natural, especially green spaces may enhance the well-being of people living in urban environments. The evidence includes epidemiological studies on green space and decreased mortality (Mitchell & Popham, 2008; Richardson & Mitchell, 2010; Richardson et al., 2012; Takano, Nakamura, & Watanabe, 2002) and decreased morbidity (Maas, Verheij, deVries, Spreeuwenberg, Schellevis, & Groenewegen, 2009), experimental studies indicating physiological, attentional and emotional stress-recovery in green space (Bowler, Buyung-Ali, Knight, & Pullin, 2010), intervention studies indicating positive effects of garden therapy on depressive patients (Gonzalez, Hartig, Patil, Martinsen, & Kirkevold, 2011; Kim, Lim, Chung, & Woo, 2009), and descriptive and experimental studies

indicating that favourite nearby places provide stress-alleviating experiences and serve emotion-regulation (Korpela & Ylén, 2009; Korpela, Ylén, Tyrväinen, & Silvennoinen, 2010).

At least three major mechanisms explaining the relationship between the amount of green space in the residential area, access or exposure to green environments, well-being, and health have been hypothesized in recent literature (de Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Maas, Verheij, et al., 2009; van Herzele & de Vries, 2012; Ward Thompson & Aspinall, 2011). These mechanisms include 1) physical activity, 2) restorative, stress-alleviating experiences, and 3) social interaction, cohesion and/or safety. First, green space in one's living environment may lead people to spend a larger part of their spare time outdoors and be physically more active (de Vries et al., 2011). Indeed, there is a body of theoretical and empirical evidence of the importance of environmental influences on neighbourhood walking and physical activity (Giles-Corti & Donovan, 2002; Humpel et al., 2004). However, one study reports no association between the percentage of green space around the

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respondent's home and the level of physical activity (Maas, Verheij, Spreeuwenberg, & Groenewegen, 2008).

Second, a consistent finding in experimental studies on restorative environments is that walking in green, natural environments, compared to built environments without natural elements, especially after negative antecedent conditions, such as attentional fatigue (Kaplan & Kaplan, 1989) and psychophysiological stress (Ulrich, 1983), produces greater physiological changes toward relaxation, greater changes to positive emotions and vitality, and faster recovery of attention-demanding cognitive performances (Berman, Jonides, & Kaplan, 2008; Hartig, Evans, Jamner, Davis, & Gärling, 2003; Park, Tsunetsugu, Kasetani, Kagawa, & Miyazaki, 2010; Ryan et al., 2010).

Third, green space may also contribute to social cohesion, sense of community and feelings of safety by creating vital neighbourhood spaces for social interaction (Wood & Giles-Corti, 2008). For individuals living in inner-city apartment buildings, well-used, urban green spaces have been linked to stronger ties to neighbours and a greater sense of safety (Kuo, Sullivan, Coley, & Brunson, 1998; Kweon, Sullivan, & Wiley, 1998). More green space in people's living environment has been associated with a greater sense of social safety except in very strongly urban areas (Maas, van Winsum-Westra, Verheij, Spreeuwenberg, & Groenewegen, 2009). Nearby green areas may draw the residents into the spaces near their homes, promote opportunities for social contact and increase informal surveillance, potentially reducing crime (Sullivan, Kuo, & DePooter, 2004). A Dutch study showed that loneliness and perceived shortage of social support partly mediated the relation between the percentage of green space around the respondent's home and health indicators (perceived general health, the number of health complaints and people's self-rated propensity for psychiatric morbidity) (Maas, van Dillen, Verheij, & Groenewegen, 2009).

Studies that have specifically tested the relative importance of all three or even more mediating mechanisms are few and the evidence is inconsistent. A survey study in two urban neighbourhoods ($N = 190$) in Belgium included physical activity, perceived stress, ability to concentrate, which is an aspect of restorative experiences, social cohesion and neighbourhood satisfaction as mediators between greenness of the local environment (availability of nearby green areas and presence of streetscape greenery) and well-being (self-reported general health, somatic complaints and happiness) (van Herzele & de Vries, 2012). The results indicated that only neighbourhood satisfaction was a significant mediator; it fully mediated the relationship between neighbourhood greenness and happiness. An Australian survey study included walking for recreation and transport, social coherence and local social interaction as possible mechanisms between perceived neighbourhood greenness and physical and mental health, including emotional problems (Sugiyama, Leslie, Giles-Corti, & Owen, 2008). The results indicated that recreational walking explained the link between perceived greenness and physical health, whereas the relationship between perceived greenness and mental health was partly accounted for by both recreational walking and social coherence. A Dutch survey study of the residents of 80 neighbourhoods indicated that stress and social cohesion but not physical activity mediated the relationship between the availability of green space and well-being (perceived general health, somatic complaints and mental health status) (de Vries, van Dillen, Groenewegen, & Spreeuwenberg, 2009).

In only one of these studies was a specific measure of restoration used. This was the ability to concentrate, which has been shown to improve in a restorative process (Berman et al., 2008), but was measured with trait-like statements ("Once I am busy with something I am not easily distracted"); no evidence of mediation was reported (van Herzele & de Vries, 2012). Two of the studies

measured perceived stress, an antecedent of restoration with trait-like statements "Usually, I feel quite nervous" (van Herzele & de Vries, 2012) or within a recent time-period "In the last month, how often have you felt difficulties were piling up so high that you could not overcome them" (Sugiyama et al., 2008); no evidence of mediation was reported.

Our contribution to this line of research is to include not only restorative experiences as mediators but also to tie them to the most recent nature-based outdoor recreation visit as state-like measures. Our second contribution acknowledges social contacts as a potential mediator measured by social company in the most recent visit. An increasing body of studies has indicated that psychological benefits of outdoor walks may depend on the immediate social context (Johansson, Hartig, & Staats, 2011; Staats, van Gemerden, & Hartig, 2010). Furthermore, previous studies on physical activity as a mediator have used weekly hours (van Herzele & de Vries, 2012), weekly frequency, and daily duration of activity (Sugiyama et al., 2008; de Vries et al., 2009). We used the perceived duration of the most recent nature-based recreation visit as a mediator, because we wanted to tie all our mediators to the most recent visit. Moreover, to our knowledge, there are no studies examining the average time used for nature-based recreation as an independent variable. None of the above measures of physical activity acknowledges the differences in the intensity of different types of physical activity. However, the evidence concerning the relationship between the intensity of physical activity and well-being is scarce and contradictory (Bauman, 2004; Netz, Wu, Becker, & Tenenbaum, 2005; Oweis & Spinks, 2001). Nevertheless, it seems that moderate or high-intensity rather than low-intensity exercise is associated with decreased symptoms of depression and anxiety (Conn, 2010; Ströhle, 2009) although high-intensity exercise may also worsen mood (Peluso & de Andrade, 2005). In this study, the respondents reported the type of activity during their latest nature-based recreation time but we were not able to measure the intensity of physical activity. However, as a control, we measured the self-reported overall level of leisure time and the frequency of active transportation among our respondents.

Our last contribution concerns the types of natural environments. The percentage of greenness in the living environment (used often in the previous studies) does not measure the actual use of green space. Moreover, research on stress restoration has indicated that blue spaces, i.e. water environments, also have restorative impacts (Völker & Kistemann, 2011). Studies on green space in winter, i.e. white space, are practically lacking (Perkins, Searight, & Ratwick, 2011). Thus, we measured nature-based recreation which due to the timing of our surveys could take place both in green, white and blue spaces.

Emotional well-being including happiness has been used as a dependent variable in earlier studies (Sugiyama et al., 2008; van Herzele & de Vries, 2012) but not in a relation to the duration of the most recent nature-based recreation visit as in our study. A meta-analysis comparing measurements of well-being in natural vs. urban environments showed that the most consistent evidence concerned emotional outcome as the strongest restorative outcome of nature exposure; activity in the natural environment produced a significant decrease in negative feelings (anger, sadness, anxiety and fatigue) and increase in positive mood (tranquillity and energy) (Bowler et al., 2010). Thus, we considered emotional well-being as a suitable dependent variable for the current study.

To summarize, we investigated whether there is a relationship between the average time used for active nature-based recreation and emotional well-being and whether it is mediated through restorative experiences, social company and the perceived duration of the most recent nature-based recreation visit. This implies a multiple mediation model (Fig. 1) (Preacher & Hayes, 2008).

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