A Walk in the Park or a Day at the Mall: The Effects of the Environment on Affect and Impulsivity

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***Abstract -* The external physical environment has been shown to have tangible effects on our health, cognitive abilities, and our emotions.3,9,13 Exposure to nature tends to have salutatory, or beneficial, effects on cognitive performance, while exposure to urban environments does not usually carry these same benefits.3,4,9 This study examined the connections between the environment and emotions. It is likely that a variety of factors influence the strength of the relationship between the environment and emotion, and the current study investigated one of these factors. The factor investigated here was *impulsivity,* a measure that describes a person’s desire for immediate rewards and general likelihood of acting impulsively. A sample of 101 adults, aged 18 to 39, were taken to two different indoor environments, one urban and one natural. They completed a baseline survey in the lab, and three self-assessment surveys while walking in the two environments, all asking participants to rate to what extent certain adjectives described their current emotional state and impulsivity. The data was analyzed using R. It was hypothesized that spending time in nature would increase the positive affect scores of the participants. This study replicated previously obtained results, demonstrating that time spent in natural environments led to large increases in positive affect, and a very slight decrease in negative affect. Participants’ trait impulsivity was shown to be unrelated to the difference in their emotion scores across conditions, and only weakly correlated to their state impulsivity in each environmental condition. These results have the potential to be applied in public health frameworks and will add to the expanding knowledge base** **regarding the interplay of the environment and the mind.**

# INTRODUCTION

When we think about what drives our emotional states, we tend to focus on tangible, direct things such as specific occurrences or other people. For example, a co-worker’s actions might make us upset, or the sight of a good friend can make us joyful. However, the environments in which we spend our time can have just as dramatic an effect on our emotions as an interaction with another person or object. An environment can be natural or urban, ordered or disordered, simple or enriched, and all of these aspects can have an impact on our emotions and affective states.

The environment’s impact on one’s emotions is a well-studied phenomenon, but the current research leaves room for further questions. Researchers have investigated the strength of the relationship between the environment and certain affective measures in a variety of ways. A meta-analysis from McMahan and Estes found that even brief contact with nature can lead to increased positive affect and to some extent, a lessened negative affect.12 Berman and colleagues had participants diagnosed with Major Depressive Disorder ruminate on a negative autobiographical experience before completing a walk in a natural or urban environment. Using a self-report measure, participants reported a greater positive affect improvement after walking in nature than they did after walking in the urban setting.4 As aforementioned, the method by which participants are exposed to particular environments may influence the strength of the effect on emotion.

There is a documented association between momentary mental well-being and time spent outdoors in environments with certain natural features like trees and birds.1 Bakolis and colleagues even found that these positive effects on participants’ mental states lasted nearly three hours after being in nature.1 The restorative effects of time spent in nature are not always felt equally, and often specific characteristics of the environment can impact the perception of the environment and its restorative abilities.

In a study conducted in outdoor urban environments, participants were instructed to walk in a city park or along a city street. Though the act of walking in both conditions reduced feelings of anxiety, depression, anger, and time pressure, the environment was a moderating factor.8 Feelings of time pressure decreased much more significantly with walks in the park than they did with walks along the street.8 Thus, it appears that while both nature and walking can elicit changes in one’s affect or emotional state, certain elements of the environment moderate the strength of this effect.

Reasons for this apparent variation have been hypothesized, but no one particular theory seems to dominate. Some people are more receptive to the influences of the environment, perhaps they are more observant of the environment’s various features. Maybe some other intrinsic trait of an individual might predispose them to being more strongly affected by their environment. One possible such trait is impulsivity. *Trait impulsivity* is generally understood as a person’s predisposition to prefer immediate rewards and act impulsively.2 Some of the characteristic features of impulsivity are urgency, lack of premeditation, lack of perseverance, and sensation seeking.15 Though this might seem unrelated to the environment’s effects on emotional state, recent research has identified a connection between trait impulsivity and sensitivity to environmental changes. Specifically, people who score higher on measures of trait impulsivity tend to experience greater benefits from natural environments.1 Understanding this relationship well could provide important insights regarding the way nature can be utilized to help individuals with certain traits.

One final aspect of the relationship between the environment and emotion that deserves further study is *connection to the environment.* This refers to a person’s experience of both the physical and the social environment around them, and how much they feel that they are a part of the environment. Much of the current research focuses on having a personal connection to the environment and its importance with respect to environmental conservation efforts.7,10 However, people may feel connected to the environment in a number of different ways that are not captured by this definition.

The current study seeks to expand upon the existing research in many ways. Primarily, I hypothesize that participants will score more highly on a measure of positive affect after spending time in a natural setting than they will after time in the urban setting. My secondary hypothesis is that there will be an interaction between the trait impulsivity of the participants and the difference in positive affect scores between the natural and urban environments; those that score highly on trait impulsivity measures will have a greater difference in affect scores between the two environments.

# METHOD

All study procedures were approved by The University of Chicago Institutional Review Board (IRB14-1065).

*Design*

The general method utilized was experience sampling, or an ecological momentary assessment. This technique allows for researchers to see how participants change across certain measures over time. This was a repeated measures design that occurred in two sessions exactly one week apart. The independent variable was the environmental condition— either urban or natural. The environments for this study were both indoors. The urban condition was Water Tower Place, a busy shopping mall, and the natural condition was Garfield Park Conservatory, a built greenspace. The dependent variables of affective state, feelings of connectedness, and cognition were measured using the ambulatory assessments.

*Participants*

101 participants were tested in total. All of the participants were University of Chicago students and other adults, recruited through Facebook or the SONA Research Participation System. The age of the participants ranged from 18 to 39, with a mean age of 22. There were 41 male participants, 58 female participants, and 2 participants who selected ‘other.’

*Surveys*

*Pre-Experiment*

The pre-experiment survey was sent to participants after they signed up for the study, and they were instructed to complete it prior to their arrival. They were asked to assess their levels of trait impulsivity using the Trait Rash Impulsivity Scale (TRIS).11

*Baseline*

The baseline survey was completed as participants arrived at the laboratory for the study. It required participants to assess how impulsive they felt in the present moment. This response was taken as a measure of state impulsivity. To measure affect, the survey utilized the Positive and Negative Affect Scale (PANAS) asking participants to rate on a Likert scale how much certain emotion-related adjectives described their present state.14

*Ambulatory*

Participants were asked to complete three ambulatory surveys. Many of the items in the baseline survey appeared in the ambulatory assessments, including questions about state impulsivity and the PANAS. As these questions are asked at three different points throughout the one-hour walk, they serve as an indicator of state impulsivity and one’s changing emotional state.

*Procedure*

As we had 12 smartphones, a maximum of 12 participants were tested at a time. Upon arrival, they were told to give their personal cell phones to the experimenter to minimize distractions. Participants were handed an experimental phone, directed to sit down in the laboratory and complete the baseline survey. Afterwards, they were given a brief overview of how to use the basic functions of the phone. Finally, they were led outside to board the shuttle that would take them to the experimental destination. Participants were taken to the indoor natural conservatory or indoor urban mall in a counterbalanced order across subject groups. They were instructed not to speak with anyone in either location.

On each of the phones, three timers had been preset to alarm over the course of the one-hour walk, with twenty minutes between each alarm. Participants were instructed to keep the experimental phones in their pockets with the screens turned off until they heard the timer ring. When the timers alarmed and the screen was unlocked, the survey appeared. Upon hearing the timers and being presented with the surveys, the participants were required to pause their walk and complete the survey. Once the survey had been completed, participants were prompted to turn off the phone screen and continue their walk until the next timer. They were instructed to rejoin the group when the last ambulatory survey was completed.

Participants were compensated with $74 with the opportunity for a $10 bonus, or with $48 and course credits after completing the second session.

# RESULTS & DISCUSSION

After spending time in the natural environment, positive affect scores of the participants (n = 81) increased at a faster rate and stayed higher than they did in the urban condition as seen in Figure 1a. There was a main effect of condition on positive affect (*M*nature = 18.08, SDnature = 9.08, *M*urban = 14.01, SDurban = 8.40, *p* < 0.01, *F*(1,80) = 23.13), as well as a main effect of survey (*F*(3,240) = 18.27, *p* < 0.001). At baseline (survey 0) there was no difference between the two groups (*t*(80) = -0.23, *p* = 0.8), which was expected. Positive emotions remained higher in nature for the duration of the walk in survey 1 (*t*(80) = 5.04, *p* < 0.001), in survey 2 (*t*(80) = 4.6, *p* <0.001), and in survey 3 (*t*(80) = 4.7, *p* < 0.001). The differences in positive affect scores between the two conditions were significant at each time point during the walk.

The second hypothesis was that individuals who score more highly on measures of trait impulsivity will show a greater difference in affect scores between conditions. The data presented in Figure 2show that this hypothesis was *not* supported. Trait impulsivity did not have an effect on positive affect scores (survey 0: *F*(1,78) = 0.31, *p* = 0.58; survey 1: *F*(1, 78) = 1.84, *p* = 0.18; survey 2: *F*(1,78) = 0.55, *p* = 0.46; survey 3: *F*(1,78) = 0.47, *p* = 0.49).

Participants (n=82) also responded to the question, “How impulsive do you feel right now?” The results are shown in Figure 3**.** There was a main effect of condition, participants felt more impulsive in the urban environment (*Murban =* 3.78, SDurban = 2.70, *Mnature =* 2.37, SDnature = 2.27, *F*(1,81) = 31.34, *p* < 0.001). Further, there was a main effect of survey (*F*(3,243) = 4.66, *p* < 0.001) and an interaction between condition and survey (*F*(3,243) = 16.98, *p* < 0.001).

I sought to determine if the physical environment has an influence on emotional state. My primary hypothesis was that positive affect scores would increase in the natural environment. Indeed, the results indicated that natural environments were associated with increased positive affect scores. Further, the negative affect scores of the participants did not vary with condition, we found no evidence that condition influences negative affect scores. These results are consistent with previous work3,4,6,9, however, it would be interesting to determine which factors *do* influence negative affect. Certain specific features of the external environment may play a role in modulating negative affect, and future research could investigate some of these features.

My secondary hypothesis was that people who scored more highly on measures of trait impulsivity would show a greater change in their positive affect scores between the natural and urban conditions, as previous work has suggested that there is a connection between trait impulsivity and sensitivity to environmental changes.1This was not supported by the data: there was no significant correlation between trait impulsivity and differences in scores between conditions. Similarly, there was no relationship between an individual’s trait impulsivity and their state impulsivity at each time in the survey. These results are not in line with previous work.

A close up of a map

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A screenshot of a cell phone

Description automatically generatedFig. 1. Scores on PANAS subscales over time by condition

Fig. 2. Correlations between PA difference and trait impulsivity scores



Fig. 3. Scores on state impulsivity throughout the walk.

# CONCLUSION

In this study, we sought to examine the relationship between the environment and affect and determine if this relationship was influenced by an individual’s trait impulsivity.

Though my primary hypothesis was supported, there are some limitations to this study. The two environmental conditions were indoors, which confers both benefits and challenges. Because participants were indoors, researchers did not have to worry about participants becoming lost or going outside the boundaries of the location and experiencing a completely new environment, but the awareness of being indoors might have prevented some participants from feeling fully immersed in their surroundings. Research indicates that age might be a moderating factor for the effect of nature on positive affect and that this relationship might be stronger for older samples.12 It would be interesting to explore this further in future research and potentially recruit an older sample. Finally, while we did collect the participants’ home zip codes which could be used as a proxy for their normal environmental exposure, we did not use this data to conduct analyses of the amount of greenspace they are normally exposed to nor did we correlate this to the affective changes we observed in our study. It is interesting to consider how the results of this study might have changed if the participants were not from largely urban areas. Given that most of them were recruited from The University of Chicago or nearby, it is reasonable to assume that they were acclimated to urban environments.

Currently, more than half of the world’s population lives in urban areas, and this number will only continue to grow.5 It is imperative that we study the possible advantages and disadvantages of certain kinds of environments, and find ways to maximize their potential for the health and well-being of individuals and communities. Knowledge about how to make those spaces more habitable for all will be extremely useful in the coming decades. As more and more people inhabit urban areas, it is important to think about the ways that we can harness the benefits of nature to improve the mental health of communities.

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