EFFECTS OF NATURE EXPOSURE AND NATURE RELATEDNESS ON GOALS:
IMPLICATIONS FOR MATERIALISM

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Abstract

Materialism, the high importance individuals assign to owning material items, is generally associated with less human happiness and fewer sustainable behaviours. In this thesis, I proposed nature contact as a novel solution for decreasing materialistic aspirations, increasing mood, and fostering environmental concern. I used self-determination theory to propose that nature contact may orient people towards pro-social goals (e.g., intrinsic goals, environmental concern) while shifting people away from extrinsic goals (e.g., materialism). I proposed that people need to affiliate and connect with nature, which is consistent with the biophilia hypothesis and ecopsychology. When this need is met, I hypothesized that intrinsic goals and mood would increase, decreasing materialistic aspirations. Nature relatedness, feeling part of the natural environment, was explored as a mediator of the relationship between nature exposure and materialistic aspirations. To test these ideas, I conducted four studies with different types of nature exposure (e.g., short walks, photographs, or repeated daily nature exposures) and then assessed dependent measures. Walks in nature generally led to improvements in mood (Pilot Study, Study 1) and state nature relatedness (Pilot Study, Study 1, Study 3). However, viewing nature photographs and spending time in nature over multiple days were mostly ineffective at improving moods (Study 2 and 3). Viewing photographs did not change state nature relatedness (Study 2). Regardless of the type of nature exposure, environmental concern did not change in response to nature exposure (Study 2 and 3). Across the four studies, nature exposure did not decrease materialistic aspirations or increase intrinsic aspirations. This suggests that nature exposure, as manipulated in this dissertation, does not shift the perceived importance of specific aspirations in the moment or over a 12-day period. However, correlational evidence suggested that trait nature relatedness (and feeling high nature relatedness in the moment) was related to

EFFECTS OF NATURE EXPOSURE

lower materialistic aspirations and higher intrinsic aspirations (Pilot Study, Study 1 and Study 3).

This supports the idea that increasing people's connection to nature may be a potential strategy or intervention for decreasing materialistic aspirations. To examine this possibility, researchers may wish to use different types of nature exposure and further document which types of nature exposure lead to which specific benefits. Overall, these results highlight the need for future research to further examine how environmental and positive psychology can more reliably assess this relationship by using more immersive nature manipulations or a variety of nature manipulations.

Keywords: nature, nature relatedness, mood, well-being, materialism, aspirations, environmental concern.

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Table of Contents

Abstract	ii
Acknowledgements	iv
Table of Contents	v
List of Tables	viii
List of Figures	x
List of Appendices	xi
Introduction.....	1
Overview of Dissertation	1
Outline of Studies	6
Materialism	7
The Trade-off between Goals	11
Development of Materialism	18
Interventions for Materialism	20
Materialism and Pro-environmental behaviours	21
Nature.....	23
Cognitive Benefits and the Reasonable Person Model	24
Subjective Well-being and Biophilia	26
Social benefits of Nature.....	30
Nature Relatedness.....	34
Nature Relatedness and Well-being.....	36
Summary	37
Pilot Study.....	38

EFFECTS OF NATURE EXPOSURE

Hypotheses	39
Method	40
Participants.....	40
Materials	40
Procedure	44
Results.....	45
Pilot Study Discussion	50
Study 1	54
Hypotheses.....	54
Method	55
Participants.....	55
Materials	56
Procedure	58
Results Study 1	59
Study 1 Discussion.....	64
Study 2	68
Method	71
Participants.....	71
Materials	72
Procedure	75
Results Study 2	75
Discussion Study 2.....	90
Study 3	96

EFFECTS OF NATURE EXPOSURE

Hypotheses	96
Method Study 3	98
Participants.....	98
Materials	99
Procedure	101
Results Study 3	102
Discussion Study 3.....	119
General Discussion	127
Conclusion	144
References	146

List of Tables

Table 1 <i>Correlations between Measures for the Pilot Study</i>	47
Table 2 <i>Affect and INS by Condition (Pilot Study)</i>	47
Table 3 <i>Willingness-to-pay Items as Z-scores by Condition (Pilot Study)</i>	48
Table 4 <i>Aspirations by Condition (Pilot Study)</i>	49
Table 5 <i>Affect and INS by Condition (Study 1)</i>	59
Table 6 <i>Aspirations by Condition (Study 1)</i>	61
Table 7 <i>Windfall by Condition (Study 1)</i>	62
Table 8 <i>Study 2 Photograph Ratings by Condition</i>	76
Table 9 <i>Correlations between Measures for Study 2</i>	77
Table 10 <i>Materialistic Desires by Conditions (Study 2)</i>	79
Table 11 <i>Aspirations by Conditions (Study 2)</i>	80
Table 12 <i>State Nature Relatedness by Conditions (Study 2)</i>	81
Table 13 <i>Positive Affect by Conditions (Study 2)</i>	82
Table 14 <i>Negative Affect by Conditions (Study 2)</i>	83
Table 15 <i>Pleasant Affect by Conditions (Study 2)</i>	84
Table 16 <i>Vitality by Conditions (Study 2)</i>	85
Table 17 <i>Egoistic Environmental Concern by Conditions (Study 2)</i>	86
Table 18 <i>Altruistic Environmental Concern by Conditions (Study 2)</i>	87
Table 19 <i>Biospheric Environmental Concern by Conditions (Study 2)</i>	88
Table 20 <i>Enjoyment on Days 1 - 10 by Condition (Study 3)</i>	103
Table 21 <i>Immersion on Days 1 - 10 by Condition (Study 3)</i>	104
Table 22 <i>Familiarity on Days 1 - 10 by Condition (Study 3)</i>	106

EFFECTS OF NATURE EXPOSURE

Table 23 <i>Correlations between Time 1 and Time 2 Measures for Study 3</i>	107
Table 24 <i>Measures at Time 1 by Dropouts (Study 3)</i>	108
Table 25 <i>Trait Materialism by Condition and Time (Study 3)</i>	110
Table 26 <i>Trait Nature Relatedness by Condition and Time (Study 3)</i>	111
Table 27 <i>State Nature Relatedness by Condition and Time (Study 3)</i>	112
Table 28 <i>Aspirations by Condition and Time (Study 3)</i>	112
Table 29 <i>Positive Affect by Condition and Time (Study 3)</i>	113
Table 30 <i>Negative Affect by Condition and Time (Study 3)</i>	114
Table 31 <i>Pleasant Affect by Condition and Time (Study 3)</i>	114
Table 32 <i>Vitality by Condition and Time (Study 3)</i>	115
Table 33 <i>Egoistic Environmental Concern by Condition and Time (Study 3)</i>	116
Table 34 <i>Altruistic Environmental Concern by Condition and Time (Study 3)</i>	116
Table 35 <i>Biospheric Environmental Concern by Condition and Time (Study 3)</i>	117

List of Figures

<i>Figure 1.</i> Grouzet et al. (2005) model of personal goals	12
<i>Figure 2.</i> Schwartz (1992) circular model of social values	15
<i>Figure 3.</i> Significant indirect effect of state nature relatedness between nature exposure and higher intrinsic aspirations or lower extrinsic aspirations.	64

List of Appendices

Appendix A: Modified Big Five Factor Inventory (BFFI)	169
Appendix B: Open Ended Questions	171
Appendix C: Aspiration Index	172
Appendix D: Willingness-to-pay	177
Appendix E: Positive and Negative Affect Schedule	178
Appendix F: Inclusion with Nature in Self Scale	179
Appendix G: General Information	181
Appendix H: Mindfulness Instructions	183
Appendix I: Coding and Analysis of Open-Ended Responses	184
Appendix J: Positive Affect and Negative Affect Schedule (PANAS)	187
Appendix K: Aspiration Index (Abbreviation Version)	188
Appendix L: Windfall	192
Appendix M: Self Esteem	193
Appendix N: Examples of Materialistic Images (Women)	196
Appendix O: Examples of Materialistic Images (Men)	197
Appendix P: Nature Photographs	198
Appendix Q: Built Photographs	199
Appendix R: Environmental Concern	200
Appendix S: Instructions for Intervention and Daily Log Questionnaire	201
Appendix T: Correlations of the Aspirations Subscales	206

Effects of Nature Exposure and Nature Relatedness on Goals: Implications for Materialism

Worldwide people are moving from rural areas with more nature, to urban areas with relatively less nature. For the first time in human history, the majority of people in the world now live in cities (United Nations Population Division [UNPD], 2011). This may be problematic as people seem to be losing a subjective connection to nature and may miss out on the psychological and social benefits of nature exposure (see Selhub & Logan, 2012 for a review). Across popular mediums (e.g., fiction books, song lyrics, and films), nature is being discussed less, which further suggests that people are disconnecting from nature (Kesebir & Kesebir, 2017). Indirect evidence suggests this disconnection from nature may be one reason people orient towards materialistic aspirations or possessions. For example, Greenfield (2013) documented how moving from rural to urban environments corresponded to changes in language. Between the years 1800 - 2000, word frequencies in books changed from social obligation and duty (e.g., giving to other people, and social belonging) to more individual and materialistic goals (e.g., personal choice, and possessions; Greenfield, 2013). Although this finding does not demonstrate causality, it does suggest that nature contact may influence how people feel about material goals. The purpose of this dissertation is to examine if nature exposure and nature relatedness decreases materialistic aspirations and increases intrinsic aspirations. I also examine the effect of nature exposure and nature relatedness on mood and environmental concern.

Overview of Dissertation

Materialism is assigning a high value to owning material items (Kasser, 2002; Kasser, Ryan, Couchman, & Sheldon, 2004; Richins & Dawson, 1992). Individuals high on materialism view material goods as central to their lives and daily activities, as a source of happiness, and an

indicator of success (Richins & Dawson, 1992). A materialistic value orientation (MVO) is an individual's perceived importance of gaining money and possessions to express the status or image they want to portray to others (Dittmar, Bond, Hurst, & Kasser, 2014)¹. People with a high materialistic value orientation believe the right image and status is mostly determined by someone's financial success and the possessions they own. It is well established that individuals who are higher in materialism are less happy in life compared to individuals lower in materialism (Burroughs & Rindfleisch, 2002; Diener & Oishi, 2000; Dittmar et al., 2014; Howell & Hill, 2009; Kasser, 2002; Kasser & Ryan, 1993; Kasser et al., 2004; Richins & Dawson, 1992). In addition, materialistic individuals, compared to less materialistic individuals, exhibit more selfish behaviours and fewer pro-social behaviours suggesting materialism leads to undesirable outcomes (Bauer, Wilkie, Kim, & Bodenhausen, 2012; Belk, 1985; Hirsh & Dolderman, 2007; Kasser, 2002; Kasser & Ryan, 1993; Richins & Dawson, 1992; Schroeder & Dugal, 1995; Schultz et al., 2005; Sheldon & McGregor, 2000).

Evidence suggests a materialistic lifestyle may also negatively impact the health of the environment, as individuals who score high on materialism generally consume more environmental resources in their everyday lives (Brown & Kasser, 2005; Crompton & Kasser, 2009) and shop more (Sevgili & Cesur, 2014). A desire for material possessions and wealth is also negatively correlated with environmental concern and love of nature (Crompton & Kasser, 2009; Saunders & Munro, 2000; Schultz et al., 2005). Overall this body of research suggests

¹ Researchers studying materialism have used many terms for someone who highly values material items. For example, Kasser & Ryan (1993; 1996) generally use the terms extrinsic aspirations/goals, material aspirations, or material value orientation (MVO) to refer to materialism. Richins & Dawson (1992) generally only use the term materialism. For this dissertation, I used Kasser & Ryan's (1993;1996) aspiration index and Richins & Dawson's (1992) materialism measure so these terms are kept separate in the methods but used throughout the introduction.

relationships between materialism, lower pro-sociality, and lower subjective well-being, as well as less concern for the natural environment. This dissertation examined if nature contact could be used as an effective intervention to decrease materialism while increasing intrinsic or pro-social goals, including environmental concern; and mood.

Self-determination theory (SDT; Deci & Ryan, 1985, 2000; Ryan & Deci, 2000) is useful for explaining why materialists report less happiness. Researchers in self-determination theory have categorized goals or aspirations as intrinsic and extrinsic. Intrinsic and extrinsic goals are different in the likelihood that they fulfill psychological needs for autonomy, competence, and relatedness. Intrinsic goals are more likely to lead to behaviours that satisfy an individual's psychological needs, which positively contribute to well-being. In comparison, extrinsic goals typically rely on external approval, which generally do not fulfill psychological needs or contribute to well-being (Grouzet, et al., 2005; Kasser, 2002; Kasser & Ryan, 1993, 1996, 2001; Niemiec, Ryan, & Deci, 2009). A high materialistic value orientation is conceptualized as an extrinsic goal (Kasser & Ryan, 1993; 1996; Kasser et al., 2004) as it is most likely pursued for external reasons (e.g., obtaining money, fame, or status), and relies on the judgments of others rather than inherent judgments and rewards. Self-determination theory also proposes that intrinsic and extrinsic goals are psychologically in opposition to one another, which makes it difficult for individuals to highly value both types of goals concurrently (Grouzet et al., 2005; Kasser, 2002; Schwartz, 1992). In other words, individuals typically orient more towards intrinsic goals relative to extrinsic goals *or* extrinsic goals relative to intrinsic goals. According to self-determination theory, as long as intrinsic goals are valued more than extrinsic, subjective well-being is not adversely affected (Kasser & Ryan, 1993, 1996).

Research has focused on strategies to decrease materialism as it is often related to

undesirable outcomes. One strategy suggested by Kasser (2009), is to promote intrinsic goals that are psychologically in opposition with materialism. This would be accomplished by promoting goals such as self-acceptance/personal growth, affiliation/close relationships, and a sense of community. Several studies have demonstrated preliminary support for this strategy. For example, when participants are asked to reflect on intrinsic goals, practice mindfulness, or focus on gratitude, materialistic aspirations decrease (Brown, Kasser, Ryan, Linley, & Orzech, 2009; Lambert, Fincham, Stillman, & Dean, 2009; Lekes, Hope, Gouveia, Koestner, & Philippe, 2012). I suggest nature contact may also be an effective strategy for decreasing materialism. This idea is preliminarily supported by empirical studies which demonstrated that nature promotes more pro-social and generous behaviours (Guéguen & Stefan, 2014; Weinstein, Przybylski, & Ryan, 2009; Zelenski, Dopko, & Calpadi, 2015). Specifically, immersion in photographs of nature momentarily decreased extrinsic goals that focus on rewards and self-enhancement (such as money) and increased intrinsic goals that focus on psychological needs (such as personal growth and feeling a part of the community; Weinstein et al., 2009). Together, these results support the idea that nature exposure may be able to increase pro-social behaviours and intrinsic goals, which may be in opposition to extrinsic goals.

In addition to Kasser's (2009) strategy of using opposing goals or aspirations, I propose nature contact may decrease materialism because it satisfies a sense of nature connectedness (relatedness) within people. As individuals feel satisfied after being in nature and feeling connected to nature, they may be more likely to engage in behaviours that further fulfill their psychological needs. In other words, nature and nature relatedness create a psychological environment where people are more orientated towards autonomy, competence, and relatedness. This orientation then increases the value people may place on intrinsic goals, compared to

materialistic aspirations. Stated another way, if people's needs are not met, they may be more likely to look for satisfaction with quicker fixes like admiration from others. This can be thought of more practically as well (e.g., when someone is really hungry they may eat something quick (e.g., junk food) that tastes good in the moment but is less nutritious than eating protein/vegetables which would keep someone satisfied for a longer period of time). This reasoning is guided by self-determination theory where meeting psychological needs orientates people more towards intrinsic goals and contributes to well-being and optimal health (Deci & Ryan, 1995, 2000). This idea that meeting basic psychological needs leads to increases in well-being is referred to as a growth tendency (Vansteenkiste & Ryan, 2013). When psychological needs are not met, people may be more likely to orient towards behaviours that align with extrinsic goals, which only further comprises well-being (Niemic et al., 2009). This situation is hypothesized to lead to vulnerabilities and need frustration (Vansteenkiste & Ryan, 2013).

Correlations support the idea that a subjective connection to nature may be more satisfying for individuals. For example, nature relatedness is correlated with life satisfaction (Mayer & Frantz, 2004) and lower materialism (Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2009). Furthermore, nature relatedness is malleable and can be increased by spending more time in nature (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet, 2013; Nisbet et al., 2009; Zelenski et al., 2015; Vinning, Merrick, & Price, 2008), which makes it ideal to use as an intervention. Finally, individuals who have higher nature relatedness generally engage in more pro-environmental behaviours (Mayer & Frantz, 2004; Leary, Tipsord, & Tate, 2008; Nisbet et al., 2009) and consequently may consume less resources.

In addition to self-determination theory, the idea that people need to connect with nature is consistent with biophilia and ecopsychology. The biophilia hypothesis (Wilson, 1984)

postulates that people have a need to affiliate with other forms of life. Fulfilling the need to be close to nature would have been adaptive for our ancestors (i.e., for getting food, finding shelter) and arguably still provides benefits and advantages to people today. Close access to nature has been shown to increase happiness (White, Alcock, Wheeler, & Depledge, 2013) and contribute to greater vitality, and energy (Ryan et al., 2010). This suggests nature exposure is fulfilling and enjoyable for individuals. The field of ecopsychology proposes that humans are a part of nature and when disconnected from the natural world, well-being may decrease (Roszak, 1995). When people's need for nature has not been satisfied, they may feel less connected to nature in the moment or at the trait level (or both). This lack of connection to nature then does not fulfill needs, orientating people away from intrinsic goals and more towards materialistic goals. Throughout this thesis, I examined nature relatedness as a mediator between nature contact and materialism.

Unfortunately, many people spend the majority of their lives indoors (Evans & McCoy, 1998; Louv, 2005; MacKerron & Mourato, 2013), physically and psychologically disconnected from the natural environment. For this dissertation, I tested the idea that nature is similar to a psychological need and that feeling connected to nature (i.e., high nature relatedness) may foster behaviours that are more likely to lead to intrinsic goals, which are incompatible with extrinsic or materialistic goals. I also tested if nature and nature relatedness improves well-being, and increases concern for the environment (for biospheric and altruistic reasons).

Outline of Studies

Although there seems to be preliminary support for the idea that nature can decrease materialism, the causal effect of nature on materialism has not been thoroughly examined beyond Weinstein and colleagues' (2009) study. I conducted four studies to examine if nature exposure

increases nature relatedness and decreases materialistic aspirations. I conducted one pilot study to examine the effect of walking in nature and feeling connected to nature (i.e., state nature relatedness) on aspirations (I also piloted materialism measures). I then conducted two brief experiments (Study 1 and 2) and one intervention study (Study 3). Study 1 had a similar methodology to the Pilot Study; participants walked in nature and then completed a mood measure, a state nature relatedness questionnaire, and an aspiration index that measured intrinsic and extrinsic aspirations. In Study 2, I examined how nature photographs affected momentary judgments of extrinsic or materialistic aspirations with a materialistic prime (i.e., advertisements) before the nature exposure to activate extrinsic goals. In other words, some participants were exposed to materialistic advertisements before viewing nature or built photographs. Study 2 also tested the strategy proposed by Kasser (2009) that promoting intrinsic goals, in this case using nature exposure and nature relatedness to increase pro-sociality, would decrease extrinsic goals. I also examined if nature contact could increase pro-environmental concern, mood, and state nature relatedness. For Study 3, I examined how nature, nature relatedness, and goals were related over a twelve-day period. This longer study design was chosen because it allowed for an investigation of goals and how they might change over time. In addition, participants' concern for the environment was examined to test the idea that materialism and environmental concern are psychologically opposing constructs.

Materialism

As briefly outlined above, materialism is conceptualized as a value or goal. Goals refer to what people ideally want to achieve in life, while values are the guiding principles to the goals (Austin & Vancouver, 1996; Schwartz, 1992). Values typically focus on abstract ideas while goals focus on more specific aims and aspirations (Maio, Pakizeh, Cheung, & Rees, 2009). For

example, travelling could be a value but going to Spain in the next year is a goal. The structure of *values* proposed by Schwartz (1992) and structure of *goals* proposed by Grouzet et al. (2005) both resulted in a similar circumplex, where materialism is in opposition to pro-social or intrinsic goals. Consequently, I use the terms goals and values interchangeably throughout this line of research (i.e., the abstract and specific structure of goals and values seem to operate the same way for materialism). To measure goals and values, I used an aspiration index (Kasser & Ryan, 1993, 1996). Goals and values are thought to reflect people's internal aspirations and dictate everyday behaviour as well as how people construct their lives (Sheldon, Gunz, Nichols, & Ferguson, 2010). For example, an individual who values money may work longer hours at the cost of having less personal time. Self-determination theory (SDT; Deci & Ryan, 1985, 2000; Ryan & Deci, 2000) proposes that some goals positively contribute to well-being as they are more likely to lead to behaviours that fulfill psychological needs more effectively than others.

According to self-determination theory, there are three basic psychological needs: autonomy—feeling a sense of control over behaviour and decisions rather than feeling pressured to complete a task (e.g., assent); competence—feeling proficient and skilled at one's work (e.g., effectiveness); and relatedness—feeling connected to others in a meaningful way (e.g., feeling close to others). Researchers within self-determination theory predict that fulfilling these basic needs provides a lasting source of happiness and optimal health (Deci & Ryan, 1995). Conditions that do not foster autonomy, competence, or relatedness may lead to decreased subjective well-being. Self-determination theory predicts environments and goals that allow individuals to move towards interests that they enjoy (autonomy), where they can demonstrate proficiency (competence), and feel a sense of personal and interpersonal connectedness (relatedness) result in the highest well-being.

Self-determination theory distinguishes between intrinsic and extrinsic goals (Kasser & Ryan, 1993, 1996, 2001; Grouzet, et al., 2005). Intrinsic goals are more likely to fulfill the psychological needs of autonomy, competence, and relatedness and are inherently satisfying to pursue (e.g., close relationships, personal growth, and community involvement). In comparison, extrinsic and materialistic goals are typically a means to an end such as rewards or praise that are less likely to fulfill basic needs (Kasser, 2002; Kasser & Ryan, 2001). Extrinsic goals usually rely on an external person to evaluate whether the individual meets the goal and focuses more on gaining external approval rather than internal processes (e.g., if someone is famous, other people have taken an interest in that individual's life and typically admire some of their qualities). This means extrinsic goals may lead to behaviours that fulfill psychological needs to a lesser degree, compared to intrinsic goals (Kasser, 2002; Kasser et al., 2014). Examples of extrinsic goals include obtaining wealth, fame, and status (Kasser & Ryan, 1996). Self-determination theory proposes that materialism and extrinsic goals are related to lower subjective well-being because extrinsic goals typically do not positively contribute to people's autonomy, competence, and relatedness. When these needs are not met, subjective well-being declines and people may further turn to extrinsic goals in an attempt to satisfy psychological needs (Kasser & Sheldon, 2000; Sheldon & Kasser, 2008).

Self-determination theory researchers would argue that intrinsic goals; affiliation, personal growth, and community, are steps toward self-actualization (Kasser & Ryan, 1996) as they meet an individual's psychological needs, and are not dependent on others' approval (Deci & Ryan, 2000). In Maslow's theory, self-actualization was the pinnacle point where an individual is able to develop one's full potential by knowing who one is and what he or she wants to contribute to society (Weiten & McCann, 2010). As Kasser and Ryan (1996) describe,

both Maslow (1954, 1956) and Rogers (1961, 1963) would have predicted that a strong focus on extrinsic goals, compared to intrinsic goals, would take away from a person's psychological well-being because they usually depend on someone else to make a judgment on their success (e.g., being famous and well-known; Kasser, 2002; Kasser & Ryan, 2001). Stated another way, humanistic researchers thought that each individual should guide their own behaviour rather than acting in ways that they believe society or other people value. If individuals believe they need to be well-known or wealthy to be successful in society, this can create conditions of worth that individuals feel that they must live up to (Rogers, 1959). Unsurprisingly, this does not lead to self-actualization or well-being.

To be clear, research suggests it is the *relative* importance of extrinsic goals compared to intrinsic goals that is an accurate predictor of subjective well-being. As long as intrinsic goals are valued more than extrinsic, subjective well-being is not adversely affected (Kasser & Ryan, 1993, 1996). Empirical evidence supports the idea that individuals who orient more towards intrinsic goals relative to extrinsic goals are happier, compared to individuals who orient more to extrinsic goals relative to intrinsic goals. Using data collected with palm pilots (i.e., computers participants carried with them to be randomly surveyed during the day), researchers concluded people are happier when pursuing relationship goals compared to financial goals (Solberg, Diener, & Robinson, 2004). Individuals who focus more on intrinsic goals relative to extrinsic goals also reported more positive affect, vitality, and less depression and anxiety (Kasser & Ryan, 1996). Individuals who achieved their intrinsic goals reported higher well-being (life satisfaction and positive affect) compared to those individuals who achieved their extrinsic goals (Niemic et al., 2009). In fact, individuals who achieved their extrinsic goals showed higher *ill-being* (e.g., depression, anxiety). The relationship between achievement of intrinsic goals and

well-being was mediated by change in need fulfillment (i.e., autonomy, competence, and relatedness). This suggests that intrinsic goals, compared to extrinsic goals, are more likely to fulfill psychological needs and this partly explains why intrinsic goals increase well-being.

Evidence also suggests that people who spend more money on material possessions, compared to experiences, tend to have lower well-being scores (Howell & Hill, 2009; Howell, Pchelin, & Iyer, 2012). Individuals who valued experiences over material products experienced greater need satisfaction (autonomy, competence, relatedness) and well-being (Caprariello & Reis, 2013; Howell et al., 2012). People who were less materialistic also generally preferred experiences compared to material possessions (Howell et al., 2012). In sum, spending money on experiences, which may better satisfy psychological needs compared to material possession, is positively related to well-being.

A Trade-off between Goals

The tradeoff between intrinsic and extrinsic goals is supported by the statistical structure of goals. Grouzet et al. (2005) investigated the structure of the goals according to participants' self-reports of importance. Participants were asked to indicate the importance of achieving 11 goals in the future on a scale of 1 (not at all important) to 9 (extremely important; see Figure 1). To model these goals, a multidimensional scaling analysis and circular stochastic modeling (an approach to understanding the underlying dimensions and their compatibility) were used to understand which goals were correlated with one another, or compatible; and which goals were incompatible, or negatively correlated. The analyses revealed a two-dimensional circumplex. On the horizontal axis, goals were organized on a continuum from extrinsic to intrinsic values. Beginning on the left side, financial success, image, popularity, and conformity are clustered. On the right side, self-acceptance, affiliation, community feeling, and physical health are clustered.

On the vertical axis, the goals are organized from self-transcendent (e.g., spirituality and conformity) versus physical (e.g., safety, hedonism). This suggests that goals on opposite ends of the circle are not usually rated as equally important concurrently because they tend to psychologically conflict with one another for the majority of people. For example, as concern about financial success increases, individuals seem to place less concern on their community. Goals that cluster together are compatible together and could be pursued at the same time as the goals that are highly related (e.g., as individuals work towards financial success; they may also work toward image and popularity values because these goals are psychologically and motivationally consistent with each other). This circumplex structure of the 11 types of goals was found to be consistent across 15 cultures and was similar in wealthier and poorer countries (Grouzet et al., 2005).

Figure 1. From Grouzet et al. (2005). Model of personal goals

Consistent with the idea that there is a trade-off between certain goals and values in life, Schwartz (1992, 1996) has also empirically examined the structure of values. This research focused on the social values that individuals deemed important. Specifically, participants were asked to read over each value and then rate the value “As a guiding principle in my life” using a 9-point scale from opposed to my values (scored as a -1) to supreme importance (scored as a 7). Across 80 countries, 10 values emerged: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. Again, the results from the ranking on social values can be statistically modeled on a two-dimensional circumplex similar to Grouzet et al. (2005). As Figure 2 demonstrates, the horizontal axis has values that range from openness to change (i.e., stimulation, self-direction, hedonism) to conservation (i.e., tradition, security, conformity). On the vertical axis, and more relevant to this line of research, values range from self-enhancement (i.e., power, achievement) to self-transcendence (i.e., benevolence, universalism). Self-enhancement values focus more on self-interest and/or attempts that may help the individual look good in the public eye (e.g., a career where someone can earn significant amounts of money). The opposite of self-enhancement, self-transcendence values focus more on the welfare of others (e.g., helpfulness, equality). Consistent with Grouzet et al. (2005), values that cluster together are psychologically related while values that are opposite from one another tend to conflict with each other as they are psychologically and motivationally distinct. There seems to be similarity in Grouzet et al.’s (2005) value of spirituality and Schwartz’s (1992) value of benevolence. Although these are most likely not the same concept, they may provide support for a significant relationship. Schwartz (1992) did not label one of the values as materialism, but self-enhancement values have been shown to be predictors of materialism (Karabati & Cemalcilar, 2010). In addition, the value of power in this model

includes wealth and social recognition, which is also included in the definition of a materialistic value orientation (Kasser et al., 2004). Power is in conflict with benevolence and universalism (see Figure 2), providing preliminary support that materialism may also conflict with benevolence and universalism (consistent with Grouzet et al., 2005). In the model of intrinsic and extrinsic goals from self-determination theory, benevolence seems to be more congruent with intrinsic goals as it focuses more on pro-sociality and others, compared to extrinsic goals. Of particular importance is Schwartz's (1992) value of universalism, which includes connection to nature and protecting the environment. Stern and Dietz (1994) found that Schwartz's (1992) self-transcendence values (universalism and benevolence) predicted pro-environmental behaviours. Materialism seems to be in opposition to environmental behaviours as consuming resources is difficult to complete at the same time as conserving resources. Based on these two models, there is correlational and theoretical support that materialism is difficult to pursue at the same time as self-transcendence goals and intrinsic goals, such as helping others or protecting the environment.

Figure 2. From Schwartz (1992). Circular model of social values

Beyond the mathematically derived structure of goals, Maio and colleagues (2009) empirically tested how priming a set of values on one side of the circumplex influences values on the other side of the circumplex in the moment. In a more complicated study design, participants began by indicating which values they endorsed from Schwartz (1992) value survey. The values were worded as: (1) self-transcendence (i.e., loyal, equality, helpful, a world at peace), (2) self-enhancement (i.e., ambitious, social power, social recognition, successful), (3) openness (i.e., an exciting life, a varied life, curious, independent), and (4) conservation (i.e., detachment, moderate, politeness, respect for tradition). Participants were then randomly assigned to one of the following conditions: self-transcendence, self-enhancement, openness, conservation, or a control condition. In the value conditions, participants were presented with false statistical trends showing that students at their university assigned the greatest importance to the value that corresponded to the condition they were in (e.g., if a participant was assigned to the conservation

condition, they were presented with fictitious averages that students at their university valued conservation the most). The researchers asked participants to read over these averages, identify the four highest ranked values, and note both the similarities and differences between their rankings and the fictitious rankings. Then participants read over the types of people that typically endorsed those values (e.g., conservation) and were asked to explain why students might emphasize this type of value. Finally, participants were asked to evaluate another set of Schwartz's (1992) value survey. This second time, a different set of values were presented for each value category (e.g., for conservation, the examples were changed to devout, honoring of parents and elders, social order, and obedient). Participants were told this new set of values had not yet been examined in research and researchers wanted to understand which values were highly ranked. Overall, researchers found that priming one set of values on the circumplex lead to positive changes in values that are psychologically related. The set of values on the opposite side of the circumplex then decreased in importance. Values that were orthogonal showed no change. As an example, participants in the self-enhancement condition were told that students highly endorsed values such as wealth, influence, and authority. These participants were then more likely to indicate a subset of the self-enhancement values were important (e.g., preserving my public image, being successful and ambitious). Additionally, these participants rated self-transcendence values (e.g., loyal, equality, helpful, and world at peace) as less important. The researchers also found that the values of openness and conservation did not change as they are orthogonal to the self-transcendence/self-enhancement dimension (see Figure 2). Again, this demonstrates that a change in one set of values may influence change on the values that are psychologically opposite, but this does not affect the values that are orthogonal.

In a subsequent experiment, Maio and colleagues (2009) found that priming achievement

and wealth decreased pro-sociality (i.e., helpfulness to the experimenter) suggesting the value of self-enhancement is incompatible with the value of self-transcendence. Additionally, helpfulness to the experimenter was measured as a behaviour supporting the idea that priming values can lead to differences in behaviours beyond only rating values as the first study by Maio and colleagues (2009). Overall these studies support Schwartz's (1992) circular structure that values compatible with one another (e.g., power and achievement) increase in importance while values incompatible to those (e.g., benevolence, universalism) decrease in importance. Values that are orthogonal to each of these (e.g., tradition, and self-direction) remain unchanged. This study provides support for the main hypothesis of this dissertation that if certain environments (i.e., nature) increase individuals' conservation or pro-social behaviours, this may orient people away from values that are incompatible with these such as power and achievement.

Individuals higher on materialism seem to also prioritize self-focused goals over pro-social goals. For example, participants were asked how they would allocate \$20,000 across seven categories: buy things the participant wanted or needed, give to church organization or charity, give or lend to friends or relatives, travel, pay off debts, save or invest, and an other category. Individuals high on materialism spent three times more money on things they wanted or needed, compared to low materialistic individuals. They donated less money to the church and charities, and spent less money travelling (Richins & Dawson, 1992). Highly materialistic individuals also reported less generosity even to friends and family (e.g., I don't like to lend things even to my good friends) than lower materialistic individuals (Richins & Dawson, 1992). This finding suggests that individuals high on materialism may place more emphasis on themselves and less on others. Related to this, materialism may also conflict with family or religious values, causing tension, and decreased well-being (Burroughs & Rindfleisch, 2002). Beyond these correlational

findings, empirical studies suggest priming materialism (using scrambled sentences with words such as buy and status) leads to more competitive behaviour and less investment in social activities (e.g., lower preference for socializing; Bauer et al., 2012). These behavioural studies support the idea that materialism is in opposition to pro-social behaviours and behaviours that align with intrinsic aspirations (e.g., social activities).

Development of Materialism

Kasser (2002) suggests two main pathways to the development of materialism. First, failure to meet psychological needs may lead to more insecurity, predisposing someone to pursue extrinsic goals. For example, children from divorced parents or children who have less communication with their parents (who may have had an interruption in either autonomy, competence, or relatedness) were more focused on extrinsic goals (Rindfleisch, Burroughs, Denton, 1997; Twenge & Kasser, 2013). To compensate for feelings of insecurity, these individuals may focus on gaining approval and attention from others (i.e., focus on extrinsic goals at the cost of autonomy, relatedness, or competence). Over the long term, an individual may try to attain a large salary as a way to compensate for insecurity and gain approval from others (Kasser et al., 2004). However, research suggests this only undermines well-being further as extrinsic goals generally do not meet psychological needs (Deci & Ryan, 1995; Kasser, 2002; Kasser et al., 2004; Ryan, Sheldon, Kasser, & Deci, 1996). Studies suggest that this shift to extrinsic goals can happen in the short term or over the long term. In the short term, priming insecurity using threats, increased the importance participants placed on extrinsic goals in the moment (e.g., participants indicated they wanted to make more money in the future and spend more money on material items; Kasser & Sheldon, 2000; Sheldon & Kasser, 2008). In a second study, the participants primed with mortality, another psychological threat, also acted greedier

when playing a resource game with others. It seems then that individuals who are feeling insecure, a sign of ill-being, may compensate for this with immediate gratification of money or material goods. Consistent with this finding, individuals who regularly experience self-doubt believed material possessions were more important after being primed in the moment with momentary self-doubt, compared to people without chronic self-doubt (Chang & Arkin, 2002).

Experimentally inducing sadness was found to increase the amount of money participants are willing to pay for a new product past the selling price (Lerner, Small, & Loewenstein, 2004). Over the long term, individuals who have low need satisfaction and well-being were also found to be more materialistic (see Kasser et al., 2004). Overall, these results provide support to the idea that well-being or low need satisfaction may cause materialism both in the moment and over time. However, more research is needed to examine the causal direction: Is it low well-being and need satisfaction that causes materialism, or an orientation towards materialism that causes low well-being and need satisfaction? Most likely, the relationship is bi-directional (i.e., people whose well-being is lower may turn to extrinsic goals but this only further decreases well-being because they do not meet psychological needs). Supportive of this idea, Garland et al. (2010) labeled these events as downward spirals to suggest some negative emotions cause other negative events and this cycle repeats. An upward spiral is the opposite, positive emotions lead to effective functioning, coping, and openness which cause other positive events (Garland et al., 2010).

The second explanation for how materialism develops is based on social models (Kasser, 2002). Social models may promote a materialistic lifestyle that people then endorse and try to attain. That is, exposure to advertisements, television shows, and media portrayals increases materialistic values. Children who watch more television or are exposed to more advertisements

tend to be more materialistic (Kasser & Ryan, 2001; Sheldon & Kasser, 1995). More research is needed in this area, however, to disentangle the causal direction (Kasser et al., 2004). It may be that highly materialistic individuals are more interested in television or that time spent watching television increases materialism. Supportive of the idea that social models increase materialism, researchers have found that viewing consumer goods can increase materialistic desires in the moment (Bauer et al., 2012). Showing participants subtle cues such as images of briefcases and boardroom tables can lead to more greed in a money task, increased competition, and less cooperative behaviour (Kay, Wheeler, Bargh, & Ross, 2004). Although materialism was not precisely measured, the Kay et al. (2004) study demonstrates that cues in the environment can change pro-social behaviour. Additionally, research has found that money cues such as credit cards, paper bills, or luxury items can orient people to distance themselves from others, and lead to less helping & social involvement (Bauer et al., 2012; Kasser & Sheldon, 2002; Vohs, Mead, & Goode, 2006). Removing people from these environments that contain social cues and advertisements might decrease materialistic judgments in the moment. Nature generally does not have the same features as a built environment (e.g., advertisements, social comparisons, and cues of money), so removing these features could give people a break where they temporarily stop thinking of these features and this consequently reduces momentary judgments about materialism.

Interventions for Materialism

Research has found that materialism is malleable and certain interventions are successful at decreasing materialistic values. For example, participants assigned to a high gratitude condition (e.g., focus on sincere appreciation and write about it in the space provided) had lower materialism in the moment. That is, these participants rated goals such as “I wish I made more

money, I wish I had a nicer car” as less important. This was compared to a low gratitude condition (e.g., write down the initials of people you feel envious of; Lambert et al., 2009). The researchers argued that gratitude and materialism seem to be difficult to pursue at the same time as materialism focuses on gaining possessions and what one does not own yet, whereas gratitude focuses on appreciating the things one already has.

Reflecting on intrinsic values can also increase intrinsic values and improve well-being over a short period of time (Lekes et al., 2012). In this study, the researchers educated participants on intrinsic versus extrinsic goals and encouraged participants to write about and reflect on intrinsic values over the next four weeks. In comparison, the control group wrote about and reflected on their daily routine and activities. After the first lab session where participants were educated on the differences between intrinsic and extrinsic goals and asked to begin reflecting, participants in the intrinsic value condition reported more vitality and positive affect after controlling for baseline well-being, and social desirability. Participants were then sent an email reminder every week for four weeks. After four weeks, participants who were in the intrinsic value condition and reported engagement with the task (found the exercises thought provoking or insightful) reported higher intrinsic values, lower extrinsic values, and greater well-being. These studies demonstrate that materialism, and judgments about material values, are malleable and interventions do not need to be extremely immersive. Even more, these studies also demonstrate that an increase in intrinsic goals may decrease materialistic goals.

Materialism and Pro-environmental behaviours

Materialism is not only damaging for human well-being and happiness; it has a negative effect on the natural environment. The more extrinsically orientated an individual is, the lower their concern for the environment (see review by Crompton & Kasser, 2009). The more

individuals consume, in the context of material items such as clothing, cars, and homes, the more products need to be disposed of or recycled (Leonard, 2011). Some researchers have found a negative relationship between materialism, love of nature and environmentalism (Saunders & Munro, 2000), suggesting these variables are incompatible with one another. Linking pro-environmental behaviours with Schwartz's (1992) values, self-transcendence values typically correlate with environmental behaviours while self-enhancement values negatively correlate with environmental behaviours, again suggesting these values are psychologically in opposition with one another (Schultz et al., 2005). This is corroborated by research on values, which found individuals that hold more pro-social, and self-transcendent values also engage in more sustainable behaviours (see review by Steg & Vlek, 2009).

A recent meta-analysis found a significant negative relationship between materialism and environmental behaviour at the trait level (Hurst, Dittmar, Bond, & Kasser, 2013), meaning people who are more materialistic tend to behave less sustainably. Again, this supports the goal structure that materialism and environmentalism are two opposing values (Crompton & Kasser, 2009; Grouzet et al., 2005; Maio et al., 2009; Richins & Dawson, 1992). Furthermore, when researchers prime participants with intrinsic goals, they recommended smaller ecological footprints for Americans (Sheldon, Nichols & Kasser, 2011), suggesting intrinsic goals are more compatible with sustainable behaviours.

The idea of increasing intrinsic aspirations and decreasing extrinsic aspirations to help the environment and increase the well-being of people is consistent with the idea of sustainable happiness. Sustainable happiness focuses on ways to increase people's enjoyment and satisfaction with their lives but in a manner that does not degrade the environment, or take away from other people's happiness including future generations (see O'Brien, 2008). Stated another

way, sustainable happiness is focusing on the things in life that actually contribute to human happiness which generally align with pro-environmental behaviours. This means sustainable happiness could be accomplished by focusing on the *good* life, things that lead to happiness such as community and social relationships, compared to the *goods* life, that focus on buying, owning possessions, and may harm the environment (see Kasser, 2006; O'Brien, 2013).

Nature

Fostering environments that satisfy needs to orient people towards intrinsic goals could be beneficial for the well-being of people and the environment. I propose that natural environments are one of these environments. In recent years, the number of scientific articles dedicated to studying the benefits of nature has greatly increased (Selhub & Logan, 2012), highlighting the potential of nature interventions. Broadly, nature is defined as living entities such as plants, trees, water, and animals. Most people think about nature as pristine and separate from human activity (Vining, Merrick, & Price, 2008). Researchers attempting to define the physical features of nature have found some reliable differences, compared to built environments, such as the density of contrast changes, colour saturation, and hue diversity (see Berman et al., 2014 for a more detailed review). Yet, sometimes the definition of nature can become more complicated. For example, manicured lawns and flowers are not separate from human activity, people had to maintain these areas, but people may still think of these as nature. In addition, many studies have found that time spent in urban parks (as the nature exposure) increased mood, and cognitive resources (e.g., Kuo, & Faber-Taylor, 2004; Mayer et al., 2009). Although there is still debate on what classifies as nature, environments and photographs of these environments that are mostly made up of natural features, maintained by people or not, were considered nature for the purposes of this thesis. The benefits of nature are discussed below as three categories: cognitive

benefits, well-being benefits, and social benefits.

Attention Restoration Theory and the Reasonable Person Model

Many studies report improved concentration and directed attention after nature contact (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Hartig, Evans, Jamner, Davis, & Gärling, 2003; van den Berg, Koole, & van de Wal, 2003). These attention benefits also extend to individuals with cognitive difficulties such as attention deficit hyperactive disorder (ADHD; Taylor & Kuo, 2009). That is, children with ADHD report an improvement in attention after a 20-minute walk in a city park. These findings can be partly explained using attention restoration theory (ART) which suggests that people can concentrate and direct their attention more easily after nature exposure (Kaplan & Kaplan, 1989). Directed attention or voluntary attention is a limited resource that becomes fatigued after extended use (e.g., attention, concentration). When this fatigue occurs, performance begins to decline, and the person is less able to concentrate and block out irrelevant information. Nature may replenish directed attention as it engages involuntary attention which allows directed attention to recharge and executive functions to be restored (Kaplan & Kaplan, 1989). Nature is believed to be one of these restorative environments because it meets four criteria (Kaplan & Kaplan, 1989). First, nature provides a break from indoor work and life by getting people away and out of routine activities. Second, nature involves feeling a subjective sense of interrelatedness with the larger whole or surroundings. This feeling can preoccupy the mind while allowing other thoughts to rest. Nature is also able to provide a sense of fascination, which engages the mind with effortless attention and allows directed attention a break. Examples of fascination in nature can include clouds, sunsets, scenery, processes of growth, or predation. Finally, nature also provides a compatible environment that tends to be easier for concentration and overall functioning. Evolutionarily speaking, it was

adaptive for people to be in environments that fostered retention and understanding of information. People may have evolved to function in natural environments that lead to retention of information. It may also be that evolutionarily these cognitive resources have not adapted yet to the new challenges in modern built environments. Regardless of the direction of this relationship however, natural environments seem to provide benefits to people's cognitive resources.

Since the time that ART was developed, Kaplan and Kaplan (2003; 2009) have also proposed the reasonable person model (RPM). This model suggests that certain environmental surroundings meet informational needs more effectively than others. When informational needs are met, people are hypothesized to be more pro-social and constructive (Kaplan & Kaplan, 2003, 2009). This model proposes that most natural environments meet the criteria for supportive environments, compared to typical built environments, as they positively contribute to the following three informational needs: (1) Natural elements support people's need to explore and understand their environment. The amount of information in nature is postulated to be more manageable than a built environment, which may contain many advertisements or bright lights. Nature is also hypothesized to support people's exploration needs because people have the opportunity to discover something new (e.g., new flowers blooming, different animals in the area). (2) People need to feel effective in their environments and like they can actively participate. Environments that are too overwhelming or foster a feeling of helplessness take away from a person's feeling of effectiveness. This need is not nature specific – rather urban environments can contribute to this need if they are not overwhelming. (3) People need to have a place to restore mental resources, particularly directed attention (similar to attention restoration theory). Research on crime and access to nature supports this theory. For example, researchers

have also found there is less crime in areas with vegetation or cues of nature. In residential areas with high canopy trees and grass, the crime rate was lower compared to residential areas without high canopy trees (Kuo & Sullivan, 2001; Donovan & Prestemon, 2012). Residents also reported lower levels of fear; and less aggression and violent behaviour. The residents in these studies were similar in socio-economic status, and buildings were of comparable physical size and number of tenants. Researchers using the reasonable person model would predict that people are committing less criminal acts in the presence of nature because their informational needs are more effectively met.

Subjective Well-being and Biophilia

Being outdoors in pleasant nature (e.g., walking in parks, watching nature videos, or viewing photographs) is associated with positive affect (Mayer et al., 2009; Nisbet, Zelenski, & Murphy, 2011; van den Berg et al., 2003) and greater vitality, and energy (Ryan et al., 2010). These mood benefits of nature may extend to all age groups from children to senior citizens (Takano, Nakamura, & Watanabe, 2002; Wells & Evans, 2003). In fact, a recent meta-analysis across 32 studies with a total sample size over 2,000 found exposure to nature was related to increases in positive affect and decreases in negative affect (McMahan & Estes, 2015). In a longitudinal analysis, which controlled for personality, employment, and marital status, people who lived in urban settings with larger amounts of nature were happier overall and had lower mental distress (White et al., 2013). This long-term benefit may also extend to how happy participants feel in the moment. For example, researchers developed a GPS for use on smart phones that tracks people's location. Participants were surveyed at random time points throughout the day with a brief questionnaire on how happy they feel at that moment, who they are with, and what they are presently doing (MacKerron & Mourato, 2013). This allows the

weather, type of activity, company, and time to be controlled for. Across 20,000 participants, the researchers found that participants were happier outdoors in green spaces or natural environments, compared to built environments, supporting the idea that natural environments can be a source of well-being. Some researchers have also expanded beyond well-being benefits to examine how access to nature affects life expectancy. Close access to nature or green spaces seems to increase life expectancy especially in those people with relatively low incomes (Mitchell & Popham, 2008) highlighting the diverse benefits of nature. This may suggest a possible indirect relationship with well-being and health (i.e., access to nature increases daily mood so that over time this increase in mood and happiness may actually increase people's life expectancy). In other words, happier people may live longer (Lyubomirsky, King, & Diener, 2005).

Consistent with the research on nature and subjective well-being, nature may also be beneficial for people's mood and happiness as it decreases stress levels (Ulrich, 1981). Walking in nature reserves may be able to decrease stress by reducing psychophysiological reactions such as blood pressure and pulse rate (Hartig et al., 2003; see Tsunetsugu, Park, & Miyazaki, 2010 for a review). Exposure to unthreatening, pleasant nature may also lower self-perceived stress. Residents who lived within 1 km of green space reported lower self-perceived stress (e.g., in the last month, how often have you felt nervous and "stressed"?), compared to residents that lived further than 1 km from green space (Stigsdotter, et al., 2010). This result is consistent with research in the Netherlands, where researchers found that people who lived within 3 km from nature were less affected by stress compared to people who lived further than 3 km away from nature (van, den. Berg, Maas, Verheij, & Groenewegen, 2010). These results remained significant after controlling for age, gender, income, educational level, and level of urbanity.

In the studies reported above on mood and happiness, the nature was pleasant and included urban parks (i.e., participants probably did not visit unattractive nature). It is likely that presenting unpleasant or threatening nature would decrease momentary feelings of positive affect and well-being (see Ulrich, 1993 for a review). That is, much of nature is pleasant nature, but there are some unpleasant natural parts that seem unlikely to boost well-being. Therefore, the type of nature researchers use is most likely important. For this dissertation, only relatively pleasant nature was used.

The benefits of nature on people's mood and happiness can be explained through biophilia (Wilson, 1984). The biophilia hypothesis postulates that people have a need to affiliate with other forms of life (e.g., plants and animals). This need and connection to nature would have been helpful to our ancestors and is proposed to still provide some of the same benefits to people today. Those individuals who felt more connected to nature may have lived in a closer connection with the environment and this connection may have provided better survival opportunities for their kin (e.g., competency of predicting time or weather conditions). These survival advantages would have increased the likelihood that the genes carrying this love of nature would be passed on. This idea that people have a need to affiliate with nature is supported by recent empirical research. For example, when people's need for nature is not satisfied (i.e., workers who do not have a window or view of the outdoors), they may seek out nature to try to compensate (i.e., by bringing in plants or photos of plants; Bringslimark, Hartig, & Patil, 2011). Additionally, certain types of nature may have also been more important for survival than others. For example, a savannah like environment with some tree cover and water is hypothesized to provide people with the best opportunity for finding food or building shelter, and this remains one of the most preferred nature scenes today (Kellert, 1997; Wilson, 1984).

Despite the benefits of nature, there are some frightening and harmful aspects of nature. Evidence suggests people have evolved to avoid certain parts of nature (Ulrich, 1993) also referred to as biophobia. Evolutionally speaking, some parts of nature are scary (e.g. snakes, and natural disasters) meaning people who successfully avoided these aspects would have increased their chances of survival. A connection to nature and understanding of the natural environment would presumably aid this avoidance. The idea that people may still fear parts of nature that are more dangerous may demonstrate the innateness of the human-nature relationship. For example, in one study researchers reported that the majority of phobias were evolutionary significant (e.g., spiders, heights), rather than equally dangerous guns or mechanical weapons (De Silva, Rachman, & Seligman, 1977). This suggests people may be drawn to parts of nature that enhance well-being and survival (e.g., forests, shallow bodies of water) and drawn away from certain parts of nature (e.g., dangerous wild animals). One final note, biophilia is mentioned here as a guiding principle; it is difficult to scientifically test because we cannot go back in time and measure people's love for nature and their well-being or survival (Kahn, 2011).

Biophilia is also the basis of ecopsychology, which examines the relationship between humans and the earth (Roszak, 1995). Ecopsychology proposes that humans are still a part of nature so when we are disconnected from nature, well-being suffers (Roszak, 1995). As already mentioned, in recent years humans have become more physically disconnected from nature. Ecopsychology theorists predict that reconnecting people back to nature (i.e., spend more time in natural environments) may result in lasting changes where people are motivated to improve the state of the planet (Kanner & Gomes, 1995). Although ecopsychology focuses more on therapy than on research, the framework is useful for understanding why a disconnection from nature may lead to lower well-being, consumption, and a lack of pro-environmental behaviours.

Social benefits of Nature

More relevant to this dissertation, research supports the idea that nature exposure and regular contact with our natural surroundings may increase pro-sociality. Pro-sociality is defined as voluntary behaviours that focus more on benefitting others, compared to the self, such as generosity, cooperation, and altruism (Caprara, Alessandri, & Eisenberg, 2012; Eisenberg & Miller, 1987). Although people can engage in pro-social behaviours for selfish reasons (e.g., people may cooperate with their coworkers to get a job promotion in the future), people who engage in more pro-social behaviours are more likely thinking of others, compared to people who rarely engage in pro-social behaviours. If a person is participating with coworkers to get a promotion, this would be considered a pro-social behaviour (even though there may be a benefit to the self). In other words, in this dissertation, behaviours that provided benefits to others (and in some cases the self) were thought to represent more other-focused behaviours, similar to intrinsic goals. Behaviours that focused mostly on providing benefits to the self were thought to represent more selfish behaviours, similar to extrinsic goals.

In recent years, researchers have demonstrated that nature provides many social benefits. For example, participants who were exposed to nature (e.g., nature photographs or by being in a plant filled room) and reported that they felt immersed in the natural surroundings (e.g., I felt like all my senses were engaged) were higher in generosity (Weinstein et al., 2009). In this generosity task, the researcher asked participants if they wanted to donate \$5 to an anonymous student. Participants were told the \$5 would then be doubled and given to the anonymous student. This student would then be given the opportunity to donate the original \$5 back to the first student or keep the \$10. Even though there was a risk to losing the original \$5, participants who viewed nature photographs chose to donate this money significantly more often compared

to participants who viewed built photographs. In this same study, nature photographs were found to increase people's autonomy and relatedness (two of the psychological needs from self-determination theory), which then partially explained why nature increased generosity. This is consistent with other studies that found people in nature exhibited more generous behaviour with money (Egger, 2017; Raihani & Bshary, 2012; Zhang, Piff, Iyer, Koleva, & Keltner, 2014).

Researchers in France found that participants were more likely to help pick up a glove after they had been in a park compared to before they entered the park (Guéguen & Stefan, 2014). This suggests that following nature exposure, people might act more pro-socially. Additionally, experimenters who wore a reminder of nature such as a flower received more help from participants (either help completing a survey or bus fare), compared to wearing only a barrette with no flower (Guéguen, Stefan, Jacob, & Sobecki, 2014; Stefan, & Guéguen, 2014). Short exposures to nature videos also increased participants' cooperation (Zelenski et al., 2015). To measure participants' cooperation, a fishing commons dilemma was employed where participants chose between the community benefit (restraining harvesting to sustain the resource) and immediate self-interest (harvesting for quick profit). The participants exposed to nature harvested less fish per round and sustained the resource for longer, representing cooperation (in this study). In a follow up study, participants were also more generous to others when allocating points in a social value orientation game. In this hypothetical game, participants chose between assigning points (imagined as money) to themselves versus others. Participants who had watched a nature video were more generous compared to those who watched built environment videos (this was not dependent on participants' mood). Exposure to nature may also be more effective at building social capital, a sense of community, or a connection and care for others (Joye & Bolderdijk, 2014; Kingsley & Townsend, 2006).

Finally, brief exposures to nature lead to higher intrinsic or other-focused goals (higher desire for community affiliation and close relationships to others) and lower extrinsic goals or external rewards (money, fame; Weinstein et al., 2009). That is, participants who viewed nature photographs, compared to built photographs, judged intrinsic goals as more important and extrinsic goals as less important (momentarily). These results were stronger for people who self-reported they were immersed in the nature photographs. These changes depended on autonomy and relatedness to nature – two of the proposed psychological needs proposed by self-determination theory. This means that time in nature may increase participants' autonomy (Weinstein et al., 2009; Mayer et al., 2009) suggesting a possible path of how nature is beneficial for well-being and fulfills a need within people. Altogether, these studies suggest nature may shift importance to become more concerned for others (i.e., shift towards intrinsic goals and pro-sociality). This shift towards intrinsic goals may orient people away from extrinsic or materialistic goals.

Examining the benefits of nature exposure on materialistic aspirations may not be an obvious relationship, but there are theoretical reasons to hypothesize this relationship. For example, researchers using attention restoration theory might hypothesize nature is influencing people to act more pro-socially because people's directed attention and executive functions are restored and they can think more clearly through the decisions. This assumes individuals can understand that materialism may not be a satisfying way to live life. Related to this reasoning, researchers testing the reasonable person model might hypothesize people are more pro-social in nature because their information needs are more easily met and this supports more rational, self-regulated behaviour. Again, it is assumed that a rationale self would not view materialism as a satisfying way to live life (or they would be able to think through decisions more effectively and

make choices that align with high well-being). Alternatively, it may also be that restored directed attention (from time in nature) increases both executive functioning and self-regulation (Kaplan & Berman, 2010) to help the individual make decisions that lead to more benefits (e.g., lower materialism).

I propose nature is partly beneficial because it satisfies the psychological need of nature relatedness. Nature relatedness may represent how much an individual's need for nature has been fulfilled (i.e., when an individual's need for nature has been fulfilled, he or she reports higher nature relatedness). This means that certain environments (e.g., nature) increase the likelihood that nature relatedness needs are satisfied. Individuals are then more likely to have their psychological needs met, and continue pursuing intrinsic aspirations and basic needs. This means people may continue pursuing intrinsic aspirations without the disruption and temptation for immediate pleasure that comes with deprived states. Nature exposure and nature relatedness may temporarily increase behaviours and values that are on the right side of Grouzet et al. (2005) circumplex (such as affiliation, self-acceptance) in Figure 1 and the top half of Schwartz (1992) circumplex (self-transcendence values) in Figure 2. This would be similar to Weinstein et al.'s (2009) study which showed that nature exposure lead to a momentary increase in intrinsic goals and a momentary decrease in extrinsic goals.

If nature exposure increases nature relatedness, which fosters basic needs and consequently intrinsic aspirations, it is possible that these small changes lead to bigger changes in behaviours. For example, if a person is consistently choosing to help others over time, this may lead to changes in values as well. This is broadly supported by the density distribution model (Fleeson, 2001; 2007) that states an individual's personality trait is the summation of their momentary behaviours that differ in reliable ways from another person's momentary behaviours.

If individuals value community more this may increase their desire to get involved with their community, and how they act.

Nature Relatedness

I proposed nature would be an effective strategy for reducing materialism because it increases nature relatedness. As previously described, nature relatedness² includes an individual's affection for nature and living entities, including unpleasant aspects, and an individual's understanding of nature (Nisbet et al., 2009). Nature relatedness is seen as trait-like, varies between individuals, similar to other personality traits, and remains consistent over time (Mayer & Frantz, 2004; Nisbet et al., 2009). However, people are able to increase how connected or related one feels to nature both in the moment, and a trait level (Kals et al., 1999; Mayer et al., 2009; Nisbet et al., 2009; Vinning et al., 2008). Exposures to nature, either real nature or video/photographs, that last 20 minutes or less can lead to increases in participant's subjective connection or relatedness in the moment (Mayer et al., 2009; Nisbet et al., 2011; Zelenski et al., 2015). As part of the David Suzuki 30X30 challenge, people who attempted to spend 30 minutes a day in nature over the month of May felt higher nature relatedness at a trait level (Nisbet, 2013). However, participants self-selected to be a part of the challenge suggesting a possible demand effect in the results. Participants in the challenge also reported increases in mood and sleep

² Nature relatedness is part of a common construct of assessing people's subjective connection with the natural world (see Schultz, 2002 for a review on the large body of research on nature connectedness). Other constructs include Emotional affinity toward nature (Kals, Schumacher, & Montada, 1999); connectedness to nature (Mayer & Frantz, 2004); inclusion of nature in self scale (INS; Schultz, 2001); environmental identity (EID; Clayton, 2003); connectivity with nature (CWN; Dutcher et al., 2007); and commitment to nature (COM; Davis et al., 2009). These measures are all highly correlated and converged on a single factor (Tam, 2013). Some small predictive differences exist; inclusion of nature in self is mostly strongly related to happiness followed by nature relatedness and connectedness to nature (Capaldi et al., 2014). But I will refer to nature relatedness to mean the common construct of nature connectedness and not distinguish among these measures. Inclusion of nature in self scale (INS; Schultz, 2001) will be used to measure state nature relatedness.

quality; more feelings of peace and vitality; and decreases in stress. The more time an individual spends in nature, generally the more connected to nature they feel (Kals et al., 1999; Mayer et al., 2009; Nisbet et al., 2009). Evidence suggests nature relatedness is malleable both in the moment and over time. Other research has examined using writing about nature to increase nature relatedness but this did not lead to increases in relatedness (Nisbet, 2011), suggesting using real nature (or photographs) might be the most effective way to increase relatedness.

The idea of nature relatedness is consistent with many researchers who argue a connection to nature is necessary to encourage sustainable behaviour (Cervinka, Roderer, & Hefler, 2012; Clayton, 2003; Howard, 1997; Nisbet et al., 2009; Schultz, 2002). If people care more about someone or something, they are more likely to protect it. Empirical results support this idea; nature relatedness is positively correlated with being an environmentalist (Nisbet et al., 2009) and how people treat the environment (Mayer & Frantz, 2004; Leary et al., 2008). People who feel more connected at a trait level are more concerned about the environment and the negative effects of human activity on nature (Mayer & Frantz, 2004; Leary et al., 2008; Nisbet et al., 2009). Even more relevant to the present research question, researchers have grouped reasons for environmental concern into three categories: altruistic concern e.g., how the environment affects children and people in the community; biospheric concern e.g., how the environment affects plants and animals, and egoistic concern e.g., how the environment affects my health or future (De Groot & Steg, 2007; Stern & Dietz, 1994). Schultz (2001) found that people who were connected to nature were more likely to be concerned about the environment for altruistic and biospheric reasons, not egoistic reasons. This finding suggests that people who are connected to nature care about the planet for pro-social reasons rather than for selfish reasons.

People high in nature relatedness are also more likely to buy fair trade products; local and

organic products; recycle; and be politically active about environmental issues (Mayer & Frantz, 2004; Nisbet et al., 2009; Nisbet & Zelenski, 2013). Consequently, nature relatedness may promote more pro-environmental behaviours that could improve the health of the planet. Nature relatedness is negatively correlated with materialism (Mayer & Frantz, 2004) suggesting a possible causal path between spending time in nature and decreasing materialism. Stated another way, people who feel a part of nature may be more motivated to conserve rather than consume.

Nature Relatedness and Well-being

Individuals who are more connected to nature at the trait level experience numerous benefits such as higher social, emotional, and psychological well-being (Howell, Dopko, Passmore, & Buro, 2011); life satisfaction (Mayer & Frantz, 2004); and meaning or purpose in life (Cervinka et al., 2012; Howell, Passmore, Buro, 2013; also see review by Capaldi, Dopko, & Zelenski, 2014). These findings suggest there is something satisfying about feeling connected to nature. However, these studies focused on correlations, meaning the causal path remains an avenue for future research. Individuals who are high in nature relatedness spend more time in nature (Nisbet et al., 2009), likely reaping short-term benefits of nature exposure. In a recent meta-analysis (Capaldi et al., 2014), trait nature relatedness was significantly related to happiness. Additionally, nature relatedness predicts happiness above general connectedness with family or friends (Zelenski & Nisbet, 2014). These results suggest a connection to nature can be a source of happiness that extends beyond what individuals feel with friends or family demonstrating the distinct contribution of nature relatedness to well-being.

Building on this research, I suggest that feeling a part of nature is satisfying for people. Feeling connected to nature may increase the likelihood that individuals continue to foster behaviours that satisfy needs (i.e., intrinsic aspirations). Additionally, I propose that nature

relatedness decreases materialism because connected people engage in more pro-environmental behaviours (Mayer & Frantz, 2004; Nisbet et al., 2009), and consuming less can be viewed as an extension of these sustainable behaviours. Recall from Schwartz (1992) structure of values, universalism included connection to nature and protecting nature which is the opposite to materialistic or self-enhancement values.

Summary

I proposed nature exposure would satisfy nature relatedness and this would provide many benefits (e.g., mood). According to self-determination theory, meeting psychological needs is thought to promote intrinsic goals and contribute to well-being (Deci & Ryan, 2000). Guided by self-determination theory, I viewed *nature relatedness* similarly to the three psychological needs of autonomy, competence, and relatedness. That is, meeting the need for nature results in nature relatedness, and fulfilling this need functions similar to meeting the psychological need of relatedness. When this need is fulfilled, people are more likely to continue fostering behaviours that meet basic needs (i.e., intrinsic aspirations). This argument is also based in biophilia (Wilson, 1984), the reasonable person model (Kaplan & Kaplan, 2003, 2009), and ecopsychology (Roszak, 1995). Biophilia suggests humanity has a need to connect with other life and when this need is fulfilled, people may experience benefits. This is consistent with researchers who hypothesize that pleasant nature is a source of well-being and happiness (Wilson, 1984; Kellert, 1997; Katcher & Belk, 1987; Roszak, 1995; Frumkin, 2001). The reasonable person model (Kaplan & Kaplan, 2003, 2009) supports this idea that people function best in nature environments, or environments that meet people's informational needs. Ecopsychology proposes humans are a part of nature and when disconnected from the natural world, well-being suffers (Roszak, 1995). This dissertation seeks to connect the biophilia

hypothesis, ecopsychology, self-determination theory, and the reasonable person model together to predict nature contact and nature relatedness (both momentarily and over time) can decrease materialism. Throughout this thesis, nature relatedness was examined as a mediator between nature contact and materialism.

Although past research offers preliminary support for the idea that nature can decrease materialism, the causal effect of nature on materialism have not been examined. To systematically test these ideas, I conducted three brief experiments and one intervention study. Together these experiments causally tested if contact with nature increased nature relatedness and decreased materialism. More specifically, these studies: a) tested the effectiveness of Kasser's (2002) strategy that promoting goals psychologically in opposition to extrinsic goals would reduce materialism, and b) examined how intrinsic/extrinsic goals changed in response to nature exposure. These studies apply to the research in environmental psychology by examining if nature causally increased nature relatedness to influence environmental concern and goals, and to positive psychology by examining nature as a source of well-being and as an effective strategy for decreasing materialism both in the moment and over a longer period of time.

Pilot Study

The goal of the Pilot Study was to preliminarily test the idea that nature exposure and feeling connected to nature could decrease the perceived importance of materialistic aspirations in the moment, and increase intrinsic aspirations. A secondary goal was to test a novel materialism measure, the willingness-to-pay measure. To test these goals, participants first completed a personality measure, completed a walk either outdoors in nature or indoors (called the built condition), and then completed a mood measure, a nature relatedness measure, and two materialism measures. In the first materialism measure, the willingness-to-pay measure,

participants were asked how much they were willing to pay for certain luxury items. This was used as an exploratory measure to test if participants in the built condition were willing to pay more for the luxury items suggesting they value luxury more. In the second materialism measure, the aspiration index, participants judged the importance of certain goals (e.g., importance of money, close relationships). This measure was intended to replicate Weinstein et al.'s (2009) finding that nature exposure increased intrinsic goals and decreased extrinsic goals. In addition to these questionnaires, three open-ended questions about how participants felt after being in nature were explored to understand the effect of nature on participants.

Hypotheses

Hypothesis one. At the trait level, materialism and extrinsic aspirations would be negatively correlated with nature relatedness and intrinsic aspirations. The aspirations are presented as relative scores and as raw scores.

Hypothesis two. Participants in the nature condition would experience positive changes in mood and feel higher state nature relatedness in the moment compared to participants in the built condition.

Hypothesis three. Participants in the nature condition would be willing to pay less (hypothetically) for luxury goods compared to those in the built condition. Participants in the nature condition would be willing to pay more (hypothetically) for nature items compared to those in the built condition.

Hypothesis four. Participants in the nature condition would judge intrinsic goals as more important compared to participants in the built condition. Participants in the built condition would judge extrinsic goals as more important compared to participants in the nature condition (again these results are presented as the relative scores and the raw scores). In addition, I

correlated state nature relatedness to intrinsic and extrinsic aspirations to examine if state nature relatedness was positively related to intrinsic goals and negatively related to relative extrinsic aspirations.

Method Pilot Study

Participants

A total of 51 participants completed the study “walking, mood, and attitudes” for course credit. The participants were recruited through the Psychology Department’s online sign-up system (SONA). Two participants (in one experimental group) were excluded from the analyses due to an interruption in procedure. Therefore, analyses were conducted with $N = 49$ (24 participants in the built condition and 25 participants in the nature condition). Participants ranged in age from 17 to 48 ($M = 19.78$, $SD = 4.96$) and 52% were in their first academic year. The majority of the sample was female (71%). The majority of participants reported that they grew up in a city (63%), while 22% grew up in a small town, and 4% grew up in a rural area or on a farm. The majority of participants (51%) reported that they presently live in a city, 33% reported that they live in residence, and 2% reported that they live in a small town (2% currently live on a farm/rural area). Participants reported a breadth of majors; the largest categories were Criminology (18%) and Psychology (18%).

Materials

Nature relatedness (Nature Relatedness Scale; Nisbet & Zelenski, 2013). The nature Relatedness scale was hidden within the Big Five Factor Inventory (BFFI; John & Srivastava, 1999). The BFFI was only used as distractor items (not for hypotheses or analyses). The BFFI is a 44-item inventory that measures five domains of personality – openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. This questionnaire began with

the stem “I see myself as someone who/who’s ...” and participants indicated how much each individual item represented them from 1 (disagree strongly) to 5 (agree strongly). The 6-item nature relatedness scale that was hidden within the BFFI measured how connected to nature participants felt at the trait level. The rating system for this scale is the same as the Big Five Factor Inventory. A sample item is, “Takes notice of wildlife wherever I am.” The scale demonstrated good reliability, $\alpha = .83$. See Appendix A for the complete measure.

Material values scale (MVS; Richins, 2004). This 6-item brief scale measures trait materialism in people. The rating system for this scale was the same as the BFFI as these 6 items were also dispersed throughout the BFFI. A sample item is, “Admires people who own expensive homes, cars, and clothes.” There are three subscales; success, which measures how much participants use material objects to judge the success of themselves and others; centrality, which measures the degree that material objects are necessary in life; and happiness which measures how much participants believe material objects can make themselves happy. Overall reliability of the scale was acceptable, $\alpha = .74$. However, the subscale reliability was lower, likely because there were only two items per subscale, success $\alpha = .61$; centrality, $\alpha = .47$; happiness, $\alpha = .70$. See Appendix A for the complete measure.

Broad assessments of nature. As an exploratory measure, participants were given a series of open-ended questions that I designed to assess the effects of being in nature on materialism in the moment. Specifically, participants were asked, “What do you feel like doing now? Please list any activities you feel ‘in the mood’ to do.” Second, participants were asked, “List 5 items you would take with you if you were going away for a while (i.e., the items you would not want to be without).” Third, participants were asked, “How you would spend a million dollars if you won the lottery.” They were also asked to allocate how much of the million dollars

would be spent on the items they listed (a percentage out of 100%). Participants were given a few blanks for each question. See Appendix B for these questions.

Aspiration index (Kasser & Ryan, 1996). This 42-item measure assessed individuals' goals in life, specifically, their intrinsic and extrinsic aspirations. This scale is easy to administer and flexible (e.g., the ratings can be changed from perceived importance to motivation; and specific aspirations can be subtracted from all goals measured to obtain a relative importance score). Participants rated how important each item was to them on a scale of 1 (not at all important) to 5 (very important). After participants rated the importance, they were asked to rate the likelihood or chances of this happening in their life on a scale of 1 (very low) to 5 (very high). The chances of the goals occurring were included in the questionnaire for completeness; however, the chances results are not reported. I was interested in the importance participants would place on the goals more than if they believed the goal was likely to happen or not. A sample item is "You will work for the betterment of society." The intrinsic aspirations domain is comprised of items from affiliation, community feeling, self-acceptance, and physical fitness³ ($\alpha = .82$). The extrinsic aspiration domain is comprised of items from social recognition, appealing appearance, and financial success ($\alpha = .88$). Kasser and Ryan (1996) recommend computing REIVO (relative extrinsic versus intrinsic value orientation) when scoring the aspirations because participants may rate all goals as important to them and this alone is related to higher well-being (Emmons, 1986; Schumck et al., 1999). To calculate REIVO, the importance of extrinsic goals are subtracted from the importance of intrinsic goals so that high REIVO scores mean intrinsic goals are more important and low REIVO scores mean extrinsic

³ Physical health is sometimes classified as an intrinsic goal (e.g., Kasser & Ryan, 1996; Schumck et al., 1999) but not always (e.g., Kasser & Sheldon, 2000; Weinstein et al., 2009). In this thesis, physical health was included as an intrinsic goal (although analyses were completed without it as an intrinsic goal and the results remain the same).

goals are more important. To also examine the relationship between the raw goals, I present correlations that have not been mean-corrected (i.e., the raw intrinsic and raw extrinsic goals).

See Appendix C for the aspiration index.

Willingness-to-pay measure. I constructed a 10-item questionnaire for this study to measure how much money participants would be willing to pay for luxury goods and nature items (i.e., plants and trees). Each question consisted of one colour photo with a blank space underneath to allow the participants to fill in the amount they were willing to pay (there was no limits on the amount a participant could indicate). For example, a photo of an iPhone was presented and participants indicated in the blank space how much they were willing to pay for it (the participants could also indicate \$0). This questionnaire follows similar willingness-to-pay questionnaires by Feinburg (1986) and Shavit, Shahrabani, & Benzion (2006). See Appendix D for the full questionnaire.

Positive and negative affect schedule (PANAS; Watson, Clark, & Tellegen, 1988). This 20-item questionnaire measures high arousal positive affect and negative affect. In addition, I added in 6 items to assess pleasant affect or low arousal positive affect (how content, in awe, peaceful, fascinated, curious, relaxed participants felt). Participants were asked to indicate how much they felt this way in the moment on a scale of 1 (very slightly) to 5 (extremely). These scales had acceptable reliability: positive affect ($\alpha = .85$), pleasant affect ($\alpha = .84$), and negative affect ($\alpha = .75$). See Appendix E for the PANAS.

Inclusion of nature in self-scale (INS; Schultz, 2002). This single item measures how connected to nature participants feel at the *state* level or in the moment (cf. nature relatedness that focuses on the trait level). This scale uses a pair of matching circles with one circle labeled self and the other circle labeled nature. Each pair of circles differ on the extent that they overlap.

Participants choose the pair of circles that best illustrates their relationship with nature. Choosing a pair of circles that completely overlap (scored as a 7) represents a close connection to nature whereas, choosing a pair of circles that do not overlap (scored as a 1) represents a distant connection with nature. In this study, participants were asked to “Please circle the picture below that best describes your relationship with the natural environment at this moment in time. How interconnected are you with nature right now?” In this study, participants also indicated how connected to they felt to family, friends, community, city, and common humanity (as distractor questions). See Appendix F for the INS.

General information⁴. At the end of the study, participants were asked a series of demographic questions (e.g. their year of study, age, sex, and major). This was completed to understand more about the participants. See Appendix G for the demographic questions.

Procedure

Participants were tested in groups ranging from 1 to 5 participants ($M = 3.08$, $SD = 1.26$). I randomly assigned the group of participants to the built or nature condition before the study began. Participants met in the psychology building where I held up a sign “walking, mood, and attitudes” to make it easier for participants to locate the study. After providing informed consent, the participants completed the Big Five personality questionnaire with the nature relatedness and materialism items added. Then, I led the participants on one of two walks: a) an indoor, built environment or b) an outdoor, natural environment. Participants in the built condition walked through the campus tunnels, to the other side of campus. The tunnels are mostly concrete with artificial lighting, and few doors/windows along the route. Participants were instructed not to talk

⁴ Although demographic information was collected about the participants, no supplementary analyses were completed with these due to the small sample size. For example, when examining if rural or urban living affects aspirations, the groups were very small and unequal (these analyses are presented in Study 1, 2, and 3 where the sample size is larger however).

to one another, but instead to focus on the environmental surroundings. Participants in the nature condition walked along a river adjacent to the university campus that lead to a small forested area with plants and trees. Participants in the nature condition were given mindfulness instructions to help immerse the students in nature. Specifically, I asked participants to focus on one of their senses in nature. For example, participants could focus on their sight by observing the movement of the water along the river. Near the end of the walk, I asked participants to focus on all their senses and become absorbed in nature (see Appendix H for mindfulness script). The built condition did not receive mindfulness instructions. This was an intentional confound that was designed to increase the strength of the nature manipulation and immerse participants more in the natural elements. That way, I could examine a possible (stronger) relationship between nature exposure, nature relatedness and the dependent measures. Sometimes the walking conditions passed other people, but mostly walks were uninterrupted. The walking routes lasted 17 - 20 minutes.

After the walk, participants were asked to complete open-ended questions about material possessions, and a willingness-to-pay measure. Participants then completed the inclusion of nature in self scale, the positive and negative affect schedule, and the aspiration index. Finally, participants completed the demographic questions before being verbally debriefed and provided with a copy of the debriefing form.

Results Pilot Study

The data were examined for outliers, missing data, and normality. There were no troublesome outliers, and less than 5% missing data on all measures. To examine the assumptions for parametric statistics and normality, the dependent variables were checked for skewness, kurtosis, and normality in histograms and Q-Q plots. The dependent measures met the

assumptions for normality except for negative affect and the willingness-to-pay measure.

Negative affect was slightly positively skewed indicating participants were low on negative affect. Attempts were made to transform this variable to improve normality but this was not effective so this variable remained unaltered (the overall results in terms of statistical significance are consistent with non-parametric analysis as well). For the willingness-to-pay measure, some of the items had high skewness and kurtosis so they were transformed to improve normality but this was generally ineffective. I also examined the willingness-to-pay measure with non-parametric statistics. All results are the same (in terms of significance) so this variable also remained unaltered.

Trait Relationships

Table 1 displays the correlations between trait materialism, trait nature relatedness, and the aspirations. The materialism questionnaire was not separated into the three subscales due to the low reliabilities. REIVO correlated positively with nature relatedness (as hypothesized) suggesting people who feel connected to nature value intrinsic aspirations more than extrinsic aspirations. REIVO correlated negatively with materialism and extrinsic aspirations (this is not surprising considering REIVO is the relative importance placed on intrinsic goals after controlling for extrinsic goals). Raw extrinsic aspirations correlated positively with materialism and negatively with REIVO and nature relatedness (although this is marginally significant). Raw intrinsic and extrinsic aspirations correlated positively ($r = .37$), suggesting these goals might not be as strongly opposed to one another as hypothesized. Raw intrinsic aspirations were not significantly related to any trait measures. The correlation between raw intrinsic aspirations and REIVO ($r = .18$) is smaller than expected but may be a result of the small sample size. Surprisingly, materialism did not negatively correlate with raw intrinsic aspirations (although

there was a negative correlation with REIVO suggesting that as more importance is placed on intrinsic aspirations, materialism might become less important). Materialism was not negatively correlated with nature relatedness (contrary to hypothesis).

Table 1

Correlations between Measures for the Pilot Study

Variable	1.	2.	3.	4.
1. Materialism	—			
2. Trait nature relatedness	-.19	—		
3. REIVO	-.58**	.36*	—	
4. Raw Intrinsic	.05	.17	.18	—
5. Raw Extrinsic	.58**	-.25 [†]	-.85**	.37**

Note. REIVO = relative extrinsic versus intrinsic value orientation, high scores mean high intrinsic goals (after controlling for extrinsic goals). $N = 49$. [†] $p < .10$. * $p < .05$. ** $p < .01$.

State Effects

To test differences on state dependent measures between the built and nature condition, t-tests were performed. T-tests demonstrated no significant differences between the built and nature conditions in positive affect or negative affect. There were, however, significant differences in pleasant affect with the nature condition scoring higher (see Table 2). Participants in the nature condition felt significantly more connected to nature (INS) compared to the built condition.

Table 2

Affect and INS by Condition

Nature	Built
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Variable	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Positive affect	3.14 (0.73)	2.86 (0.82)	-1.25	.36
Negative affect	1.30 (0.43)	1.28 (0.38)	-0.14	.05
Pleasant affect	3.66 (0.92)	2.89 (0.80)	-3.13**	.89
INS	4.20 (1.47)	2.96 (1.37)	-3.06**	.87

Note. INS = inclusion of nature in self scale. $n = 24$ for built condition; $n = 25$ for nature condition. $df = 47$.

** $p < .01$.

Willingness-to-pay.

To analyze how much money participants were willing to pay for certain items a series of t-tests were performed between conditions. The scores are presented as z-scores for easier comparison because the amounts vary widely by item. As can be seen in Table 3, the amount of money participants were willing to pay for a luxury car was marginally different between conditions with the nature condition willing to pay less. The other willingness-to-pay items were not significantly different between conditions; although the means were generally in the hypothesized direction with the nature condition willing to pay less (except for the nature items).

Table 3

Willingness-to-Pay Items as Z-scores by Condition

	Nature	Built		
Item	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Watch	-.08 (.46)	.09 (1.36)	.59	.17
Ring	.03 (1.02)	-.03 (.99)	-.20	.06
House	-.13 (.26)	.14 (1.41)	.94	.27
Car	-.27 (.51)	.28 (1.29)	1.96 [†]	.56

Wine	.13 (.130)	-.13 (.54)	-.90	.26
iPhone	-.15 (.76)	.15 (1.20)	1.04	.30
Television	-.16 (.59)	.17 (1.29)	1.17	.39
Plant	.10 (1.11)	-.11 (.89)	-.73	.21
Plant 2	.04 (.85)	-.04 (1.15)	-.29	.08
Tree	.14 (1.40)	-.14 (.003)	-.99	.28

Note. $n = 24$ for the built condition; $n = 25$ for the nature condition. $df = 47$.

[†] $p < .10$.

Aspirations.

Participants' intrinsic and extrinsic aspirations were analyzed by condition and are displayed in Table 4. The first line is REIVO and the bottom two lines are the raw aspirations. The relative and the raw aspirations were not significantly different between the nature and built condition, although the means are in the hypothesized direction (nature condition higher on intrinsic aspirations and lower on extrinsic aspirations).

Table 4

Aspirations by Condition

	Nature	Built		
Aspiration	$M (SD)$	$M (SD)$	t	d
REIVO	1.40 (.66)	1.25 (.68)	-.76	.22
Raw Intrinsic	4.54 (.35)	4.45 (.41)	-.77	.24
Raw Extrinsic	3.14 (.72)	3.20 (.71)	.30	.08

Note. REIVO = relative extrinsic versus intrinsic value orientation. In these analyses, high scores mean high intrinsic goals (after controlling for extrinsic goals). $n = 24$ for built condition; $n = 25$ for nature condition. $df = 47$.

To further examine hypothesis four, INS was correlated with REIVO, raw intrinsic

aspirations, and raw extrinsic aspirations. INS significantly correlated with REIVO ($r = .41, p = .004$); significantly correlated with raw extrinsic aspirations ($r = -.38, p = .008$), but was not related to raw intrinsic aspirations ($r = .01, p = .92$). These correlations suggest that higher INS is related to lower extrinsic goals but not necessarily high intrinsic goals.

Open-ended questions.

The coding and results for the open-ended questions are presented in Appendix I. There were no specific hypotheses made about these questions because they were exploratory and the coding scheme was not developed until after reading the responses. Findings revealed little about materialism and nature (e.g., the findings focused on participants' desire for food/drinks or physical activity after the walks).

Pilot Study Discussion

The Pilot Study was conducted to test the idea that nature may decrease materialistic aspirations while also increasing affect and state nature relatedness (or INS). Cautiously interpreting these results due to the small sample size, the Pilot Study partially replicated the effect that nature exposure leads to increases in mood (i.e., feeling relaxed) and connection to nature in the moment (in past research nature exposure also led to increases in positive affect and decreases in negative affect e.g., Nisbet et al., 2011). Although the sample size is small, this result is consistent with past research (Mayer & Frantz, 2004; Mayer et al., 2009; Nisbet et al., 2009; Nisbet et al., 2011; Ryan et al., 2010; van den Berg et al., 2003). It may be the relationship between nature exposure with mood and connection to nature is fairly strong (e.g., $d = .89$ for pleasant affect) meaning a larger effect size is easier to detect with small sample sizes. This might explain why this relationship is significant here but not with other dependent measures. State nature relatedness was correlated with higher REIVO and lower extrinsic aspirations

suggesting the potential of nature relatedness for decreasing extrinsic or materialistic aspirations.

The nature condition was not significantly different from the built condition in aspirations. Overall these results are contrary to Weinstein et al.'s (2009) study that immersion in nature photographs lead to changes in both intrinsic and extrinsic aspirations. I did not measure immersion as Weinstein and colleagues did, but I used nature walks rather than nature photographs, which seem more immersive as a nature experience. A larger sample size may be needed to observe significant differences (e.g., Weinstein et al. 2009 had between 75 – 112 participants per study). Additionally, within-person comparisons would have more power to detect an effect, as in Weinstein et al. (2009) where participants completed the aspiration index before and after the nature manipulation. A post-hoc power analysis on the aspiration index revealed the observed power was at .23 for detecting a medium effect ($d = .5$) at .05 with a sample size of 49 participants. Ideally, power should be .80 (Tabachnick & Fidell, 2013). The relationship between nature exposure, REIVO, and materialism may still be present, but the sample size in this Pilot Study was not sufficient to detect it.

The willingness-to-pay measure did not reveal many significant findings. Again, power is likely an issue with this measure as well. However, it is also possible that the measure is not sensitive enough to detect momentary differences. There was high variability in responses; the skewness and kurtosis were higher too, making it again harder to find a true effect. Currently the literature does not have well-validated measures for examining state materialism, beyond the aspiration index, which is why this measure was created and piloted.

This study also demonstrated that trait nature relatedness is positively related to REIVO (higher intrinsic aspirations compared to extrinsic aspirations) and negatively related to raw extrinsic aspirations (although this was marginally significant). Broadly, these correlations are

consistent with Grouzet and colleagues' (2005) model of personal values and Schwartz's (1992) model of social values i.e., as importance on self-transcendence goals like unity with nature and protecting the environment increase, self-enhancement goals (e.g., money and fame) may decrease. As participants feel more connected to nature at the trait level, they may be less likely to place an overly high importance on material possessions (but again these results should be interpreted cautiously due to the small sample size). This finding is also similar with Mayer & Frantz (2004) who reported a negative relationship between trait nature connectedness and materialism (in the Pilot Study, materialism was not significantly correlated with nature relatedness; however, this correlation ($r = -.19$) is a small correlation even though it does not meet statistical significance; Cohen, 1992). It may be the small sample size does not have enough power to reliably detect statistical significance, however it is unclear which findings might be true findings and which might be a result of not having enough statistical power.

Raw intrinsic and raw extrinsic aspirations were positively correlated (contrary to hypotheses). This positive correlation may be problematic as this was one of the proposed mechanisms of how nature could increase intrinsic aspirations to subsequently decrease extrinsic aspirations (this seems to rely on the aspirations being negatively related). However, extrinsic aspirations are only hypothesized to be detrimental for well-being if participants value them more than intrinsic aspirations-this is why computing the relative indices can be helpful. Kasser and Ryan (1996) also reported that raw intrinsic and extrinsic aspirations were positively correlated ($r = .20 - .23$), but when factor analyses were applied to the intrinsic and extrinsic aspirations, they load onto two distinct factors. This suggests that the aspirations are distinct and measure unique aspects of goals but they might not be as opposed as hypothesized. The correlations between subscales in the Pilot Study (see Appendix S) generally demonstrate that

the intrinsic aspirations are more related to each other than to extrinsic aspirations, and extrinsic aspirations are generally more related to each other than to intrinsic aspirations. Alternatively, it could be the small sample size in the Pilot Study that inflated the correlation between intrinsic and extrinsic goals (the correlation in the Pilot Study is larger compared to Kasser & Ryan, 1996). When Kasser and colleagues tested the structure of these aspirations there were 83-100 participants (Kasser & Ryan, 1996; Schmuck, Kasser, & Ryan, 2000). Finally, it might also be that students experienced acquiescence bias and thought all goals were important (i.e., there are no reverse scored aspirations so participants might have been more likely to mark all goals are important to them). Again, this suggests the relative aspirations may be more useful because the aspirations that are most important to the participant are easier to observe.

Overall, the results from the Pilot Study are mixed and more difficult to interpret because the study is underpowered. This study suggests nature exposure and materialistic aspirations may be related (correlations at the trait level and means in the hypothesized direction). Data collection for studies taking place outdoors is limited (i.e., this study could only collect usable data on days in September, October, and some of November where there was no rain). Cohen (1992) suggests that to detect a medium effect ($d = .5$) between two samples at $\alpha = .05$, a sample size of 128 participants is required. This study only had 49 participants overall meaning all significant and insignificant results should be interpreted cautiously as p-values can change drastically. For instance, Cumming (2014) demonstrated the *dance of the p-values*, which simulates how much p-values can vary even with the same study parameters but with a different random sample. Using two independent groups with $n = 32$ per group, $d = .5$, statistical power = .5, and replicating this 25 times lead to the p-values fluctuating from .001 to .75. Therefore, the null results may be true, but they may also be uninformative because of the small chance of detecting

a true effect (and vice versa with significant findings). Therefore, from the Pilot Study, there is useful information in terms of how participants responded to new measures, but for the remaining studies, I collected an overall sample size of approximately 120 (this sample size satisfies recommendations from Cohen, 1992; Soper, 2006; Simmons, Nelson, Simonsohn, 2013).

Study 1

Based on the Pilot Study, Study 1 was designed with the expectation that a larger sample size might be collected to assess the relationship between nature exposure and materialistic aspirations. As in the Pilot Study, the experimental manipulation was walking outdoors in nature (without any mindfulness instructions for this study), compared to walking indoors in a built environment. However, one of the measures was changed. Instead of using the willingness-to-pay measure as the Pilot Study (which had high skewness and kurtosis), a windfall measure where participants allocated money to various causes was employed. The aspiration index was retained in Study 1 as it is a validated and a flexible measure to use (Grouzet et al., 2005; Kasser, 2002) compared to the willingness-to-pay questionnaire. The mood questionnaire (PANAS) and state nature relatedness (INS) were also retained for this study. The trait personality questionnaires were not measured in Study 1 to keep the study short.

Hypotheses

Hypothesis one. Participants in the nature condition would experience positive changes in mood and feel more connected to nature compared to participants in the built condition.

Hypothesis two. Participants in the nature condition would judge intrinsic goals as more important compared to participants in the built condition. Participants in the built condition would judge extrinsic goals as more important compared to participants in the nature condition.

Again, I present the relative and raw aspirations.

Hypothesis three. Participants in the nature condition would allocate less money to themselves and more money to others compared to participants in the built condition.

Hypothesis four. State nature relatedness would mediate the relationship between condition and aspirations.

Method Study 1

Participants

One hundred eighty-three students were recruited for the study “walking, mood, and attitudes” for course credit. Of these participants, 24 were excluded because it was raining at the time of the experiment (these participants were purposely assigned to the built condition so that they would still experience what it was like to be a participant in a psychology study), 3 participants did not sign a secondary consent form to have their data used at the end of the study, and 9 participants were excluded either due to an interruption in procedure or error. This left 147 participants whose data was entered for analyses. Participants ranged in age from 17 to 49 ($M = 19.75$, $SD = 4.57$) and 66% were in their first academic year. The majority of the sample was female (73%). The majority of participants reported that they grew up in a city (62%), while 24% grew up in a small town, and 11% grew up in a rural area or on a farm. Many participants (48%) reported that they presently live in a city, 33% reported that they live in residence, and 11% reported that they live in a small town (5% currently live on a farm/rural area). Participants reported a breadth of majors; the largest categories were Criminology (15%) and Psychology (14%).

The participants were recruited through the Psychology Department’s online sign-up system (SONA). Similar to the Pilot Study, the researcher met participants in the bottom of the

psychology building and completed either a walk through the campus tunnels (built condition) or a walk outdoors (nature condition). Data collection for this study began in the fall semester of 2014 (47 participants with usable data), and was completed in the fall semester of 2015 (100 participants with usable data). This sample size means statistical power was at .80 to detect a medium effect size ($d = .50$; Cohen, 1992; this satisfies the recommendations by Soper, 2006 and Simmons et al., 2013).

Materials

Walking routes. The following two walking routes were used: the same inside, built environment as the Pilot Study and an outdoor, natural environment which was different than the Pilot Study. For this study, participants in the nature condition walked on a path along a river adjacent to the university campus that leads to an arboretum, which contained many diverse plants and trees. This route was changed because there are less roads and traffic compared to the route in the pilot study. In both conditions, participants were instructed to focus on the environmental surroundings and refrain from talking. The walking routes lasted between 17 - 20 minutes.

Positive and negative affect schedule (PANAS; Watson et al., 1988). Similar to the Pilot Study, a 20-item questionnaire that measured high arousal positive affect ($\alpha = .87$) and negative affect ($\alpha = .76$) was used. Again, there were 6 items to assess low arousal positive affect or pleasant affect (how content, in awe, peaceful, fascinated, curious, relaxed participants felt, $\alpha = .84$). I also added 6 items from Ryan and Frederick (1997) to assess vitality that were not included in the Pilot Study (how alive and vital, full of energy and spirit, alert and awake, so alive I want to burst, looking forward to each new day, and energized participants felt, $\alpha = .86$). Participants were asked to indicate how much they feel this way in the moment on a scale of 1

(very slightly) to 5 (extremely). See Appendix J for the PANAS.

Aspiration index (Grouzet et al. 2005). In the Pilot Study the full measure of the aspiration index was used; in Study 1 an abbreviated 24-item measure that assessed individuals' aspirations was used. Although this scale is abbreviated, it measures more aspirations than the aspiration index used in the Pilot Study. This scale measures 12 goal domains from Grouzet et al. (2005) compared to the Pilot Study which only measured intrinsic and extrinsic aspirations. This means that the aspirations are presented differently in the results section. In the Pilot Study, the relative importance of goals was calculated by subtracting extrinsic goals from intrinsic goals (i.e., REIVO). In Study 1, there were 12 goal domains measured so intrinsic and extrinsic aspirations can be subtracted from the overall importance of all 12 goals measured to get a relative intrinsic score and a relative extrinsic score. This method of scoring would have been redundant in the Pilot Study as the relative intrinsic and relative extrinsic would be mirror images of one another. I still present the raw intrinsic and raw extrinsic aspirations in Study 1. Participants rated how important each item is to them on a scale of 1 (not at all important) to 9 (very important). A sample item from community feeling is "You will donate time or money to charity." The intrinsic aspiration items were 2 questions from each of the following: affiliation, community feeling, self-acceptance, and health ($\alpha = .73$). The extrinsic aspiration items were 2 questions from each of the following: popularity, image, and money ($\alpha = .80$). Only intrinsic and extrinsic aspirations are presented in the results (the other goal domains were measured so that the relative indices could be calculated). See Appendix K for the aspiration index.

Windfall (Richins & Dawson, 1992). Participants were asked to imagine they unexpectedly received \$20,000 and could choose how to spend the money. There were six categories: buy things I want or need, give to church organization or charity, give or lend to

friends or relatives, travel, pay off debts, savings or investment, other. This measure has been used to find differences between high and low trait materialism (Richins & Dawson, 1992). See Appendix L for this measure.

Inclusion of nature in self-scale (INS; Schultz, 2002). This single item measured how connected to nature participants felt at the *state* level (same as in the Pilot Study). Participants also completed the distractor questions (how connected they feel to family, friends, etc.). See Appendix F for the INS.

General information. At the end of the study, participants were asked a series of demographic questions to understand more about the participants (e.g., their year of study, age, sex, and major). See Appendix G (except the liberal versus conservative questions were removed from the Pilot Study).

Procedure

Participants were tested in groups ranging from 1 to 5 participants. A researcher randomly assigned the group of participants to the built or nature condition before the study began. Participants met in the bottom of the psychology building where the researcher held up a sign “walking, mood, and attitudes.” After providing informed consent, the researcher lead participants on an inside walk through a built environment or a nature walk. After the walk, participants were asked to complete the positive and negative affect schedule, the aspiration index and the windfall measure. Participants also completed a self-esteem measure⁵ and then the

⁵ As an exploratory measure, participants completed a self-esteem measure (Heatherton & Polivy, 1991). An example item is “I feel self-conscious.” Participants were asked how they felt right now and responded on a Likert scale from 1 (strongly disagree) – 9 (strongly agree). This 20-item scale has been found to be sensitive enough to find differences in experimental priming studies such as giving false negative feedback. This was included to explore Kasser’s (2002) idea that insecurity causes materialism. See Appendix M for this questionnaire.

inclusion of nature in self-scale. Finally, participants completed the demographic questions before being debriefed.

Results Study 1

The data were examined for normality, outliers, and missing data. Negative affect and the windfall measures were high on skewness and kurtosis. I experimented with transforming these measures and analyzing them with non-parametric statistics (all results were the same in terms of statistical significance), so these measures remained unchanged in analyses. All other dependent measures met the assumptions for parametric statistics and there were no troublesome outliers or missing data.

T-tests were performed to test the hypothesis that participants in the nature condition would experience positive changes in mood and feel more connected to nature, compared to the built environment. There were no significant differences between the built and nature condition in negative affect, although the means are in the expected direction (see Table 5). The nature condition scored significantly higher in positive affect, pleasant affect and vitality, compared to the built condition. Participants in the nature condition also felt more connected to nature compared to the built condition (see Table 5). These results generally support the first hypothesis that exposure to nature leads to higher feelings of connection to nature and positive changes in mood (with the exception of lower negative affect).

Table 5

Affect and INS by Condition

	Nature	Built		
Variable	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Positive Affect	3.13 (.65)	2.55 (.69)	5.24**	.87

Negative Affect	1.27 (.37)	1.35 (.41)	-1.19	.20
Pleasant Affect	3.66 (.76)	2.66 (.77)	7.88**	1.31
Vitality	3.35 (.75)	2.71 (.82)	4.93**	.81
INS	4.64 (1.61)	3.25 (1.39)	5.62**	.92

Note. INS = inclusion of nature in self scale. $n = 69$ for nature condition for affect and vitality; $n = 77$ for built condition for affect and vitality. The sample size for INS was, $n = 70$ for nature condition, and $n = 76$ for built condition. $df = 144$.

** $p < .01$.

For the aspiration index (hypothesis 2), the relative and raw aspirations are presented in Table 6. There were no significant differences between conditions in extrinsic or intrinsic aspirations regardless of how the aspirations were scored. The means for intrinsic aspirations are in the hypothesized direction (i.e., the nature condition is higher in overall intrinsic goals compared to the built condition. However, the means for extrinsic goals vary depending on how they were scored). For relative extrinsic aspirations, the nature condition is lower compared to the built condition. But for raw extrinsic aspirations, the means are in the opposite direction than hypothesized (e.g., the nature condition is higher in the extrinsic goals compared to the built condition). The nature condition may have been more likely to rate both intrinsic and extrinsic goals as important to them (i.e., acquiescence bias) but the intrinsic goals ($M = 7.33$) were rated as overall higher than extrinsic goals ($M = 5.48$) which resulted in higher *relative intrinsic goals* (also these means are not *significantly* different between conditions). However, it should also be noted that the means for raw intrinsic goals across conditions are much higher than for raw extrinsic goals. In other words, participants in both conditions seemed to value intrinsic goals more than extrinsic goals.

Table 6*Aspirations by Condition⁶*

	Nature	Built		
Aspiration	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Relative Intrinsic Goals	.80 (.62)	.74 (.69)	.51	.09
Relative Extrinsic Goals	-1.11 (1.01)	-1.03 (1.06)	-.47	.08
Raw Intrinsic Goals	7.39 (.92)	7.19 (.88)	1.29	.22
Raw Extrinsic Goals	5.48 (1.51)	5.43 (1.42)	.24	.03

Note. For the nature condition $n = 70$, for the built condition, $n = 77$. $df = 145$.

The relative intrinsic and extrinsic goals were negatively correlated ($r = -.69, p < .001, N = 147$) as expected. The raw intrinsic and extrinsic goals were weakly related ($r = .19, p = .02, N = 147$) suggesting intrinsic and extrinsic goals may be less related than presented in the Pilot Study. I correlated state nature relatedness (INS) to raw and relative goals. State nature relatedness was positively correlated with relative intrinsic aspirations ($r = .30, p < .001, N = 146$) and negatively correlated to relative extrinsic aspirations ($r = -.29, p < .001, N = 146$). State nature relatedness was positively correlated with raw intrinsic aspirations ($r = .29, p < .001, N = 146$) and negatively correlated (marginally) to raw extrinsic aspirations ($r = -.16, p = .06, N = 146$). This suggests that as state nature relatedness increases, participants may be less likely to place an overly high importance on materialistic aspirations and more likely to place importance on intrinsic aspirations.

⁶ Controlling for how participants travelled across campus to the study (indoor, built route compared to outdoor route) did not change the relationship between condition and relative intrinsic aspirations ($F(1, 143) = .25, p = .62$) or relative extrinsic aspirations ($F(1, 143) = .07, p = .79$).

To further understand the aspirations, I examined where participants grew up and if this was related to the relative aspirations. Participants who grew up in the city reported lower intrinsic aspirations ($M = .66$, $SD = .66$, $n = 92$) compared to participants who grew up on a farm, rural area, or small town ($M = .97$, $SD = .64$, $n = 51$; $t(141) = 2.74$, $p = .007$). Participants who grew up in the city reported higher extrinsic aspirations ($M = -.92$, $SD = .97$, $n = 92$) compared to participants who grew up on a farm, rural area, or small town ($M = -1.32$, $SD = .110$, $n = 51$; $t(141) = 2.24$, $p = .03$). This suggests that participants who grow up outside of a city, with presumably more nature, might have higher intrinsic aspirations and lower extrinsic aspirations.

For hypothesis 3, I proposed that participants in the nature condition, compared to participants in the built condition, would allocate less money to themselves and more money to others in the windfall task. There was one significant difference in the windfall task (see Table 7). Participants in the built condition allocated more money to travelling (there was not a hypothesis about the travel category). Participants in the nature and built conditions allocated similar amounts of money in the other categories, although the means are in the expected direction. For example, participants in the nature group allocated less money to buy stuff they wanted or needed compared to the built condition. The nature condition also allocated more money to the church/charity and to friends/relatives compared to the built condition (but not significantly more). The other categories (pay off debts, and savings/investment) did not have a specific hypothesis or direction of relationship proposed.

Table 7

Windfall by Condition

Nature	Built
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Variable	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Buy stuff I want or need	2,234.29(1,855.42)	2,779.87(2,796.55)	-1.41	.23
Give to church or charity	1,735.71(1,906.11)	1,410.39(1,575.10)	1.13	.19
Give or lend to friends/relatives	2,183.86(2,748.46)	1,784.42(2,105.39)	.99	.16
Travel	2,831.86(2,132.33)*	3,805.19(2,931.40)*	-2.32	.38
Pay off debts	4,334.29(4,217.25)	4,140.26(4,191.64)	.28	.05
Savings or investment	5,320.00(4,296.97)	5,409.09(4,078.77)	-.13	.02
Other	941.43(1,946.27)	604.55(1,085.13)	1.31	.21

Note. $n = 70$ for nature condition and $n = 77$ for built condition. $df = 105.84-145$.

* $p < .05$.

For hypothesis 4, I proposed that state nature relatedness (INS) would mediate the relationship between condition and aspirations. According to Baron and Kenny (1986), these results would not meet the conditions for mediation because the nature/built condition was not significantly related to aspirations (hypothesis 2). However, researchers (e.g., MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Preacher & Hayes, 2004; Shrout & Bolger, 2002) still recommend testing the indirect effect (i.e., if state nature relatedness is related to aspirations). Some researchers refer to this as testing the indirect effect, not mediation, to reflect the absence of a direct path or total path to mediate (see Hayes, 2009). Testing the indirect effect allows researchers to test alternative paths that may be occurring between X and Y. For example, there could be two variables (e.g., mediators) occurring in opposite directions that cancel out each other when tested with a t-test, but there could still be a significant indirect effect (Hayes, 2009). Based on this argument, the indirect effect was tested for Study 1 using the PROCESS macro for SPSS from Hayes (2013). The indirect path is considered significant if the confidence

interval does not include zero. State nature relatedness was a significant indirect pathway between condition and relative intrinsic aspirations with 5000 bootstrapping resamples ($M = -.19$, $SE = .06$, 95% CI $-.33, -.08$). State nature relatedness was also a significant indirect pathway between condition and relative extrinsic aspirations with 5000 bootstrapping resamples ($M = .29$, $SE = .10$, 95% CI $.12, .52$).⁷ This significant finding suggests that state nature relatedness seems to (partly) explain the participants' aspirations (see Figure 3). The more connected to nature participants felt, the higher their intrinsic goals and lower their extrinsic goals were (i.e., nature might change aspirations through state nature relatedness).

Figure 3. Significant indirect effect of state nature relatedness between nature exposure and higher intrinsic aspirations and lower extrinsic aspirations.

Study 1 Discussion

Overall the results of Study 1 support the idea that nature can lead to positive changes in affect and state nature relatedness. However, nature did not lead to differences in aspirations or how participants allocated money (except for the travel question). These findings generally do not replicate the Weinstein et al. (2009) study, which found that brief exposures to nature increased intrinsic aspirations, and decreased extrinsic aspirations. As discussed in the Pilot

⁷ State nature relatedness was also a significant indirect path between condition and raw intrinsic aspirations ($M = -.23$, $SE = .08$, 95% CI $-.42, -.10$), and raw extrinsic aspirations ($M = .25$, $SE = .13$, 95% CI $.03, .54$) with 5000 bootstrapping resamples.

Study, Weinstein et al. (2009) assessed change in aspirations by having participants complete the aspirations before and after viewing the photographs (a within-subjects design). This means the statistical power in the Weinstein et al. (2009) was higher compared to the between-subjects design used in Study 1. Although the effect size is unclear in Weinstein et al.'s (2009) statistical analyses (they conducted a moderated mediation), I assumed a medium effect size ($d = .5$) based on their sample sizes (between 75 – 112 participants per study), but it may be that the relationship between nature and aspirations is a small effect size. Using Cohen (1992) recommendations, I would need 393 participants in each condition to reliably detect a small effect size ($d = .20$) at $\alpha = .05$. However, this seems like an unfeasible study to conduct in Canada when the walks can only be completed for a few months out of the year. It is possible that nature exposure increases intrinsic aspirations and decreases extrinsic aspirations, but this study did not have enough statistical power to detect this small effect. Weinstein and colleagues (2009) also measured immersion in nature and found this to be a significant moderator. Immersion was not measured in Study 1, as it was assumed the nature walks were more immersive than the nature photographs Weinstein et al. (2009) used and therefore, less relevant to control for. However, this may have been an incorrect assumption.

Relative intrinsic and extrinsic aspirations were negatively related and the raw intrinsic and extrinsic aspirations were weakly positively correlated. This is more supportive of hypotheses and the theoretical structures as proposed by (Grouzet et al., 2005; Schwartz, 1992) compared to the Pilot Study where the raw aspirations correlated more substantially ($r = .37$). Perhaps it was the small sample size that inflated the correlation between the raw aspirations in the Pilot Study (usually the correlation is small, $r = .20$; Kasser and Ryan, 1996). Alternatively, it might be the slightly different version of the aspiration index that was used in Study 1. In the

Pilot Study, only extrinsic and intrinsic aspirations were included compared to Study 1, where intrinsic and extrinsic aspirations were included along with savings, conformity, spirituality, hedonism, and safety aspirations. This means that when the aspirations are being scored, there is a more complete picture of participants' goals to then compute the relative aspirations.

Study 1 generally did not support the idea that nature would lead to more other-focused spending and less self-focused spending. Participants in the nature group spent similar amounts of money on themselves compared to the built condition, although the means are in the hypothesized direction. It is interesting that participants in the built condition allocated more money to travelling. This could be interpreted as more money spent on themselves, and therefore more self-focused spending (although it is also possible they intended to take friends or family). Richins and Dawson (1992) found that individuals high on materialism spent less money travelling, compared to individuals lower on materialism. This means travelling could be an indicator of lower materialism in the moment. From an environmental view, travelling can be harmful to the environment (e.g., flying, staying in hotels), although we do not have details on how the participants wished to travel (maybe they wanted to camp in the wilderness). Perhaps, students in the nature condition felt like they 'got away' more than the built group (according to ART, getting away is a needed element to feel cognitively restored). This might explain why participants in the built condition felt like they wanted to travel. Alternatively, the travelling result might be a false positive finding with a small sample size, future research would need to replicate this. In the original validation of this measure, Richins and Dawson (1992) used the windfall measure to examine trait level differences. It may be this measure can reliably detect differences between trait variables but is not sensitive enough to detect in-the-moment differences for most of the categories. It may also be that the windfall task is not a reliable way

to measure materialism. As explained in the introduction, there is not a well-validated measure to assess in-the-moment materialism (aside from the aspiration index).

Study 1 replicated the finding that walks in nature lead to greater feelings of joy, peace, vitality, and nature relatedness; supporting the idea nature can (at least temporarily) lead to increases in mood (Mayer & Frantz, 2004; Mayer et al., 2009; Nisbet et al., 2009; Nisbet et al., 2011; Ryan et al., 2010; van den Berg et al., 2003). The effect sizes for differences in affect are larger in this study compared to the effect sizes for aspirations; this may explain why the mood results replicated past studies and the aspirations did not. Within the PANAS measure, negative affect was the only subscale that did not differ between conditions (although the means were in the hypothesized direction). This difference may not be significant in this study because the negative affect means for the nature and built conditions were both low (1.27 and 1.35 respectively) on a 5-point scale. If all participants were lower on negative affect (i.e., a floor effect), finding a significant difference between nature and the built condition is less likely without a larger sample and more statistical power, compared to the positive affect finding that was a larger effect size ($d = .87$). It may also be that the relationship between nature exposure and a decrease in negative affect is a smaller effect size (even without a floor effect), which means I would again need more statistical power (larger sample size) to reliably detect. This is consistent with a past meta-analysis conducted by McMahan and Estes (2015), which found that the relationship between nature exposure and a decrease in negative affect was a smaller effect size compared to the relationship between nature exposure and an increase in positive affect.

There was a significant indirect path between nature exposure and aspirations through state nature relatedness. This significant indirect effect suggests that nature relatedness partly explains participants' judgments of aspirations; however, causality is difficult to infer here as the

manipulation did not affect the outcome. There may be a suppressor variable, which is why the relationship between nature and aspirations was not significant, but the indirect effect was significant. It is difficult to know what this variable could be (e.g., terror management theory might predict that having people spend time in nature increases people's awareness of their own death; Greenberg et al., 1990). This could potentially limit the benefits of nature and explains why we do not see a significant relationship between nature and aspirations, but the indirect effect of nature relatedness is significant because of the unique variance between nature relatedness and aspirations. Alternatively, it may be that participants' state nature relatedness does not entirely depend on immediate prior nature contact. Stated another way, feeling connected to nature is more important than physically being in nature for predicting aspirations (the correlations from Study 1 support this idea). This is also consistent with the negative correlation reported between trait nature relatedness and materialism (Mayer & Frantz, 2004). So as long as participants feel connected to nature (regardless of nature exposure), they may judge intrinsic aspirations as more important and extrinsic aspirations as less important. In statistical terms, the relationship between M (nature relatedness) and Y (aspirations) is more related than the relationship between X (nature contact) and Y (aspirations). This aligns with the idea that feeling connected to nature may be satisfying for participants (based on self-determination theory) and may encourage participants to act in a way that further meets their psychological needs and align with intrinsic aspirations. However, these are all speculative reasons that should be cautiously interpreted. In other words, this significant indirect effect may not be a true finding, it would need to be replicated in future studies before it was widely accepted.

Study 2

Similar to the previous studies, Study 2 examined if nature exposure could decrease

momentary desires for material goods and extrinsic aspirations while increasing intrinsic aspirations. To accomplish this goal, Study 2 used photographs rather than walks to attain a larger sample size that was not dependent on weather, as in the first two studies. Using photographs of many different nature areas also increases the generalizability to the study design because the nature photos are a collection of nature areas rather than one type of nature (i.e., a specific walking path which can lead to limited stimulus sampling; Wells & Windschitl, 1999). This study sought to extend the previous studies by examining if nature exposure could decrease participants' desire for material products after viewing the advertisements for these products. To accomplish this, a 2 X 2 research design was utilized. The first independent variable was whether participants viewed advertisements of luxury goods (advertisement condition) or not (no advertisement condition). The advertisements were photographs of luxury items that were designed to increase materialism (similar to Bauer et al., 2012). The second independent variable was whether participants viewed photographs of built environments (built condition) or photographs of natural environments (nature condition). After these photographs, all participants indicated how much they would like to buy the luxury products (called materialistic desires). Participants then completed a mood measure, a state nature relatedness question (INS), the aspiration index, and an environmental concern measure.

Hypotheses

Hypothesis one. Intrinsic and extrinsic aspirations will correlate negatively with each other because they are theoretically in opposition (this is less likely to be true for the raw aspirations given the first two studies). I will also test if materialistic desires and concern for the environment are negatively correlated. This is based on Schwartz (1992) and Grouzet et al. (2005) circumplex models that materialism and environmental concern are negatively related,

and that intrinsic and extrinsic aspirations are negatively related (both REIVO and the raw aspirations are presented).

Hypothesis two. I predict a main effect of environment (nature or built photos) on aspirations and materialistic desires such that participants who viewed the nature photographs will have lower extrinsic aspirations, lower materialistic desires, and higher intrinsic aspirations. This hypothesis is attempting to replicate Weinstein et al.'s (2009) finding that immersion in nature photographs, compared to built photographs, can increase intrinsic aspirations while decreasing extrinsic aspirations. I also predict a main effect of advertisements (advertisements versus no advertisements) such that participants who were not previously exposed to advertisements will have lower extrinsic and materialistic desires (and higher intrinsic aspirations). This is replicating Bauer et al. (2012) that exposure to luxury advertisements will increase materialistic desires and extrinsic aspirations. I will attempt to extend Bauer et al. (2012) by examining if nature photographs, compared to built photographs, can decrease materialistic desires and extrinsic aspirations in the moment. I do not hypothesize an interaction between environmental condition and advertisements on materialistic desires or aspirations.

Hypothesis three. I predict a main effect of environment (nature or built photos) on state variables (mood and nature relatedness), such that participants who viewed the nature photographs would have higher nature relatedness and positive mood. I predict a main effect of advertisements (advertisements versus no advertisements) such that participants who were not previously exposed to advertisements would have higher nature relatedness and positive mood. Stated another way, participants who were exposed to the advertisements and the built condition will have lower nature relatedness scores and positive affect. As in hypothesis three, environmental condition and advertisement condition will not interact.

Hypothesis four. I predict a main effect of environment (nature or built photos) on environmental concern such that participants who viewed the nature photographs, compared to built photographs, will have higher biospheric and altruistic environmental concern and lower egoistic environmental concern. I predict a main effect of advertisements (advertisements versus no advertisements) such that participants who were not previously exposed to advertisements will have higher biospheric and altruistic environmental concern and lower egoistic environmental concern. Stated another way, participants exposed to advertisements and the built photographs will have lower biospheric and altruistic environmental concern (and higher egoistic concern). Again, environmental condition and advertisement condition will not interact.

Hypothesis five. State nature relatedness will mediate the relationship between environmental condition and desire for material items. State nature relatedness will also mediate the relationship between environmental condition and environmental concern. If there are no significant between group differences, then the indirect pathway will be tested (similar to Study 1).

Method Study 2

Participants

Five hundred and thirty students completed the study called ‘effects of viewing photographs’ on decision-making and mood. The participants were recruited through Carleton University’s online sign up system (SONA) and redirected to Qualtrics where they completed the study online. In exchange for participating (45 minutes of their time), students were granted half a credit towards their introductory psychology final grade. Of the students who completed the study, I deleted participants who spent less than ten minutes (if they were in the advertisement condition) and deleted participant responses who spent less than five minutes (if they were in the

no advertisement condition). I adjusted the cut offs between these two conditions because in the advertisement condition, participants saw additional photos (there were 13 photos that were displayed for at least 15 seconds each). Based on these cut-offs, I deleted 11 participants, $N = 519$. I deleted three respondents whose data was almost all blanks. I then deleted participants who did not pass the compliance checks (e.g., please leave this question blank, 35 participants deleted). Finally, I deleted participants who were high on string responding (eight people deleted), so that my final $N = 473$ ⁸. This final sample size of 473 participants with four conditions means power = .80, at $p < .05$ to detect a medium effect size ($d = .25$; Cohen, 1992). This number also meets the 50 participants per condition recommendation by Simmons et al. (2013).

Participants were mostly females (70%), and in their first year of study (56%). Ages ranged from 17 – 55 years ($M = 19.58$, $SD = 3.33$). The majority of participants reported that they grew up in a city (60%), while 25% grew up in a small town, and 12% grew up in a rural area or on a farm. The majority of participants (61%) reported that they presently live in a city, 27% reported that they live in residence, and 9% reported that they lived in a small town (3% currently live on a farm/rural area). Participants reported a breadth of majors; the largest category was Psychology (23%).

Materials

Advertisements for material goods (Bauer, Wilkie, Kim, & Bodenhausen, 2012).

Participants viewed a set of 13 advertisements for material goods. These advertisements were photographs of luxury goods that were separate for females (e.g., jewelry, clothing) and males

⁸ A stricter cut-off was also imposed where participants who spent less than 4 seconds viewing each photograph of built or nature were excluded (74 participants excluded, final $N = 400$), the results remained similar so the larger sample size was retained for analyses.

(e.g., electronics, cars). Participants viewed these on computer screens with all images standardized in size (see Appendix N for women and Appendix O for men advertisements). Each image was displayed for 30 seconds. These advertisements were replaced with updated advertisements (i.e., the newest iPhone model updated the iPhone Bauer and colleagues used in 2012).

Photographs (van der Wal, Schade, Krabbendam, & van vugt, 2013). Participants were shown 6 photographs of either a built environment or a natural environment. A script, appearing above the photographs, was used to encourage participants to immerse themselves in the photographs. Specifically, participants were asked to “Imagine yourself in this place. Look around, noticing all aspects of your environment. Pay attention to the color. Notice the textures. Imagine yourself breathing in the air; notice any smells that may be present. Imagine any sounds you may hear. Let yourself take in all the aspects of the environment in front of you” (Weinstein et al., 2009). The built photographs were a variety of images, from city streets to back alleys. The nature photographs also had a wide range of images, from forests to farmland (see Appendix P for the photographs). There was no timer set for how long participants had to view each image, instead a list of ratings (e.g., how likeable, pleasant) were asked for each photograph to further encourage participants to immerse themselves in the photographs.

Desire for material items. All participants were asked a question to assess how much they wanted the luxury items from Bauer et al. (2012). The question was: How much do you want the item? This was scored on a scale of 1 (very little) – 7 (very much). The reliabilities were acceptable, $\alpha = .86$ for females, and $\alpha = .84$ for males ($\alpha = .85$ overall). The results were similar between men and women so these are presented as an overall category (i.e., with men and women combined).

Inclusion of nature in self-scale (INS; Schultz, 2002). This single item measures how connected to nature participants felt at the *state* level (same as in the Pilot Study & Study 1, see Appendix F for the INS). Participants were also asked a few distractor questions (how connected do you feel to your friends, family, etc.).

Positive and negative affect schedule (PANAS; Watson et al., 1988). This measure is the same as the PANAS used in Study 1 (with questions assessing pleasant affect and vitality added in, see Appendix J). The reliability of this scale in this study was acceptable, negative affect, $\alpha = .89$; positive affect, $\alpha = .90$; pleasant affect, $\alpha = .76$; vitality, $\alpha = .89$.

Aspiration index (Kasser & Ryan, 1996). This 42-item measure assessed individuals' goals in life, specifically, their intrinsic and extrinsic aspirations (same as the Pilot Study. See Appendix C for the aspiration index). The reliability of this index was acceptable, overall intrinsic goals, $\alpha = .89$; overall extrinsic goals, $\alpha = .92$. The raw aspirations and REIVO are presented (not the relative intrinsic and relative extrinsic aspirations as they would be mirrors of each other again).

Environmental concern (Schultz, 2001). This scale measures participants' concern for the environment and how this might affect other living entities. Specifically, participants were asked, "How much they are concerned about environmental problems because of the consequences for ..." There were 12 responses that participants indicated on a scale of 1 (not important) – 7 (supreme importance). Each of these 12 responses fit into one of the following three subscales: egoistic (how the environment affects me personally, e.g., me, my health, my future, my lifestyle, $\alpha = .90$), altruistic (how the environment affects other people, e.g., all people, children, people in my community, and my children, $\alpha = .85$), and biospheric (how the environment affects all living entities, e.g., plants, marine life, birds, animals, $\alpha = .91$). The

biopspheric subscale correlates significantly with environmental behaviour, nature relatedness, empathy, and perspective taking. The altruistic subscale correlates with perspective taking, empathetic concern, and nature relatedness. The egoistic subscale does not significantly correlate with any of the above variables. See Appendix Q for the environmental concern measure.

General information. At the end of the study, participants were asked a series of demographic questions (e.g., their year of study, age, and sex). Similar to Study 1, the liberal versus conservative questions were removed. See Appendix G for the demographic questions.

Procedure

Participants completed the study online. After providing informed consent, half of the participants were randomly assigned to view photographs of the material items (advertisement condition) before viewing and rating the photographs of the built or natural environments (environmental condition). The other half of the participants were not assigned to view the material or luxury items (no advertisement condition) at the beginning of the study, instead they started the study by viewing and rating either the built or natural environments (environmental condition). This was done to examine if nature can restore or decrease the effect of advertisements on extrinsic aspirations (as Bauer et al., 2012 demonstrated). After viewing the natural or built photographs, all participants were asked how much they wanted the material items (materialistic desires), and subsequently completed the aspiration index, a mood measure (PANAS), how connected they felt to nature (INS), and the environmental concern measure. Finally, participants completed the demographic questions before the online debriefing.

Results Study 2

The data were examined for normality, outliers, and missing data. There were no troublesome outliers and less than 5% missing data on all measures. The assumptions for

parametric statistics were met for all variables except the environmental concern measure and negative affect. For the environmental concern measure, the data were negatively skewed, but for negative affect, the data was positively skewed. I attempted to transform this data but this did not improve normality. I conducted the environmental concern analyses with non-parametric tests; the results are consistent so the parametric results are reported below.

Although I did not make any specific hypotheses about the photo ratings, I present the means, standard deviations, and t-test results in Table 8. Participants rated the nature photos higher on all positive qualities (e.g., relaxing, enjoyable), compared to the built photos. Participants also rated the nature photos higher on familiarity and whether the photo looked like a place they had been before, compared to the built photos. This is somewhat odd as the nature and built photographs are not from Ottawa and have few landmarks that most participants would be able to identify. However, the nature photographs appear that they *could* be from Ottawa as there are no obvious landmarks from other cities or countries.

Table 8

Study 2 Photograph Ratings by Condition

	Nature	Built		
Variable	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Like	3.71 (.70)	2.51 (.63)	-19.53***	1.80
Pleasant	3.71 (.69)	2.47 (.62)	-20.64***	1.89
Enjoyable	3.63 (.73)	2.41 (.65)	-19.08***	1.76
Relaxing	3.69 (.74)	2.13 (.69)	-23.65***	2.18
Interesting	3.35 (.74)	2.71 (.69)	-9.84***	.89
Attractive	3.50 (.71)	2.45 (.64)	-17.01***	1.55

Curious	2.97 (.88)	2.74 (.76)	-3.09***	.28
Awe	2.84 (.88)	1.91 (.69)	-12.82***	1.17
Place Been	2.71 (1.04)	1.60 (.69)	-13.79***	1.25
Familiar	2.97 (.94)	2.00 (.74)	-12.48***	1.15
Happy	3.20 (.84)	1.83 (.61)	-20.21***	1.86
Quality of Life	3.02 (.89)	2.21 (.66)	-11.29***	1.03

Note. $n = 240$ for nature condition, $n = 233$ for built condition. $df = 416.10 - 471$.

*** $p < .001$.

As hypothesized, REIVO correlated positively with raw intrinsic aspirations, altruistic and biospheric concern and negatively with raw extrinsic aspirations, materialistic concerns and egoistic concern (see Table 9). These correlations suggest that intrinsic aspirations may be in opposition to self-driven focuses such as materialism and egoistic concern. Materialistic desires correlated positively with raw extrinsic aspirations and egoistic concern. Similar to above, this suggests that they measure some aspect of being concerned with the self (this could be seen as more of an ego view or selfish view). Materialistic desires did not significantly correlate with altruistic concern or biospheric concern however. Egoistic, altruistic, and biospheric concern all positively correlated together, suggesting people may be concerned about environmental issues for one related reason, rather than three separate reasons. Raw extrinsic and intrinsic aspirations positively correlated ($r = .25$, similar to the correlation reported by Kasser & Ryan, 1996).

Table 9

Correlations between Measures for Study 2

Variable	1.	2.	3.	4.	5.	6.	7.
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1. Materialistic desires	—						
2. Egoistic Concern	.17**	—					
3. Altruistic Concern	.08	.53**	—				
4. Biospheric Concern	-.05	.17**	.30**	—			
5. REIVO	-.45**	-.16**	.16**	.17**	—		
6. Raw Extrinsic	.51**	.34**	.11*	.01	-.82**	—	
7. Raw Intrinsic	.08	.27**	.46**	.31**	.35**	.25**	—
8. INS	.004	-.007	.02	.22**	.05	-.01	.07

Note. REIVO = relative extrinsic versus intrinsic value orientation, in these analyses, high scores mean high intrinsic goals (i.e., intrinsic goals controlling for extrinsic goals). INS = inclusion of nature in self scale. $N = 471-473$.

* $p < .05$. ** $p < .01$.

The following paragraphs report on all hypotheses and ANOVA's in detail, but the results can be summarized briefly: the majority of results were null. The exceptions were: (1) the advertisement condition reported lower materialistic desires, compared to the non-advertisement condition (this was contrary to the hypothesis) (2) the nature condition reported marginally lower materialistic desires, compared to the built condition (3) the nature condition reported marginally higher pleasant affect and marginally higher vitality. Efficient readers may wish to skip to hypothesis 5 [p. 88].

I hypothesized that participants' materialistic desires would differ by condition. A two-way between subjects ANOVA showed a marginally significant main effect of environmental condition (nature or built), $F(1, 469) = 2.69, p = .10, \eta_p^2 = .006$. Participants who saw the built photographs ($n = 233, M = 4.22, SD = 1.30$), compared to the nature photographs ($n = 240, M = 4.05, SD = 1.21$) reported marginally higher materialistic desires (also displayed in Table 10).

There was a significant main effect of advertisement on materialistic desires, $F(1, 469) = 4.71, p = .03, \eta_p^2 = .01$. Contrary to the hypothesis, participants who saw the advertisements ($n = 243, M = 4.01, SD = 1.30$) desired the items less, compared to participants who did not see the advertisements ($n = 230, M = 4.25, SD = 1.20$). As predicted, there was no significant interaction between environmental condition and advertisement condition, $F(1, 469) = .71, p = .40, \eta_p^2 = .002$. Participants in the advertisement condition who saw the built photographs ($n = 127, M = 4.06, SD = 1.34$) reported similar materialistic desires as those participants who saw the nature photographs ($n = 116, M = 3.97, SD = 1.26$). Participants in the non-advertising condition who saw the built photographs ($n = 106, M = 4.41, SD = 1.23$) reported similar materialistic desires as participants who saw the nature photographs ($n = 124, M = 4.12, SD = 1.17$).

Table 10*Materialistic Desires by Conditions*

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	3.97 (1.26)	4.12 (1.17)	4.05 (1.21)
Built <i>M (SD)</i>	4.06 (1.34)	4.41 (1.23)	4.22 (1.30)
Overall means	4.01 (1.30)	4.25 (1.20)	

As part of hypothesis 2, I hypothesized that participants' REIVO scores (aspirations) would differ by condition. A two-way between subjects ANOVA showed the main effect of environmental condition (nature or built) was not significant, $F(1, 469) = .37, p = .57, \eta_p^2 = .001$. Participants who saw the built photographs ($n = 233, M = 2.58, SD = 1.50$) compared to the nature photographs ($n = 240, M = 2.50, SD = 1.40$) reported similar aspirations (also displayed in

Table 11). There was no significant main effect of advertisements on aspirations, $F(1, 469) = .10$, $p = .75$, $\eta_p^2 = .0002$. Participants who saw the advertisements ($n = 243$, $M = 2.52$, $SD = 1.51$) reported similar aspirations, compared to participants who did not see the advertisements ($n = 230$, $M = 2.56$, $SD = 1.39$). There was no significant interaction (as hypothesized) between environmental condition and advertisement condition, $F(1, 469) = .32$, $p = .57$, $\eta_p^2 = .001$. Participants in the advertisement condition who saw the built photographs ($n = 127$, $M = 2.60$, $SD = 1.59$) reported similar aspirations as those participants who saw the nature photographs ($n = 116$, $M = 2.44$, $SD = 1.42$). Participants in the non-advertising condition who saw the built photographs ($n = 106$, $M = 2.56$, $SD = 1.40$) reported similar aspirations compared to participants who saw the nature photographs ($n = 124$, $M = 2.56$, $SD = 1.39$). Finally, I examined the correlation between REIVO and state nature relatedness to compare with previous studies. Contrary to the Pilot Study and Study 1, REIVO was not correlated with state nature relatedness ($r = .05$, $p = .256$, $N = 472$).

Table 11

Aspirations (REIVO) by Conditions

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	2.44 (1.42)	2.56 (1.39)	2.50 (1.40)
Built <i>M (SD)</i>	2.60 (1.59)	2.56 (1.40)	2.58 (1.50)
Overall means	2.52 (1.51)	2.56 (1.39)	

For hypothesis 3, I predicted that participants' state nature relatedness scores would differ by condition. A two-way between subjects ANOVA showed that the main effect of

environmental condition (nature or built) was not significant, $F(1, 468) = 2.21, p = .14, \eta_p^2 = .005$. Participants who saw the built photographs ($n = 232, M = 3.07, SD = 1.56$), compared to the nature photographs ($n = 240, M = 3.29, SD = 1.58$) did not differ in their state nature relatedness (also displayed in Table 12). Whether participants viewed the advertisements ($n = 243, M = 3.23, SD = 1.66$) or did not view the advertisements ($n = 229, M = 3.13, SD = 1.47$), did not affect their state nature relatedness, $F(1, 468) = .66, p = .42, \eta_p^2 = .001$. There was no significant interaction (as hypothesized) between environmental condition and advertisement condition, $F(1, 468) = 2.10, p = .15, \eta_p^2 = .004$. Participants in the advertisement condition who saw the built photographs ($n = 127, M = 3.03, SD = 1.62$) reported similar state nature relatedness scores as those participants who saw the nature photographs ($n = 116, M = 3.46, SD = 1.68$). Participants in the non-advertising condition who saw the built photographs ($n = 105, M = 3.12, SD = 1.49$) reported similar state nature relatedness scores as participants who saw the nature photographs ($n = 124, M = 3.13, SD = 1.47$).

Table 12*State Nature Relatedness by Conditions*

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	3.46 (1.68)	3.13 (1.47)	3.29 (1.58)
Built <i>M (SD)</i>	3.03 (1.62)	3.12 (1.49)	3.07 (1.56)
Overall means	3.23 (1.66)	3.13 (1.47)	

I hypothesized that participants' positive affect would differ by condition. A two-way between subjects ANOVA did not find a significant main effect of environmental condition

(nature or built) on positive affect, $F(1, 468) = 2.55, p = .11, \eta_p^2 = .005$. Participants who saw the built photographs ($n = 232, M = 2.61, SD = .82$), compared to the nature photographs ($n = 240, M = 2.74, SD = .85$) reported similar positive affect (also see Table 13). There was no significant main effect of advertisements on positive affect, $F(1, 468) = .006, p = .94, \eta_p^2 = .00001$.

Participants in the advertisement condition ($n = 243, M = 2.67, SD = .87$) and those in the non-advertisement condition ($n = 229, M = 2.68, SD = .80$), reported similar positive affect. There was no significant interaction (as hypothesized) between environmental condition and advertisement condition, $F(1, 468) = .18, p = .68, \eta_p^2 = .0004$. Participants in the advertisement condition who saw the built photographs ($n = 127, M = 2.62, SD = .88$) reported similar positive affect as those participants who saw the nature photographs ($n = 116, M = 2.72, SD = .87$).

Participants in the non-advertising condition who saw the built photographs ($n = 105, M = 2.60, SD = .76$) reported similar positive affect as participants who saw the nature photographs ($n = 124, M = 2.75, SD = .83$).

Table 13

Positive Affect by Conditions

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	2.72 (.87)	2.75 (.83)	2.74 (.85)
Built <i>M (SD)</i>	2.62 (.88)	2.60 (.76)	2.61 (.82)
Overall means	2.67 (.87)	2.68 (.80)	

I hypothesized that participants' negative affect would differ by condition. A two-way between subjects ANOVA showed that the main effect of environmental condition (nature or built) was not significant, $F(1, 468) = 1.90, p = .17, \eta_p^2 = .004$. Participants who saw the built

photographs ($n = 232$, $M = 1.62$, $SD = .64$), compared to the nature photographs ($n = 240$, $M = 1.71$, $SD = .73$) did not differ in their negative affect (also displayed in Table 14). Whether participants saw advertisements ($n = 243$, $M = 1.63$, $SD = .68$) or not ($n = 229$, $M = 1.70$, $SD = .69$), did not lead to significant differences in their negative affect scores, $F(1, 468) = 1.01$, $p = .32$, $\eta_p^2 = .002$. There was no significant interaction (as expected) between environmental condition and advertisement condition, $F(1, 468) = .14$, $p = .71$, $\eta_p^2 = .0003$. Participants in the advertisement condition who saw the built photographs ($n = 127$, $M = 1.58$, $SD = .61$) reported similar negative affect as those participants who saw the nature photographs ($n = 116$, $M = 1.69$, $SD = .75$). Participants in the non-advertising condition who saw the built photographs ($n = 105$, $M = 1.66$, $SD = .66$) reported similar negative affect as participants who saw the nature photographs ($n = 124$, $M = 1.73$, $SD = .71$).

Table 14*Negative Affect by Conditions*

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	1.69 (.75)	1.73 (.71)	1.71 (.73)
Built <i>M (SD)</i>	1.58 (.61)	1.66 (.66)	1.62 (.64)
Overall means	1.63 (.68)	1.70 (.69)	

I hypothesized that participants' pleasant affect would differ by condition. A two-way between subjects ANOVA showed that the main effect of environmental condition (nature or built) was marginally significant, $F(1, 467) = 3.18$, $p = .08$, $\eta_p^2 = .007$. Participants who saw the nature photographs reported marginally higher pleasant affect scores ($n = 240$, $M = 2.78$, $SD = .77$), compared to participants who saw the built photographs ($n = 231$, $M = 2.66$, $SD = .74$;

also displayed in Table 15). Whether participants saw the advertisements ($n = 242$, $M = 2.72$, $SD = .79$) or not ($n = 229$, $M = 2.72$, $SD = .73$), did not lead to differences in their pleasant affect, $F(1, 467) = .12$, $p = .91$, $\eta_p^2 = .00003$. There was no significant interaction (as expected) between environmental condition and advertisement condition, $F(1, 467) = .46$, $p = .50$, $\eta_p^2 = .001$.

Participants in the advertisement condition who saw the built photographs ($n = 126$, $M = 2.68$, $SD = .78$) reported similar pleasant affect as those participants who saw the nature photographs ($n = 116$, $M = 2.76$, $SD = .80$). Participants in the non-advertising condition who saw the built photographs ($n = 105$, $M = 2.62$, $SD = .71$) reported similar pleasant affect as participants who saw the nature photographs ($n = 124$, $M = 2.80$, $SD = .74$).

Table 15

Pleasant Affect by Conditions

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	2.76 (.80)	2.80 (.74)	2.78 (.77)
Built <i>M (SD)</i>	2.68 (.78)	2.62 (.71)	2.66 (.74)
Overall means	2.72 (.79)	2.72 (.73)	

I hypothesized that participants' vitality would differ by condition. A two-way between subjects ANOVA found that the main effect of environmental condition (nature or built) was marginally significant, $F(1, 468) = 3.04$, $p = .08$, $\eta_p^2 = .006$. Participants who saw the nature photographs reported marginally higher vitality scores ($n = 240$, $M = 2.73$, $SD = .93$; also see Table 16), compared to participants who saw the built photographs ($n = 231$, $M = 2.58$, $SD = .96$). Whether participants saw the advertisements ($n = 243$, $M = 2.71$, $SD = .94$) or not ($n = 229$, $M =$

2.61, $SD = .95$), did not lead to significant differences in their vitality scores, $F(1, 468) = 1.51$, $p = .22$, $\eta_p^2 = .003$. There was no significant interaction (as expected) between environmental condition and advertisement condition, $F(1, 468) = .004$, $p = .95$, $\eta_p^2 = .000009$. Participants in the advertisement condition who saw the built photographs ($n = 127$, $M = 2.63$, $SD = .94$) reported similar vitality as those participants who saw the nature photographs ($n = 116$, $M = 2.79$, $SD = .94$). Participants in the non-advertising condition who saw the built photographs ($n = 105$, $M = 2.53$, $SD = .98$) reported similar vitality as participants who saw the nature photographs ($n = 124$, $M = 2.67$, $SD = .92$).

Table 16

Vitality by Conditions

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	2.79 (.94)	2.67 (.92)	2.73 (.93)
Built <i>M (SD)</i>	2.63 (.94)	2.53 (.98)	2.58 (.96)
Overall means	2.71 (.94)	2.61 (.95)	

For hypothesis 4, I predicted that participants' environmental concern would differ by condition. Environmental concern was comprised of three subscales, egoistic concern, altruistic concern, and biospheric concern. For *egoistic* environmental concern, a two-way between subjects ANOVA showed the main effect of environmental condition (nature or built) was not significant, $F(1, 467) = .25$, $p = .62$, $\eta_p^2 = .001$. Participants who saw the built photographs ($n = 232$, $M = 4.23$, $SD = .79$; also displayed in Table 17), compared to the nature photographs ($n = 239$, $M = 4.19$, $SD = .86$) reported similar egoistic environmental concern. Whether participants

saw the advertisements ($n = 243$, $M = 4.20$, $SD = .84$) or not ($n = 228$, $M = 4.22$, $SD = .82$), did not lead to significant differences in their egoistic environmental concern, $F(1, 467) = 0.90$, $p = .77$, $\eta_p^2 = .0002$. There was no significant interaction (as expected) between environmental condition and the advertisement condition, $F(1, 467) = .10$, $p = .76$, $\eta_p^2 = .0002$. Participants in the advertisement condition who saw the built photographs ($n = 127$, $M = 4.21$, $SD = .84$) reported similar egoistic environmental concern as those participants who saw the nature photographs ($n = 116$, $M = 4.19$, $SD = .83$). Participants in the non-advertising condition who saw the built photographs ($n = 105$, $M = 4.25$, $SD = .73$) reported similar egoistic environmental concern as participants who saw the nature photographs ($n = 123$, $M = 4.19$, $SD = .90$).

Table 17*Egoistic Environmental Concern by Conditions*

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	4.19 (.83)	4.19 (.90)	4.19 (.86)
Built <i>M (SD)</i>	4.21 (.84)	4.25 (.73)	4.23 (.79)
Overall means	4.20 (.84)	4.22 (.82)	

I hypothesized that participants' *altruistic* environmental concern would differ by condition. A two-way between subjects ANOVA showed that the main effect of environmental condition (nature or built) was not significant, $F(1, 467) = .51$, $p = .48$, $\eta_p^2 = .001$. Participants who saw the built photographs ($n = 232$, $M = 4.37$, $SD = .72$; see Table 18) compared to the nature photographs ($n = 239$, $M = 4.42$, $SD = .75$) did not differ in their altruistic environmental concern. Whether participants saw advertisements ($n = 243$, $M = 4.35$, $SD = .76$) or not ($n = 228$, $M = 4.44$, $SD = .71$), had no significant effect on their altruistic environmental concern, $F(1,$

467) = 1.64, $p = .20$, $\eta_p^2 = .004$. There was no significant interaction (as expected) between environmental condition and advertisement condition, $F(1, 467) = 1.97$, $p = .16$, $\eta_p^2 = .004$ on altruistic environmental concern. Participants in the advertisement condition who saw the built photographs ($n = 127$, $M = 4.28$, $SD = .78$) reported similar altruistic environmental concern as those participants who saw the nature photographs ($n = 116$, $M = 4.43$, $SD = .73$). Participants in the non-advertising condition who saw the built photographs ($n = 105$, $M = 4.47$, $SD = .64$) reported similar altruistic environmental concern as participants who saw the nature photographs ($n = 123$, $M = 4.42$, $SD = .76$).

Table 18*Altruistic Environmental Concern by Conditions*

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	4.43 (.73)	4.42 (.76)	4.42 (.75)
Built <i>M (SD)</i>	4.28 (.78)	4.47 (.64)	4.37 (.72)
Overall means	4.35 (.76)	4.44 (.71)	

I hypothesized that participants' *biospheric* environmental concern would differ by condition. A two-way between subjects ANOVA did not find a main effect of environmental condition (nature or built) on biospheric environmental concern, $F(1, 467) = 1.74$, $p = .19$, $\eta_p^2 = .004$. Participants who saw the built photographs ($n = 232$, $M = 4.00$, $SD = .91$) compared to the nature photographs ($n = 239$, $M = 4.11$, $SD = .81$), reported similar biospheric environmental concern (also see Table 19 for means). Whether participants saw advertisements ($n = 243$, $M = 4.05$, $SD = .88$) or not ($n = 228$, $M = 4.06$, $SD = .84$), had no significant effect on their biospheric

environmental concern, $F(1, 467) = .0001, p = .99, \eta_p^2 = .0000002$. There was no significant interaction (as expected) between environmental condition and advertisement condition, $F(1, 467) = .65, p = .42, \eta_p^2 = .001$ on biospheric environmental concern. Participants in the advertisement condition who saw the built photographs ($n = 127, M = 3.97, SD = .91$) reported similar biospheric environmental concern as those participants who saw the nature photographs ($n = 116, M = 4.14, SD = .84$). Participants in the non-advertising condition who saw the built photographs ($n = 105, M = 4.04, SD = .90$) reported similar biospheric environmental concern as participants who saw the nature photographs ($n = 123, M = 4.08, SD = .79$).

Table 19*Biospheric Environmental Concern by Conditions*

Condition	Advertisements <i>M (SD)</i>	No advertisements <i>M (SD)</i>	Overall means
Nature <i>M (SD)</i>	4.14 (.84)	4.08 (.79)	4.11 (.81)
Built <i>M (SD)</i>	3.97 (.91)	4.04 (.90)	4.00 (.91)
Overall means	4.05 (.88)	4.06 (.84)	

For hypothesis 5⁹, I hypothesized two mediation paths that were both tested with the PROCESS macro for SPSS from Hayes (2013). First, state nature relatedness would mediate the relationship between environmental condition and desire for the material items. The mediation path is significant if the confidence interval does not include zero. State nature relatedness did not significantly mediate the relationship between environmental condition and desire for

⁹ Although not stated explicitly as part of hypothesis 5, I tested if state nature relatedness mediated the relationship between environmental condition and REIVO (similar to the analyses in Study 1). State nature relatedness was not a significant indirect path between condition and aspirations ($M = .01, SE = .01, 95\% CI = -.005, .05$). In Study 2, state nature relatedness does not explain part of the relationship between nature and aspirations.

material items with 5000 resamples ($M = .002$, $SE = .02$, 95% CI $-.03$, $.06$). Second, I hypothesized that state nature relatedness would mediate the relationship between environmental condition and environmental concern (i.e., egoistic, altruistic, and biospheric concern). Although environmental condition was not significantly related to environmental concern (see hypothesis 4), the indirect path was still tested as in Study 1 (as recommended by MacKinnon et al., 2002; Preacher & Hayes, 2004; Shrout & Bolger, 2002). State nature relatedness was not a significant indirect path between condition and *egoistic* environmental concern ($M = -.0006$, $SE = .007$, 95% CI $-.02$, $.01$). State nature relatedness was not a significant indirect path between condition and *altruistic* environmental concern ($M = .002$, $SE = .006$, 95% CI $-.01$, $.02$). State nature relatedness was not a significant indirect path between condition and *biospheric* environmental concern ($M = .03$, $SE = .02$, 95% CI $-.006$, $.06$). These findings suggest that an increase in state nature relatedness resulting from nature exposure does not partly explain the participants' environmental concern.

Supplementary analyses

As a supplementary analysis, I examined if where participants grew up affected their aspirations. Participants who grew up in the city ($M = 2.38$, $SD = 1.47$, $n = 284$) compared to participants who grew up in a small town, on a farm or in rural area ($M = 2.79$, $SD = 1.40$, $n = 175$) had lower REIVO scores ($t(457) = -2.95$, $p = .003$). This suggests that participants who grow up outside a city, with presumably more nature, may value intrinsic aspirations more than extrinsic aspirations. However, a two-way ANCOVA controlling for where participants grew up (urban, small town, farm) did not show any significant differences in REIVO across nature or built photographs ($F(1, 454) = .42$, $p = .52$) or ads/ no ads ($F(1, 468) = .03$, $p = .86$).

I also examined if where participants live now (campus residence and city compared to small

town or farm) affected their aspirations. Participants who live in the city or in campus residence had marginally lower REIVO ($M = 2.38$, $SD = 1.52$, $n = 168$) compared to participants who live in a small town, on a farm or in rural area ($M = 2.63$, $SD = 1.42$, $n = 300$; $t(466) = -1.78$, $p = .08$). This suggests that participants who live in small towns, farms, or in rural areas place more emphasis on intrinsic aspirations relative to extrinsic aspirations.

Finally, I also tested the idea that enjoyment of the photographs was correlated with higher intrinsic and lower extrinsic aspirations. Enjoyment was chosen from the photo ratings as it seemed to be the closest variable to immersion from Weinstein et al. (2009). In the nature condition, participants who enjoyed the photographs more reported higher REIVO ($r = .17$, $p = .01$, $n = 240$). In the built condition, enjoyment in the pictures was marginally related to lower REIVO ($r = -.13$, $p = .05$, $n = 233$). However, a two-way ANCOVA controlling for overall enjoyment of the photographs did not show any significant differences in REIVO across nature or built photographs ($F(1, 468) = .67$, $p = .41$) or advertisement or no advertisement condition ($F(1, 468) = .11$, $p = .75$).

Discussion Study 2

The main goal of Study 2 was to examine the effect of nature photographs, advertisements, and state nature relatedness on momentary material desires and aspirations. I was attempting to replicate (1) Weinstein and colleagues (2009) study that found nature photographs lead to higher intrinsic aspirations and lower extrinsic aspirations, and (2) Bauer and colleagues (2012) study that found advertisements lead to higher extrinsic, materialistic aspirations. I attempted to extend these studies by examining if nature photographs could decrease participants' desire for material products after viewing the advertisements for these products and by examining participants' environmental concern. These ideas were not well-supported and appear to be a failure to

replicate and extend both Bauer et al. (2012) and Weinstein et al. (2009).

As previously discussed, this failure to replicate may have occurred due to methodology differences between Study 2 and Weinstein et al. (2009). Weinstein and colleagues used a within-subjects design, which is a statistically more powerful design, compared to the between-studies design used in Study 2. When calculating power, I assumed a medium effect size based on Weinstein et al. (2009) sample size, but this relationship may actually be a small effect size and a more powerful statistical design or larger sample size is needed (this may partly explain the null findings with environmental concern as well). Weinstein and colleagues also found that the effect of nature on aspirations was mediated by autonomy and nature relatedness, and depended on participant's immersion in the photographs (i.e., a moderated mediation). I did not measure the extent that participants felt autonomous because this was not a proposed mechanism for why/how nature affects aspirations. I measured state nature relatedness, but this was not a significant mediator or indirect pathway between nature and aspirations (see footnote with hypothesis 5). Finally, I did not measure or control for participants' immersion in the photographs (although the same immersion script was used as Weinstein and colleagues). From Study 2 then, it is unclear whether immersion is the essential variable to this relationship or if the nature condition was not immersive enough to observe effects on aspirations. Related to the aspirations, Study 2 found that participants in the nature condition reported marginally less materialistic desires for the luxury items. Exposure to nature might have some positive effects on decreasing how much people want luxury items in the moment. However, materialistic desires are different from raw extrinsic aspirations (although related, $r = .51$). Materialistic desires measure how much participants want a specific luxury item in the moment, whereas extrinsic aspirations measure a broader desire, e.g., the importance of money, status, and image. This

finding suggests it is easier to find significant differences with momentary desires compared to broader life aspirations.

Study 2 was completed online, compared to Weinstein et al. (2009) and Bauer et al. (2012) that were both collected in-person. This may affect participants' immersion (e.g., participants could have been texting, watching unrelated videos, etc. while completing this study at home, compared to in-lab studies where there is a research assistant monitoring participants). While most research has found that online data collection techniques approximate lab studies (Buhrmester, Kwang, & Gosling, 2011; Gosling, Vazire, Srivastava, & John, 2004), some studies have shown that participants in online studies may have more interruptions and distractions as well as invest less time and energy (Clifford & Jerit, 2014; Gould, Cox, Brumby, & Wiseman, 2015). In online studies, it is difficult to control all details of the study e.g., the size of the photograph was standardized in the online survey for computers, but participants could have completed this study on their smart phones (where the screen is much smaller than the average computer size), possibly decreasing participants' immersion as well. In contrast to Weinstein et al., Study 2 examined how participants rated the photos, something that Weinstein and colleagues did not include. Perhaps the ratings took the participants out of the photos (i.e., being asked to objectively rate the photographs decreased participants' subjective feelings and immersion in the photos which may have further limited the effects of the photographs). Alternatively, rating the photographs may have helped the students engage more with the photos (e.g., rating perceived beauty in photographs requires that the participant look at it and make a judgment). However, this seems to contradict Weinstein and colleagues' (2009) finding that photos (without photo ratings) lead to changes in aspirations.

Study 2 generally did not replicate Bauer et al. (2012), which found that advertisements lead

to higher extrinsic aspirations (hypothesis 2). This is surprising considering the photographs used in Study 2 were almost identical to the Bauer et al. (2012) photographs, and a similar aspiration measure was used (Bauer and colleagues used Grouzet et al. (2005) aspiration measure, but this measure is an abbreviated measure of Kasser & Ryan (1996) used in Study 2). Bauer and colleagues also used nature photographs as the control condition, although these were a different set of nature photographs compared to Study 2. It does not seem as though Bauer and colleagues matched the photos and they do not present the results of the photo ratings (from their pilot study). Contrary to Bauer et al., participants who saw the advertisements in Study 2 had lower scores on the materialistic desires measure compared to participants who did not see the advertisements (marginally significant). In the Bauer et al. (2012) study, participants saw the photos and then immediately completed the extrinsic aspirations measure. In Study 2, participants saw the advertisements, then saw the environmental photographs, and then completed the aspirations and materialistic desire measure. This additional wait time (between seeing the luxury advertisements and rating them) may have decreased how much participants wanted the luxury items. Future research is needed to replicate this result and examine if this is a true finding or just a finding that is limited to very specific circumstances.

Immersion may also partly explain why the nature photographs did not improve positive mood or state nature relatedness. To increase state nature relatedness, real nature might be needed. The effect of nature on positive affect is a well-established finding (see meta-analysis by McMahan & Estes, 2015), suggesting something was different about the nature manipulation used in Study 2. Most of the past studies used real nature suggesting it is the photographs themselves that may not have been enough to replicate the mood finding. Perhaps it was a combination of the photographs not being immersive enough (compared to nature videos or a

walk) and the online study format used in Study 2 that decreased participants' attention toward the study (if attention is lower, it seems less likely the nature manipulation would not be successful). However, participants who saw the nature photographs were (marginally) higher on vitality and pleasant affect, suggesting the nature photos were enough to find some positive effects of nature. In Study 1, the effect sizes for pleasant affect and vitality were larger than the effect sizes in Study 2 for vitality and pleasant affect suggesting the photos may have been a weaker manipulation. Large effect sizes may be easier to find compared to small effect sizes. Although in Study 1, the effect size for positive affect was also large ($d = .87$) so it seems a bit odd this did not replicate (although these are marginal findings not significant findings, and positive affect was close to being marginally significant, $p = .11$). This may also be due to the differences in activity level between Study 1 and Study 2. In Study 1 participants walked through nature settings, compared to Study 2 where participants viewed nature photographs (probably while sitting). It seems more likely that walking through nature would increase high arousal positive affect (e.g., enthusiastic, excited) compared to sitting and viewing nature photographs. More broadly, nature did not increase momentary feelings of nature relatedness, which means one of my proposed mechanisms for why nature will decrease materialism (through nature relatedness) could not work. Perhaps a more immersive, longer experience in nature could increase feelings of nature relatedness, and then I could examine if state nature relatedness decreases extrinsic goals and increases intrinsic goals.

Although my study is close to Weinstein and colleagues, it is not an exact replication. This means the relationship between nature and aspirations may be more difficult to replicate (partly due to small effect sizes) and only present under certain conditions (e.g., dependent on immersion, with specific nature photographs). The results presented so far decrease confidence

in the robustness of the relationship between nature and aspirations, but this may be due to the possible moderators, subtle changes in methodology, or the small effect size.

A secondary goal of Study 2 was to test the theoretical model proposed by Schwartz (1992) and Grouzet et al. (2005). Raw intrinsic and raw extrinsic goals were positively correlated similar to the Pilot Study (although the correlation in Study 2 is smaller than the Pilot Study). Perhaps the larger sample size in Study 2 was useful to obtain a ‘truer’ correlation (and one that is more similar to the correlation presented in Kasser & Ryan, 1996). However, nature did not increase intrinsic aspirations in Study 2; therefore, it is not possible to examine if extrinsic aspirations decreased in response to the increase of intrinsic aspirations. A more immersive, longer nature experience may be needed to increase intrinsic aspirations and then subsequently examine if extrinsic aspirations decrease. Materialistic desires positively correlated with egoistic concern and extrinsic goals suggesting these variables all measure some ‘focus on the self’ or self-enhancement values (Schwartz, 1992). Intrinsic aspirations positively correlated with altruistic and biospheric concern suggesting these measure a more global concern for others (i.e., a self-transcendence value which would be in opposition to self-enhancement values; Schwartz, 1992). All three types of environmental concern positively correlated together suggesting people are concerned about environmental issues for more than one reason at a time i.e., people may be concerned about the environment for themselves (egoistic), other members of their community (altruistic), and for animals (biospheric). These correlations in study 2 were similar to the size of correlations reported in Schultz (2001) but a factor analysis there revealed three factors.

Finally, state nature relatedness did not mediate the relationship between environmental condition and environmental concern. State nature relatedness was not a significant indirect pathway between environmental condition and aspirations (contrary to Study 1 where the

indirect path was significant). This inconsistent result between the two studies may be due to the different nature manipulations. In Study 1, real nature was used and participants in the nature condition reported higher nature relatedness scores compared to the built condition (state nature relatedness was also correlated with aspirations). In Study 2, nature photographs were used and there were no significant differences in state nature relatedness between conditions (state nature relatedness was not correlated with aspirations). These results suggest that exposing participants to real nature and increasing their state nature relatedness scores may be key for mediation models or indirect pathways (although it is also possible that the mediation model in Study 1 is a false positive, future research would need to further examine these models).

Study 3

The third study examined if nature exposure could change aspirations and trait materialism over a longer period of time (cf. momentary effects in Study 1 and 2). On the first day of the study, participants completed measures of trait materialism, trait nature relatedness, aspirations, mood, and environmental concern (Time 1). Participants were then randomly assigned to one of two conditions: spend 20 minutes a day examining features of nature; or spend 20 minutes a day examining architecture and interior design. Both conditions completed daily questionnaires about their experiences after the activity. After the 10 daily activities were complete, participants completed the same measures at Time 1 (as Time 2 indicators). Participants were also asked to enter their name for a prize that was given at the end of the study. The prize was either for an experience (gift card to Le Nordic Spa) or to a department store where they could (presumably) buy material possessions (Nordstrom store).

Hypotheses

Hypothesis one. At time 1 and 2, trait materialism will correlate negatively with REIVO

and concern for environment. Trait nature relatedness will correlate positively with concern for environment and REIVO. The raw aspirations will also be tested as part of hypothesis one. Specifically, raw intrinsic aspirations were hypothesized to correlate positively with concern for the environment, and trait nature relatedness; and negatively with trait materialism. Raw extrinsic aspirations were hypothesized to correlate positively with trait materialism; and negatively with concern for the environment and trait nature relatedness.

Hypothesis two. At Time 2, participants in the nature condition will have higher trait nature relatedness and lower trait materialism.

Hypothesis three. At Time 2, participants in the nature condition will report higher REIVO compared to the control condition.

Hypothesis four. Participants in the nature condition will report positive changes in their average mood and state nature relatedness (at Time 2). Specifically, participants in the nature condition will be higher in state nature relatedness, positive affect, pleasant affect, and vitality; and lower in negative affect, compared to participants in the built condition.

Hypothesis five. Participants in the nature condition will report more biospheric and altruistic concern for the environment after the 12-day period compared to the built condition. The built condition will report more egoistic concern for the environment compared to the nature condition.

Hypothesis six. Trait nature relatedness will mediate the relationship between condition and aspirations (REIVO).

Hypothesis seven. Participants in the nature condition will be more likely to enter their name for the experience prize, compared to the built condition.

Method Study 3

Participants

Approximately 160 students were recruited for a study called ‘effects of immediate environments on people.’ The participants were recruited through Carleton University’s online sign up system (SONA) and then completed all questionnaires online on the Qualtrics website. In exchange for participating, undergraduate students were awarded 3% towards their final grade and entered for a draw to win a \$250 gift certificate of their choice. Every time participants completed a daily activity (and the Time 2 questionnaire); their name was entered into the draw as an incentive to participate. I excluded participants from the analyses if they did not complete at least eight out of the 12 activities (i.e., participants had to complete the Time 1 and 2 questionnaires and at least six, out of the ten, daily activities). I also excluded participants who self-declared they did not complete the activity (or it was clear from reading their daily reports that they did not complete the activity). This meant 59 students were excluded before analyses; $N = 101$. This final sample size of 101 participants meets the general recommendation of 50 participants per condition (Simmons et al., 2013). A more specific power analyses was not conducted because the assumptions (e.g., the strength of the association) were not known.

Participants were mostly females (71%), and in their first or second year of study (67%). Ages ranged from 17 – 50 years ($M = 20.96$, $SD = 4.58$). The majority of participants reported that they grew up in a city (65%), while 30% grew up in a small town, and 4% grew up in a rural area or on a farm. The majority of participants (72%) reported that they presently live in a city, 17% reported that they live in residence, and 6% reported that they lived in a small town (4% currently live on a farm/rural area). Participants reported a breadth of majors; the largest category was Psychology (29%).

Materials

Nature relatedness and material value scale. Similar to the Pilot Study, the Material Values Scale (MVS; Richins, 2004) and the Nature Relatedness (Nature Relatedness Brief Scale; Nisbet & Zelenski, 2013) were hidden within the Big Five Factor Inventory (BFFI; John & Srivastava, 1999). The BFFI was only used as distractor items (not for hypotheses or analyses). Participants were asked to complete the scale based on how they have felt over the past two weeks. The scales demonstrated acceptable reliability, material values scale, $\alpha = .81$ at Time 1, and $\alpha = .85$ at Time 2. Alphas for the nature relatedness scale were also acceptable, $\alpha = .86$ at Time 1, and $\alpha = .87$ at Time 2. See Appendix A for the BFFI.

Aspiration index (Kasser & Ryan, 1996). The same version of the Aspiration Index that was used in the Pilot Study and Study 2 was also used in Study 3 (see Appendix C for the aspiration index). The reliabilities were acceptable at Time 1, intrinsic aspirations $\alpha = .90$, and extrinsic aspirations $\alpha = .93$. The reliabilities were acceptable at Time 2, intrinsic aspirations $\alpha = .92$, and extrinsic aspirations $\alpha = .92$. Consistent with Pilot 1 and Study 2, the aspiration index is presented as REIVO scores and as the raw scores.

Positive and negative affect schedule (PANAS; Watson et al., 1988). This measure is the same as the PANAS used in Study 2 (with questions assessing pleasant affect and vitality added). The instructions were modified from Study 2 to ask participants how much they have felt the following emotions over the past two weeks (cf. momentary emotions in Study 2). The reliabilities of each subscale were acceptable, negative affect $\alpha = .88$ for Time 1 and 2, positive affect $\alpha = .92$ at Time 1, positive affect $\alpha = .91$ at Time 2, pleasant affect $\alpha = .83$ at Time 1 and 2, and vitality $\alpha = .92$ at Time 1, vitality $\alpha = .93$ at Time 2. See Appendix J for the PANAS.

Inclusion of nature in self-scale (INS; Schultz, 2002). This single item measures how

connected to nature participants felt at the *state* level (same as in the Pilot Study and Study 2, see Appendix F for the INS). Participants were also asked two distractor questions (how connected do you feel to your friends and family).

Environmental concern (Schultz, 2001). This scale measures participants' concern for the environment and how this might affect other living entities (same as in Study 2). The instructions were modified to ask participants how concerned they have been about environmental problems over the past two weeks for each of the 12 living entities listed in the question. Reliabilities for this scale were acceptable, egoistic concern at $\alpha = .89$ at Time 1, egoistic concern $\alpha = .87$ at Time 2, altruistic concern $\alpha = .80$ at Time 1, altruistic concern $\alpha = .84$ at Time 2, biospheric concern $\alpha = .94$ at Time 1, and biospheric concern $\alpha = .92$ at Time 2. See Appendix Q for this questionnaire.

Daily log Questionnaire. Each day participants completed questions about the type of environment they visited. These were asked to obtain details about the environments- there were no specific hypotheses about these questions however. The following questionnaires were included in the daily log: whether participants completed the activity; a description of the setting; how familiar the setting was, and the intrinsic motivation inventory (the enjoyment subscale; Ryan, Mims, & Koestner, 1983). See Appendix R for the daily log questionnaire.

Prize draw. Participants were also asked to enter an email address or phone number for a prize as part of payment for participating in the study. There were two options: a gift card for Nordstroms Store (where material possessions can presumably be bought) or a gift card at Le Nordik Spa (where it would be more difficult to buy material possession and the focus would be on the experience). This is used as an indirect measure of well-being and materialism as spending money on experiences, rather than material possessions, may be related to well-being

and happiness (Howell & Hill, 2009; Howell et al., 2012).

General information. At Time 1, participants were asked a series of demographic questions (e.g., their year of study, age, sex, and major) to understand more about the participants. Similar to Study 1, the liberal versus conservative questions were removed. See Appendix G for the demographic questions.

Procedure

After providing informed consent online, participants completed baseline questionnaires on the big five personality measure (with trait nature relatedness and trait materialism items added), aspirations, mood, environmental concern, and a general demographics section (Time 1). I subsequently randomly assigned the participants to spend 20 minutes of their free time either in nature or indoors examining architecture/interior design (see Appendix R for specific instructions that varied day-by-day). Each day, I emailed participants the instructions so that participants could complete the 20-minute activity on their own time. After the activity, participants were asked to complete the daily log questionnaire (approximately 5 minutes). After the 10-day intervention, participants completed the big five personality measure (again with the nature relatedness and materialism measures added), the aspiration index, a measure of mood, a measure of their environmental concern (Time 2), and the prize draw. To complete the Time 1 and 2 questionnaires, participants spent approximately 20 minutes (each). To motivate participants to complete the daily activities and log questionnaire, participants were entered for additional chances to win the \$250 prize draw (i.e., a participant could get their name entered in the draw 12 times if they completed Time 1 and 2 questionnaires and the 10 days of the daily log questionnaire). Participants could only put their name in for one of the two prizes. Data collection began early July and was complete by the beginning of November.

Results Study 3

The data were examined for normality, outliers, and missing data. There were no troublesome outliers, less than 5% missing data on all measures, and assumptions for parametric statistics were met for all measures except the egoistic environmental concern measure and negative affect. Similar to the previous studies, negative affect and environmental concern were skewed. Negative affect was positive skewed and egoistic environmental concern measure was negatively skewed. Despite this, the variables remained unaltered to keep interpretations clear.

There were no hypotheses about the daily activities but I included descriptions of the settings that participants reported. Participants' descriptions focused on the smells, sights, sounds, and weather conditions, as the instructions asked (e.g., lighting/colours, hearing birds chirping, traffic sounds, smell of food, how busy the area was). There was some variability in the descriptions depending on the instructions for that day (e.g., on some days participants in the nature condition were instructed to find a garden/vegetation compared to other days where they were instructed to find a river/body of water). However, there were also some overall consistencies in what participants did over the 10-day period. Almost all participants used real nature and built environments (cf. online photographs or videos). On days where it rained in Ottawa, it was more likely participants reported using virtual environments (between 1 - 8 people used online photos or videos per day). This occurred in both conditions, but more often in the nature condition. In the nature condition, participants mostly used the canal, a nearby park, garden, or greenhouse (in that order).

Participants in the built condition mostly used restaurants and coffee shops (especially on days when the instructions asked participants to find café and restaurants; Starbucks was a popular reporting). When the instructions asked participants to find a building with high ceilings,

many participants reported they went to a museum, gym, or yoga studio. On the remaining days, many participants reported they went to Rideau Mall or the Byward Market. A few participants (from both conditions) completed the daily activities while they were away from the Ottawa area (e.g., while they were travelling to Florida, British Columbia, or New York City).

Participants in both the nature and built conditions seemed to select places that were nearby to their home or work/school. This is contrary to the instructions, which asked participants to find an area that was out of their daily routine (although it is possible participants did not previously explore these areas). Most participants reported the setting for their daily activity was about 5 – 10 minutes away from their home or work. Participants reported a variety of transportation to get to the destinations - bus, drive, walk, or bike. As can be seen in Table 20, participants reported higher intrinsic motivation (e.g., activity was enjoyable, interesting) when they visited areas with trees and rivers (nature condition), compared to visiting areas with high ceilings and areas with cars and roads (built condition). The overall mean for enjoyment (days 1 – 10 combined) in nature is significantly higher compared to the built condition. This suggests that participants generally enjoyed visiting nature areas compared to built or indoor areas.

Table 20

Enjoyment on Days 1 – 10 by Condition

	Nature	Built		
Day: Nature vs. Built	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Day 1: Garden vs. Café	4.39 (1.76)	3.94 (1.33)	1.39	.27
Day 2: Trees vs. High ceilings	4.92 (1.49)	3.96 (1.48)	3.18**	.65
Day 3: River vs. Roads/cars	5.14 (1.55)	4.01 (1.41)	3.78**	.77
Day 4: Forest vs. Downtown	4.38 (1.56)	4.14 (1.35)	.78	.17

Day 5: Flowers vs. Bright rooms	4.74 (1.38)	4.36 (1.55)	1.22	.26
Day 6: Garden vs. Café	4.03 (1.55)	4.12 (1.41)	-.26	.06
Day 7: Trees vs. High ceilings	4.73 (1.55)	3.93 (1.48)	2.46*	.53
Day 8: River vs. Roads/cars	4.86 (1.37)	3.83 (1.49)	3.31**	.72
Day 9: Forest vs. Downtown	4.57 (1.37)	4.35 (1.16)	.79	.17
Day 10: Flowers vs. Bright rooms	4.52 (1.66)	4.51 (1.51)	.04	.006
Overall Days 1 - 10	4.68 (1.27)	4.11 (.98)	2.51*	.50

Note. $n = 39-48$ for the nature condition; and $n = 41-53$ for the built condition. $df = 79-99$.

* $p < .05$. ** $p < .001$.

Participants in the nature condition reported higher immersion or marginally higher immersion when they visited rivers/trees compared to visiting roads/cars or buildings with high ceilings (see Table 21). The overall mean for immersion (days 1 – 10 combined) in nature was not significantly different compared to the built condition. Participants might have found it easier to become immersed in nature (at least on some days), compared to a built setting, or they might have found the nature environments were generally more enjoyable (see Table 21) and this increased the likelihood that participants would rate it higher on all attributes (i.e., halo effect).

Table 21

Immersion on Days 1 – 10 by Condition

	Nature	Built		
Day: Nature vs. Built	$M (SD)$	$M (SD)$	t	d
Day 1: Garden vs. Café	4.32 (1.65)	4.14 (1.36)	.59	.12
Day 2: Trees vs. High ceilings	4.48 (1.64)	4.15 (1.70)	.96	.20
Day 3: River vs. Roads/cars	5.00 (1.79)	4.35 (1.55)	1.91 [†]	.39

Day 4: Forest vs. Downtown	4.22 (1.65)	4.11 (1.49)	.35	.07
Day 5: Flowers vs. Bright rooms	4.45 (1.83)	4.32 (1.53)	.36	.08
Day 6: Garden vs. Café	3.95 (1.63)	4.02 (1.52)	-.21	.05
Day 7: Trees vs. High ceilings	4.71 (1.69)	3.85 (1.67)	2.37*	.51
Day 8: River vs. Roads/cars	4.59 (1.43)	4.00 (1.56)	1.80 [†]	.39
Day 9: Forest vs. Downtown	4.34 (1.68)	4.24 (1.36)	.31	.07
Day 10: Flowers vs. Bright rooms	4.26 (1.68)	4.64 (1.72)	-1.02	.22
Overall Days 1 - 10	4.47 (1.23)	4.20 (.99)	1.24	.24

Note. $n = 39-48$ for the nature condition; and $n = 41-53$ for the built condition. $df = 79-96$.

[†] $p < .10$. * $p < .05$.

Finally, participants reported that the nature condition was more familiar to them on days where they were instructed to visit an area with water, vegetation, or trees (see Table 22). Most participants used the canal or a nearby garden, which likely would have been familiar to them. In the built condition, participants were instructed to find an area with cars and traffic or a brightly decorated room. The results suggest that these types of built environments were less familiar to participants. The overall mean for familiarity (days 1 – 10 combined) in nature was marginally higher compared to the built condition. These results are somewhat odd for two reasons (1) in both conditions participants were instructed to find areas that are out of their routine. This suggests that participants either did not follow the instructions or finding novel nature was more difficult; (2) almost all participants completed this study in Ottawa near to their homes/work so the nature and built features should have been equally familiar to participants (especially the built features compared to nature).

Table 22*Familiarity on Days 1 – 10 by Condition*

	Nature	Built		
Day: Nature vs. Built	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>d</i>
Day 1: Garden vs. Café	3.50 (1.49)	3.14 (1.46)	1.20	.24
Day 2: Trees vs. High ceilings	3.04 (1.55)	3.37 (1.10)	-1.17	.25
Day 3: River vs. Roads/cars	3.44 (1.24)	2.96 (1.34)	1.80 [†]	.37
Day 4: Forest vs. Downtown	2.82 (1.44)	2.55 (1.30)	.94	.20
Day 5: Flowers vs. Bright rooms	3.39 (1.60)	2.46 (1.28)	2.99**	.65
Day 6: Garden vs. Café	2.90 (1.48)	2.96 (1.48)	-.17	.04
Day 7: Trees vs. High ceilings	3.00 (1.33)	2.93 (1.31)	.26	.05
Day 8: River vs. Roads/cars	3.39 (1.26)	2.75 (1.16)	2.43*	.53
Day 9: Forest vs. Downtown	2.56 (1.48)	2.55 (1.31)	.04	.007
Day 10: Flowers vs. Bright rooms	2.54 (1.41)	2.19 (1.17)	1.20	.27
Overall Days 1 - 10	3.05 (.81)	2.81 (.68)	1.67 [†]	.32

Note. $n = 39-48$ for the nature condition; and $n = 41-53$ for the built condition. $df = 74.14 - 93$.

[†] $p < .10$. * $p < .05$. ** $p < .001$.

Correlations

For hypothesis 1, a correlational analysis was completed with the Time 1 and Time 2 variables. As shown in Table 23, REIVO positively correlated with intrinsic aspirations, and at Time 2 with nature relatedness. REIVO negatively correlated with materialism, and extrinsic aspirations (these correlations are generally supportive of hypotheses). REIVO was not correlated with environmental concern (contrary to hypotheses). Trait nature relatedness was related to altruistic and biospheric concern and negatively with materialism (but not related to the

other dependent measures). Raw intrinsic and extrinsic aspirations correlated positively at both Time 1 but were not significantly at Time 2. Trait materialism negatively related to biospheric concern at Time 2.

Table 23

Correlations between Time 1 and Time 2 Measures for Study 3

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Trait Mat.	—	-.23*	-.55**	.06	.62**	.06	-.07	-.22*	-.20*
2. Trait NR	-.26**	—	.25*	.24*	-.14	.009	.17	.53**	.66**
3. REIVO	-.63**	.13	—	.38**	-.85**	.06	.12	.05	.19 [†]
4. Intrinsic	.02	.16	.28**	—	.17	.29**	.26**	.03	.15
5. Extrinsic	.63**	-.05	-.85**	.26**	—	.10	.02	-.04	-.12
6. E. Concern	.25*	-.006	-.06	.35**	.25*	—	.48**	.12	.15
7. A. Concern	-.02	.21*	.11	.26**	.03	.55**	—	.34**	.23*
8. B. Concern	-.07	.48**	.08	.05	-.06	.20*	.56**	—	.53**
9. INS	-.10	.39**	.11	.06	-.08	.06	.18	.29**	—

Note. Trait Mat = trait materialism. Trait NR = trait nature relatedness. REIVO = relative extrinsic versus intrinsic value orientation. Intrinsic = raw intrinsic aspirations. Extrinsic = raw extrinsic aspirations. E. Concern = egoistic concern. A. Concern = altruistic concern. B. Concern = biospheric concern. INS = inclusion of nature in self scale (state nature relatedness). The numbers below the diagonal are Time 1; the numbers above the diagonal are Time 2. $N = 101$. [†] $p < .10$. * $p < .05$. ** $p < .001$.

Throughout the mixed ANOVA analyses (presented below), the random assignment to

conditions did not produce equivalences among many of the dependent variables (e.g., the nature condition was already lower on trait materialism and higher on intrinsic aspirations at Time 1). In the nature condition, 26 participants dropped out or did not finish the study after Time 1 questionnaires. In the built condition; 23 participants dropped out or did not finish the study after Time 1 questionnaires. The number of drop outs across conditions seem similar enough that it was not the specific instructions of each condition that led to drop outs. I was also able to compare participants Time 1 dependent variables with 49 participants who dropped out of the study (but completed Time 1 dependent variables). There were no significant differences between those who stayed in the study and those who dropped out after the Time 1 questionnaire (i.e., all participants at Time 1 had similar scores on aspirations, environmental concern, mood, trait nature relatedness and materialism). See Table 24 for the t-tests comparing conditions on dependent measures.

Table 24

Measures at Time 1 by Dropouts

	Remained	Dropout			
Variable	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>p</i>	<i>d</i>
Positive affect	3.31 (.88)	3.40 (.79)	.65	.52	.11
Negative affect	2.35 (.84)	2.23 (.80)	-.88	.38	.15
Pleasant affect	3.04 (.89)	3.02 (.75)	-.13	.90	.02
Vitality	2.85 (1.02)	3.02 (1.00)	.97	.34	.17
Egoistic Concern	5.35 (1.55)	5.32 (1.49)	-.14	.89	.02
Altruistic Concern	4.40 (1.75)	4.19 (1.63)	.71	.48	.12
Biospheric Concern	3.52 (1.87)	3.12 (1.80)	-1.24	.22	.22

Nature Relatedness	3.12 (.98)	2.97 (.88)	-.91	.36	.16
Materialism	3.34 (.92)	3.23 (.76)	-.73	.47	.13
REIVO	1.29 (.84)	1.19 (.66)	-.73	.47	.13

Note. REIVO = relative extrinsic versus intrinsic value orientation. $n = 49$ for dropouts and $n = 101$ for non-dropouts. $df = 148$.

Condition Differences

To test the idea that nature exposure could increase intrinsic aspirations and environmental concern, while decreasing extrinsic and materialistic aspirations, I conducted many mixed ANOVA's. The following paragraphs report the results from the mixed ANOVA's in detail, but similar to Study 2, the results can be summarized here briefly: virtually all main effects of condition (nature or built) on the dependent measures were null. There were a few exceptions: (1) there was a main effect of condition on trait nature relatedness with the nature condition being higher (a failure of random assignment across conditions); (2) there was an interaction between time and condition predicting state nature relatedness (INS). At Time 2, participants in the nature condition reported higher state nature relatedness compared to Time 1, whereas participants in the built condition at Time 1 and 2 reported the lowest state nature relatedness; (3) in the built condition participants were higher in negative affect, compared to the nature condition; and (4) egoistic environmental concern was marginally lower in the built condition, compared to the nature condition. Unexpectedly, the time variable (Time 1 scores compared to Time 2 scores) was significant for many of the dependent measures. Specifically, participants in both conditions at Time 2 reported higher intrinsic aspirations, and lower extrinsic aspirations, marginally higher positive affect, a decrease in trait materialism, and an increase in altruistic and biospheric environmental concern. Efficient readers may wish to skip to hypothesis 6 [p. 117].

For hypothesis 2, a mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' trait materialism, across two time periods (Time 1/Time 2). There was a significant main effect for time, $F(1, 99) = 8.56, p = .004, \eta_p^2 = .08$ with both conditions showing a decrease in materialism at Time 2 (see Table 25). The main effect comparing the two types of conditions was not significant, $F(1, 99) = .16, p = .69, \eta_p^2 = .002$, suggesting participants across the two conditions had similar materialism scores. There was no significant interaction between time and condition, $F(1, 99) = 1.37, p = .25, \eta_p^2 = .014$, meaning the nature and built conditions did not differ over time. In other words, the effect of condition (nature or built condition) does not depend on time to predict materialism.

Table 25

Trait Materialism by Condition and Time

Time period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	3.27	.88	53	3.41	.95
Time 2	48	3.18	.92	53	3.18	.91

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' trait nature relatedness, across two time periods (Time 1/Time 2). There was no significant main effect of time, $F(1, 99) = .09, p = .77, \eta_p^2 = .001$ with both conditions showing similar scores on nature relatedness across the two time periods (see Table 26). The main effect comparing the two types of conditions was significant, $F(1, 99) = 5.70, p = .02, \eta_p^2 = .05$, with the nature condition showing higher scores on trait nature

relatedness, compared to the built condition. As previously mentioned, this seems to be a failure of random assignment across conditions. There was no significant interaction between time and condition, $F(1, 99) = 1.06, p = .31, \eta_p^2 = .01$.

Table 26

Trait Nature Relatedness by Condition and Time

Time Period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	3.31	.99	53	2.95	.96
Time 2	48	3.39	1.01	53	2.90	.85

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' state nature relatedness (INS), across two time periods (Time 1/Time 2). In the state nature relatedness question, participants were asked, how connected they felt to nature *at this moment in time*. There was a significant main effect of time, $F(1, 99) = 17.83, p = .000, \eta_p^2 = .15$ with both conditions showing an increase in state nature relatedness (see Table 27). The main effect comparing the two types of conditions was not significant, $F(1, 99) = 1.98, p = .16, \eta_p^2 = .02$, participants in the built and nature condition reported similar state nature relatedness scores when examining average state nature relatedness across the two time points. There was a significant interaction between time and condition, $F(1, 99) = 8.70, p = .004, \eta_p^2 = .08$, at Time 1, participants in the nature and built condition had similar state nature relatedness scores; however, at Time 2, participants in the nature condition reported higher state nature relatedness scores compared to participants in the built condition.

Table 27*State Nature Relatedness by Condition and Time*

		Nature			Built	
Time period	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	2.85	1.40	53	2.93	1.47
Time 2	48	3.92	1.71	53	3.11	1.47

For hypothesis 3, a mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' REIVO¹⁰, across two time periods (Time 1/Time 2). There was a significant main effect of time, $F(1, 99) = 13.37, p = .0004, \eta_p^2 = .12$ with both conditions showing an increase in REIVO (i.e., an increase in intrinsic aspirations relative to extrinsic aspirations) at Time 2 (see Table 28). The main effect comparing the two types of conditions was not significant, $F(1, 99) = 2.11, p = .15, \eta_p^2 = .02$, participants in the built and nature condition reported similar REIVO. There was no significant interaction between time and condition, $F(1, 99) = .009, p = .93, \eta_p^2 = .00009$.

Table 28*Aspirations by Condition and Time*

		Nature			Built	
Time period	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>

¹⁰ In Study 3, there was one immersion question that participants completed as part of the daily questionnaires. I tested this as a moderating variable (as Weinstein and colleagues did) to examine if the relationship between nature contact and relative intrinsic aspirations at Time 2 depended on immersion. The interaction term was not significant for predicting relative intrinsic aspirations ($B = .002, SE = .08, p = .99$).

Time 1	48	1.42	.86	53	1.17	.82
Time 2	48	1.59	.92	53	1.35	.80

For hypothesis 4, a mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' positive affect, across two time periods (Time 1/Time 2). There was a marginal main effect of time, $F(1, 99) = 3.20, p = .08, \eta_p^2 = .03$ with both conditions showing marginally higher positive affect at Time 2 (see Table 29). The main effect comparing the two conditions was not significant, $F(1, 99) = .99, p = .32, \eta_p^2 = .01$, participants in the built and nature condition reported similar positive affect. There was no significant interaction between time and condition, $F(1, 99) = .03, p = .87, \eta_p^2 = .00$.

Table 29

Positive Affect by Condition and Time

Time period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	3.38	.82	53	3.24	.95
Time 2	48	3.52	.88	53	3.35	.79

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' negative affect, across two time periods (Time 1/Time 2). There was no significant main effect of time, $F(1, 99) = 1.08, p = .31, \eta_p^2 = .01$ with both conditions showing similar negative affect across the two time periods (see Table 30). The main effect comparing the two types of conditions was significant, $F(1, 99) = 4.56, p = .04, \eta_p^2 = .04$, with the nature condition showing lower negative affect scores. However, this finding

may be a result of the random assignment failure (i.e., participants in the nature and built conditions already differed on key outcomes before the activities began). At Time 1, negative affect in the nature condition (2.15) is lower than the built condition (2.54). There was no significant interaction between time and condition, $F(1, 99) = 1.55, p = .22, \eta_p^2 = .02$.

Table 30

Negative Affect by Condition and Time

Nature				Built		
Time period	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	2.15	.62	53	2.54	.97
Time 2	48	2.16	.66	53	2.38	.90

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' pleasant affect, across two time periods (Time 1/Time 2). There was no significant main effect of time, $F(1, 99) = .53, p = .47, \eta_p^2 = .005$ with both conditions showing similar pleasant affect (see Table 31). The main effect comparing the two types of conditions was not significant, $F(1, 99) = .10, p = .75, \eta_p^2 = .001$, participants in the built and nature condition reported similar pleasant affect. There was no significant interaction between time and condition, $F(1, 99) = .76, p = .39, \eta_p^2 = .008$.

Table 31

Pleasant Affect by Condition and Time

Nature				Built		
Time period	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>

Time 1	48	3.10	.85	53	2.99	.92
Time 2	48	3.09	.91	53	3.10	.79

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' vitality, across two time periods (Time 1/Time 2). There was no significant main effect of time, $F(1, 99) = 1.66, p = .20, \eta_p^2 = .02$ with both conditions showing similar vitality across the two time periods (see Table 32). The main effect comparing the two types of conditions was not significant, $F(1, 99) = .24, p = .62, \eta_p^2 = .002$, participants in the built and nature condition reported similar vitality scores. There was no significant interaction between time and condition, $F(1, 99) = .18, p = .67, \eta_p^2 = .002$.

Table 32

Vitality by Condition and Time

Time period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	2.88	1.01	53	2.82	1.04
Time 2	48	3.02	1.16	53	2.89	1.00

For hypothesis 5, a mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' egoistic environmental concern, across two time periods (Time 1/Time 2). There was no significant main effect of time, $F(1, 99) = .16, p = .70, \eta_p^2 = .002$ with both conditions showing similar egoistic environmental concern across the two time periods (see Table 33). The main effect comparing the two types of conditions was marginally significant, $F(1, 99) = 3.03, p = .09, \eta_p^2 = .03$, with

the built condition showing lower egoistic environmental concern (again, this is likely a failure of random assignment). There was no significant interaction between time and condition, $F(1, 99) = .30, p = .59, \eta_p^2 = .003$.

Table 33

Egoistic Environmental Concern by Condition and Time

Time period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	5.63	1.56	53	5.10	1.52
Time 2	48	5.61	1.38	53	5.23	1.42

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' altruistic environmental concern, across two time periods (Time 1/Time 2). There was a significant main effect of time, $F(1, 99) = 5.50, p = .02, \eta_p^2 = .05$ with both conditions showing higher altruistic environmental concern at Time 2 (see Table 34). The main effect comparing the two types of conditions was not significant, $F(1, 99) = .89, p = .35, \eta_p^2 = .009$, participants in the built and nature condition reported similar altruistic environmental concern. There was no significant interaction between time and condition, $F(1, 99) = 1.30, p = .26, \eta_p^2 = .01$.

Table 34

Altruistic Environmental Concern by Condition and Time

Time period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>

Time 1	48	4.43	1.69	53	3.98	1.56
Time 2	48	4.61	1.77	53	5.52	1.50

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different conditions (nature/built) on participants' biospheric environmental concern, across two time periods (Time 1/Time 2). There was a significant main effect of time, $F(1, 99) = 13.98, p = .00, \eta_p^2 = .12$ with both conditions showing higher biospheric environmental concern at Time 2 (see Table 35). The main effect comparing the two types of conditions was not significant, $F(1, 99) = 1.85, p = .18, \eta_p^2 = .02$, participants in the built and nature condition reported similar biospheric environmental concern. There was no significant interaction between time and condition, $F(1, 99) = .02, p = .88, \eta_p^2 = .00$.

Table 35

Biospheric Environmental Concern by Condition and Time

Time period	Nature			Built		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Time 1	48	3.76	1.97	53	3.30	1.77
Time 2	48	4.32	1.88	53	3.91	1.53

For hypothesis 6, I hypothesized that trait nature relatedness would mediate the relationship between condition (nature vs. built) and REIVO.¹¹ Even though the conditions did

¹¹ Even though I did not hypothesize that state nature relatedness would mediate the relationship between condition and environmental concern, I tested this to be able to compare the results to Study 2 results. Nature relatedness did not significantly mediate the relationship between condition and egoistic environmental concern ($M = .002, SE = .02, 95\% CI -.04, .04$); altruistic

not differ on aspirations, I tested if the indirect pathway through trait nature relatedness was significant (MacKinnon et al., 2002; Preacher & Hayes, 2004; Shrout & Bolger, 2002). I used Montoya and Hayes' (2016) MEMORE macro for this within-subject mediation model or indirect pathway. The path is significant if the confidence interval does not include zero (the analyses here are completed with 5000 bootstrap resamples). Trait nature relatedness was not a significant indirect pathway between condition and REIVO ($M = .002$, $SE = .01$, 95% CI = $-.03$, $.01$). In this study, trait nature relatedness does not partly explain participants' aspirations.

For hypothesis 7, a chi-squared test for independence (with Yates Continuity Correction) was performed and found no relationship between condition (nature/built) and the frequency of selecting the experience prize (Le Nordik Spa), $\chi^2(1, n = 98) = .03$, $p = .87$, $\phi = -.04$. This means participants in the built and nature condition had similar preferences for the prizes (Le Nordik versus Nordstroms). In the nature condition 30% of participants selected Nordik Spa, compared to 33% of participants in the built condition. In the nature condition 70% of participants selected Nordstroms, compared to 67% participants in the built condition.

As an exploratory analysis, I conducted t-tests to examine whether prize selection (Nordstroms versus Nordik) predicted participants' aspirations at Time 2 (i.e., the independent and dependent variables reversed). Participants who selected Nordstroms ($n = 67$, $M = 1.28$, $SD = .83$) were also lower in REIVO compared to participants who selected Nordik ($n = 31$, $M = 1.92$, $SD = .77$), $t(96) = -3.62$, $p = .0005$. Although the sample size is uneven, this suggests that aspirations may be related to participants' preference for experiences (over products). In other words, people who prefer experiences may have higher intrinsic aspirations and lower extrinsic aspirations. This is speculative however and should be interpreted with caution. Future research

environmental concern ($M = -.006$, $SE = .03$, 95% CI $-.07$, $.05$); or biospheric environmental concern ($M = -.004$, $SE = .02$, 95% CI $-.06$, $.03$).

is needed to replicate this effect, especially with a more equal sample size between groups.

I also conducted t-tests to examine whether prize selection (Nordstroms versus Nordik) predicted participants' trait nature relatedness Time 2 (i.e., the independent and dependent variables reversed). Participants who selected Nordstroms ($n = 67$, $M = 3.05$, $SD = 1.01$) did not differ in trait nature relatedness compared to participants who selected Nordik ($n = 31$, $M = 3.32$, $SD = .85$), $t(96) = -1.26$, $p = .21$.

Demographic Variables

Similar to the previous studies, I completed a t-test to examine if where participants grew up (city versus small town/rural area/farm) predicted Time 1 REIVO. Participants who grew up in the city had lower REIVO ($M = 1.13$, $SD = .82$, $n = 66$), compared to participants who grew up in a small town, on a farm or in rural area ($M = 1.57$, $SD = .82$, $n = 34$; $t(98) = -2.52$, $p = .01$). Again this supports the idea that participants who grew up outside a city may value intrinsic aspirations more than extrinsic aspirations. I also conducted these analyses with Time 2 REIVO and found consistent results that participants who grew up in the city had lower REIVO ($M = 1.33$, $SD = .90$, $n = 66$) compared to participants who grew up in a small town, on a farm or in rural area ($M = 1.71$, $SD = .77$, $n = 34$; $t(98) = -2.10$, $p = .04$). However, a two-way ANCOVA controlling for where participants grew up (urban, small town, farm) did not show any significant differences across the nature or built condition at Time 1 REIVO ($F(1, 98) = 2.32$, $p = .13$) or at Time 2 REIVO ($F(1, 98) = 1.96$, $p = .17$).

Discussion Study 3

This study sought to extend past research by testing the relationship between nature exposure and aspirations over a longer period, rather than momentary effects. In Study 3, the relative aspirations, environmental concern, and trait measures of materialism and nature relatedness

generally correlated in the hypothesized manner according to the theoretical structures proposed by Grouzet et al. (2005) and Schwartz (1992). This demonstrates that at the trait level, these measures are related. However, when nature exposure and nature relatedness were manipulated to test cause and effect relationships, the results were mostly null. In other words, exposure to nature generally did not change aspirations, trait measures, mood, or environmental concern over the 10-day period, although there was some evidence that nature relatedness changed in hypothesized ways. These results are more difficult to understand because participants in nature were already higher on some dependent measures before the study began (i.e., failure to randomly assign which restricts the generalizability of the results). An interesting finding was that participants responded to the dependent measures at Time 2 in ways that were more beneficial to their well-being (e.g., higher intrinsic and lower extrinsic aspirations/materialism). This finding was unexpected and essentially the result I predicted from nature exposure and nature relatedness alone.

The nature intervention increased participant's state nature relatedness (INS) at Time 2 (an interaction between time and condition). In the state nature relatedness question, participants were asked how connected they felt to nature *at this moment in time*. This significant finding seems a bit odd then as participants completed the questionnaires the day after the last activity. This means that participants in the nature condition still felt connected to nature in the moment the day after the last activity. It is possible that because participants enjoyed the nature activities more (see Table 20) they were more likely to go outside even though the daily activities were over. Alternatively, they might have seen the question asking about connection to nature, thought about the previous daily activity in nature, and been more likely to respond in ways that reflected a higher connection to nature (or in a more socially desirable way). There was also a significant

main effect of condition on trait nature relatedness (the nature condition was higher at both time points compared to the built condition). This is most likely due to the failure to randomly assign participants across conditions.

For average mood, participants in the nature condition were not higher in positive affect, pleasant affect, or vitality. Overall, these results are inconsistent with past studies, which have found many momentary mood benefits of nature (e.g., meta-analysis by McMahan & Estes, 2015). This lack of replication may be a result of when participants completed the dependent measures. In past studies on nature, the dependent measures were usually measured directly after nature exposure (e.g., Weinstein et al., 2009), but in Study 3 it was not. In other words, time 2 dependent measures were measured the day after the last activity. This means some of the momentary benefits from nature exposure may have decreased. The average mood questionnaire asked participants to ‘indicate to what extent you have been feeling this way lately, over the past two weeks.’ This phrasing may make this questionnaire more trait-like, compared to state-like that may have been more likely to change in response to spending 20-minutes outside in nature. The null results with average moods may also suggest that the manipulation was not immersive enough (20 minutes per day is very little of participants waking time). Perhaps if the study design was more similar to the David Suzuki 30X30 challenge where participants spent 30 minutes outside for 30 days, that would be a long enough time frame to observe benefits.

In addition, participants may have invested less effort and attention towards the study because the instructions were online and participants were instructed to complete the daily activities on their own time. This may have caused problems with compliance (e.g., participants might have gone to their backyard for only half the time they were supposed to (i.e., 10 minutes) but then answered that they fully completed the daily activity). If participants only partly

completed the daily activities (e.g., by spending less time in the daily activities, and going to locations that do not meet the requirements of the study) this would have limited the overall effect of nature on mood, aspirations, and environmental concern.

Given this failure to detect differences across conditions for average mood levels it is not surprising that other dependent measures did not change either (e.g., aspirations, trait measures of both nature relatedness and materialism, and environmental concern). Stated another way, if nature did not lead to differences in dependent measures that are more robust or well-replicated, it is not surprising that other dependent measures (that have not been as reliably found) were not significantly different between conditions. Alternatively, the null relationship between nature and mood might be separate from the relationship between nature and aspirations. The relationship between nature and aspirations does not depend on an affective (or mood change) but on a different process or mechanism. Maybe as participants spend more time in nature, they felt more cognitively restored and this changed how and what they judged to be important (e.g., their aspirations). In other words, nature and feeling cognitively restored helps participants more clearly understand what is most important to them. Future research would need to examine various explanations (e.g., restoration) to test these relationships.

As discussed in Study 1 and 2 this lack of a conceptual replication for aspirations might also be due to differences in methodology between Weinstein et al. (2009) and my study (e.g., my study was online, not in person; and measured different variables). Specifically, Weinstein et al. (2009) measured these variables in a more state-like way (e.g., a 15-minute in-lab study); whereas Study 3 more examined these variables in a trait-like way across a 12-day period.

For environmental concerns, the built condition was marginally higher in egoistic environmental concern compared to the nature condition (this main effect is likely a failure of

random assignment). For altruistic and biospheric concern, there was no significant main effect of nature or interactions (although the environmental concern measure was not normally distributed making generalizations more difficult). It may also be that changing environmental concern takes education and understanding (e.g., learning about how our actions affect the natural environment) alongside with more intensive exposures to nature (e.g., longer time per day and over more days).

Significant changes across time

The time variable was significant for some measures of Study 3 across the nature and built condition (e.g., lower materialism and extrinsic aspirations, higher intrinsic aspirations, altruistic and biospheric environmental concern, and state nature relatedness (INS)). This was unexpected; I hypothesized that only participants in the nature condition would be lower in materialism and extrinsic aspirations, and subsequently higher in intrinsic aspirations. A possible interpretation could be that having time in between questionnaires (in this study 10 days), gives participants the opportunity to passively reflect on how they feel about these constructs and then respond in ways that are more beneficial for their well-being (or ways that they think might be more beneficial to their well-being e.g., most participants are probably aware of sayings such as ‘money doesn’t make you happy’). This explanation is supported by past research which found that reflecting on intrinsic goals increased intrinsic goals and well-being indices, while also decreasing materialistic desires (Lekes et al., 2012). In this study, participants were instructed to write on intrinsic goals over a 4-week reflection period. This reflection manipulation is much more immersive and active than Study 3, but reflection may still partly explain this finding.

A second interpretation might be that having participants be more mindful for a few minutes each day offered some benefits to all participants in Study 3. Mindfulness, an awareness and

acceptance of the present moment (Kabat-Zinn, 2005), is related to well-being and positive functioning (Brown & Ryan, 2003). In both conditions, participants were instructed to, 'look for colours and different textures in the environment. Listen for any sounds you can hear,' which may have been beneficial to participants' moods, aspirations, and materialism. This fits with previous research (Brown et al., 2009; Brown & Kasser, 2005) which found that trait mindfulness and mindfulness training, was related to participants' satisfaction with what money they had and this subsequently increased subjective well-being (Brown et al., 2009). In Study 3, the daily activities (with the mindfulness component) may have decreased extrinsic aspirations/materialism, and this subsequently increased intrinsic aspirations and mood. To explain this, Brown et al. (2009) reviewed three reasons why mindfulness might be beneficial for participants; (1) paying attention to the present moment (again similar to the instructions in Study 3) may increase participants' appreciation of the present moment and this decreases the degree that participants want extrinsically orientated goals (2) By paying attention to internal states, the awareness aspect of mindfulness, participants might also be more guided by internal wants compared to external pressures or advertisements (3) The acceptance aspect of mindfulness may also increase feelings of content with finances. This might be a research avenue for future studies to examine as I did not measure mindfulness in Study 3.

Third, it might be that participants responded in socially desirable ways to the questionnaires. In the informed consent of the study, participants were told that researchers were interested in how immersion in different environments related to well-being, personality, and attitudes. This may have lead to some demand in that participants thought researchers wanted to see a differences in the well-being, personality, and attitudes questionnaires. This means some participants may have indicated a positive change when completing the questionnaires for a

second time. This may partly explain some of the main effects of time (e.g., going to a Starbucks or mall probably does not change positive affect).

Correlational Relationships

The correlations presented in Study 3 are generally similar to the correlations in Study 2. REIVO correlated in hypothesized ways (negatively with materialism and positive with nature relatedness at Time 2) suggesting that people who are connected to nature have higher intrinsic and lower extrinsic aspirations. Nature relatedness was also negatively related with materialism supporting the idea that feeling connected to nature is in opposition to materialism. This relationship is consistent with the theoretical models proposed by Grouzet et al. (2005) and Schwartz, (1992); as well as the results in Mayer & Frantz (2004). Overall this correlation supports the idea of using interventions that increase trait nature relatedness to examine if this decreases materialism. However, based on Study 3 it is difficult to know if a 10-day intervention is long enough to increase trait nature relatedness due to the failure to randomly assign participants (i.e., the nature condition was higher on trait nature relatedness at both time periods). Future research is needed to further examine the length of time needed in nature to increase nature relatedness. Researchers could then examine if this increase in trait nature relatedness decreases materialism or if there are other variables that alter this relationship or explain why these variables are related.

It is somewhat surprising that REIVO did not correlate with any of the environmental concern measures (as in Study 2). The smaller sample size in Study 3, compared to Study 2, might partly explain this. Biospheric and altruistic environmental concern were related to nature relatedness, suggesting people who feel more connected to nature are more concerned about the environment for reasons beyond how it affects them personally. This is consistent with past

research (e.g., Cervinka et al., 2012; Clayton, 2003; Howard, 1997; Nisbet et al., 2009; Schultz, 2002) suggesting feeling connected to nature is a way to motivate environmental concern for reasons beyond the self. Trait materialism correlated negatively with biospheric environmental concern, at Time 2; and positively with egoistic environmental concern at Time 1. Even though these correlations were not consistent across time points, they may provide support to the idea that materialism is in opposition to environmental concern. This correlation between materialism and egoistic environmental concern also suggests that these variables measure some ‘focus on the self’ or self-enhancement values (Schwartz, 1992). Finally, raw intrinsic and extrinsic aspirations positively related at Time 1 (but were not related at Time 2). Again, this suggests that there is some positive association between the two (perhaps due to acquiescence bias).

Overall Study 3 found that 20-minutes a day in mostly urban green spaces may not be immersive enough to shift the perceived importance of aspirations for participants. The nature exposures may have needed to be more intense (e.g., longer and over more days) or may have needed nature that is out of participant’s routine (i.e., not just urban green spaces but forests that are outside participant’s routine). However, given the restrictions on compensation for undergraduates who participate in psychology studies, it was more difficult to ask participants to spend more time in nature. Another option would have been to ask participants to spend more time in nature but over fewer days to examine if more time in nature per day changed the outcomes (this would have also fit the compensation guidelines for undergraduate who complete psychological studies for course credit). Finally, the time delay from when participants completed the last daily activity and then began the final set of questionnaires may have been too long to observe any benefits of short exposures to nature. In other words, Study 3 used nature exposures that were similar to nature exposures used in previous research (e.g., Guéguen &

Stefan, 2014) but rather than measuring state variables, I attempted to measure some trait variables (trait materialism and nature relatedness) that may have required more time in nature to detect change.

General Discussion

The main goal of this dissertation was to examine if nature exposure decreased materialistic or extrinsic aspirations and increased intrinsic aspirations. A secondary goal was to examine if nature exposure increased mood and environmental concern (Study 2 – 3). A final goal was to examine if changes in nature relatedness explained part of this relationship between nature exposure and materialistic aspirations (Study 1 – 3). To accomplish these goals, participants were randomly assigned to a built environment or a natural environment in four separate studies. In the Pilot Study and Study 1, participants who completed a 20-minute nature walk, compared to a 20-minute indoor walk in a built setting, reported higher mood and state nature relatedness, but there were no significant differences in materialistic aspirations. In Study 2 participants who viewed nature photographs, compared to urban or built photographs, did not differ on measures of mood or nature relatedness, most likely due to the weaker nature manipulation. Consistent with the first two studies, there were no significant differences across conditions on materialistic aspirations. The environmental concern measure that was added in Study 2 also did not change after nature or advertisement photographs. Finally, in Study 3 participants were assigned to a multi-day nature experience or an architecture/urban design condition. Spending time in nature generally did not change materialistic aspirations, trait measures, mood, or environmental concern over the 10-day period. Across these four studies, exposing participants to nature (i.e., urban parks or photographs of nature) did not change materialistic aspirations or environmental concern. However, state nature relatedness was related

to intrinsic aspirations and lower extrinsic aspirations when measured in the Pilot Study, Study 1, and Study 3; suggesting a potential relationship. Trait nature relatedness was related to intrinsic aspirations and lower extrinsic aspirations in the Pilot Study and Study 3 (time 2). These two findings are both discussed below. Finally, only short walks in real nature increased mood and state nature relatedness.

These null results are interesting because they were built on empirical research in the area, and not based on a single finding or study (although Weinstein and colleagues (2009) was a key paper for guiding hypotheses). Specifically, there were three research areas that were used to develop the hypotheses. First, according to researchers in self-determination theory (SDT) intrinsic and extrinsic aspirations are conceptualized as in opposition to one another (Deci & Ryan, 1985, 2000; Kasser, 2002; Ryan & Deci, 2000). I examined Kasser's (2002) idea that promoting intrinsic goals, psychologically in opposition to extrinsic goals and materialism, would reduce materialistic aspirations. In addition, intrinsic aspirations were hypothesized to be associated with environmental concern (guided by Schwartz's (1992) value of universalism; and empirical studies by Schultz et al., 2005 and Stern & Dietz, 1994) supporting the idea that environmental concern may increase if intrinsic aspirations are increased. Second, I sought to extend the line of research demonstrating nature increases pro-social behaviours by testing if nature increased intrinsic aspirations in a similar manner as pro-sociality. I hypothesized that intrinsic aspirations and pro-sociality were similar in that they both involve thinking of others. Third, I tested the idea that spending time in nature would increase nature relatedness. Feeling connected to nature was then predicted to fulfill the basic needs of self-determination theory which would orient people towards behaviours that align with intrinsic goals. I hypothesized that individuals low in nature relatedness would be less likely to have their psychological needs met,

and this would motivate them to seek quick fixes (e.g., extrinsic goals) which would only further decrease their desire for nature and subsequently nature relatedness.

Self-determination Theory

Self-determination theory proposes that intrinsic and extrinsic aspirations are incompatible and psychologically in opposition to one another, which makes it difficult for individuals to achieve these goals concurrently (Grouzet et al., 2005; Kasser, 2002; Schwartz, 1992). Based on this incompatibility, I hypothesized the aspirations would be negatively correlated with one another indicating that as individuals valued intrinsic goals more, they valued extrinsic goals less. In this dissertation, the correlation between intrinsic and extrinsic aspirations varied depending on whether the aspirations were scored as *relative* aspirations or as *raw* aspirations. Relative aspirations correlated negatively, as predicted by the theoretical models. This negative correlation is partly a function of how relative aspirations are scored (mean-corrected), which is the scoring method recommended by Kasser (2016). Raw aspirations were positively correlated in most studies suggesting intrinsic and extrinsic aspirations may not be as opposed to each other as hypothesized. Specifically, in the Pilot Study the correlation between aspirations was moderately strong ($r = .37$), but this study was underpowered ($n = 49$), meaning it can be more difficult to obtain a true estimate of the relationship. In studies 1 - 3 the correlation between intrinsic and extrinsic aspirations was small or not significant (r 's = .17 - .26; although there were no negative correlations between intrinsic and extrinsic aspirations). The size of these correlations is similar to the size reported by Kasser and Ryan (1996), $r = .20 - .23$, suggesting there is a small positive relationship between intrinsic and extrinsic aspirations beyond the studies included in this dissertation. Although there may be some concern over the opposition between intrinsic and extrinsic goals, researchers have generally found that as

intrinsic aspirations increased, extrinsic decreased adding further support to the idea that intrinsic and extrinsic aspirations are incompatible (Bauer et al., 2012; Maio et al., 2009; Weinstein et al. 2009).

This positive correlation between raw intrinsic and extrinsic aspirations may be problematic as I hypothesized nature would decrease extrinsic aspirations by increasing intrinsic aspirations. This proposed pathway seems to rely on a negative correlation between intrinsic and extrinsic aspirations to test Kasser's (2002) idea that promoting intrinsic goals will decrease extrinsic goals. However, this positive correlation is not necessarily problematic. It is possible that participants rated and thought both intrinsic and extrinsic aspirations were important. To understand which is *more* important or prominent (after the nature manipulation), researchers recommend computing the relative indices (e.g., Kasser, 2016). The small positive correlation may also be a function of how the aspirations are worded. In the aspiration index, all goals are positively worded (i.e., there were no reverse-scored goals). This means as participants are completing the scale, some participants might be more likely to engage in the acquiescence bias and rate all goals as important to them. Other participants would be less likely to engage in the acquiescence bias and consequently rate all goals as less important to them. This difference in bias then explains a positive correlation between intrinsic and extrinsic goals. When items are worded negatively (or need to be reverse scored), it is more likely students think through each item carefully and decreases the probability that all goals will be rated as important (the acquiescence bias also tends to cancel out across items that are positively worded and negatively worded). Again, computing the relative indices is helpful because researchers can see what type of goal was most important to the participant, even if they judged all goals to be generally important. Second, it is possible that two variables are positively correlated even though one

causally decreases or inhibits the other. Intrinsic and extrinsic aspirations may appear positively correlated but are actually decreasing each other. Finally, participants may have thought many different types of goals were important, for example being financially successful (an extrinsic goal) and sharing your life with someone you love or having friends that you can count on (intrinsic goals) were commonly highly endorsed goals. Computing the relative importance (i.e., mean correct) helps understand which type of goal is *most* important to the participant. Also, according to self-determination theory, placing a high importance on extrinsic goals is not detrimental in and of itself, it is only when extrinsic goals are valued more than intrinsic goals that they negatively affect a person's well-being (Kasser & Ryan, 1993, 1996).

Nature and Pro-sociality

Second, I was attempting to extend the research demonstrating nature exposure increased generosity, helping behaviours, and cooperation (i.e., pro-sociality), by examining if nature exposure increased intrinsic aspirations to subsequently decrease materialistic aspirations. Overall, nature exposure was not related to aspirations (in this line of research) in the same manner as pro-sociality. The null findings between nature exposure and aspirations are somewhat surprising considering the nature exposures used in this dissertation are similar to the type of nature exposure and length of exposure used in previous research examining pro-social behaviours (e.g., Guéguen & Stefan, 2014; Raihani & Bshary, 2012; Weinstein, Przybylski, & Ryan, 2009; Zelenski, Dopko, & Calpadi, 2015; Zhang et al., 2014). In these studies, the nature exposures ranged from very small (e.g., nature photograph(s), or plants in the room) to bigger nature immersions (e.g., a short walk in a park, or a short video on nature). Stated another way, even though these nature exposures were not particularly strong or immersive, nature increased pro-social behaviours.

The null results presented in this dissertation suggest that intrinsic aspirations and pro-sociality are not as similar as hypothesized, or at least do not change in similar ways after nature exposure. Judging the importance of aspirations may be less likely to change in the moment compared to deciding to help someone in the moment; however, this explanation contradicts previous research that found aspirations change with small manipulations (e.g., reading over prime words/unscrambling words, or viewing photographs; Bauer et al., 2012; Maio et al., 2009; Weinstein et al. 2009). Aspirations seem to have a high test-retest over time (see Schmuck et al., 2000) suggesting a more trait like quality compared to the pro-social dependent measures used in previous research (e.g., helping someone pick up a glove; Guéguen & Stefan, 2014), donating \$5 (Weinstein et al., 2009), or deciding to restrain from fishing in a commons dilemma (Zelenski et al., 2015). So although materialistic aspirations can change, people may have overall or trait averages on the aspiration index that makes it more difficult to detect with questionnaires, compared to pro-social behaviours. In other words, pro-social behaviours have greater variability and are more responsive to changes (e.g., more state-like). Future research may wish to develop methods that rely less on a questionnaire format to assess the importance of goals or adapt the instructions so that the measure is about momentary choices. For example, maybe asking people to make a momentary choice about what is more important to them (e.g., watch a 10-minute video on how to make more money or watch a video on increasing acceptance or self-growth (i.e., mediation, forgiveness)).

It is also possible that to change aspirations at a more trait-like level, rather than momentary judgments as Weinstein et al. (2009) demonstrated, there needs to be bigger nature immersions than what was used in the pro-sociality research. A study design that is closer to Lekes et al. (2012) methodology could be more effective. In this study, approximately 100

participants were educated on the difference between intrinsic and extrinsic aspirations, and then participants in the intrinsic group were emailed instructions over a four-week period that encouraged them to write about and reflect on intrinsic values. Participants in the control group were emailed instructions that asked them to reflect on their daily activities and routine. After a month, participants in the intrinsic group had higher intrinsic values, lower extrinsic values and greater well-being (although these results were only significant for participants who were engaged with the task e.g., found the task interesting). Perhaps a month-long intervention with nature and including an educational component might be more effective for detecting changes in aspirations.

The relationship between nature and aspirations may also be more complex than originally hypothesized. Both Weinstein et al. (2009) and Lekes et al. (2012) found immersion or engagement to be an important component for their experimental manipulation on aspirations. This seems reasonable, if participants are not immersed or engaged in the experimental task, the benefits are more limited. In Weinstein et al (2009) and Lekes et al. (2012), immersion was not manipulated but was a personality trait that affected the outcomes. It could also be that immersion is a trait that is associated with relevant traits (e.g., suggestibility to that specific content), and this affects the outcomes as well. For example, some participants may find it easier to become immersed in various studies and this increases the benefits of that specific intervention. Stated another way, participants higher on traits of suggestibility or who have an easier time becoming immersed may show benefits and this is partly due to the manipulation but partly due to this personality trait. This is all very speculative, and remains an area for future research to examine the processes of immersion, and how interventions affect aspirations.

As previously discussed, this is a failure to conceptually replicate Weinstein and

colleagues' (2009) finding that nature photographs increased intrinsic aspirations and decreased extrinsic aspirations. This may be a result of methodology differences (e.g., the within versus between-subjects design, the role of immersion, or the difference in online versus in-lab study). In Weinstein and colleagues (2009), nature exposure interacted with immersion and was mediated by both autonomy and nature connection to predict higher intrinsic goals and lower extrinsic goals (i.e., a moderated mediation). These types of analyses are difficult to replicate due to many assumptions and the larger sample sizes needed (Fairchild & MacKinnon, 2009) perhaps partly explaining the null results here.

Beyond these methodology differences between this dissertation and Weinstein et al.'s (2009) study, this lack of replication may also be a result of publication bias (i.e., studies that have significant results are more likely to be published compared to studies that have null findings). This means published research may over-estimate the effect size and consistency of effects due to publication bias or the file drawer problem (Rosenthal, 1979; Simonsohn, Nelson, & Simmons, 2014a, 2014b; Simonsohn, 2015). Results may be more likely to be published if they are supportive of the researchers' main theories and less likely to be published if the ideas are not supportive to the researchers' main ideas. This is probably not the intention of researchers or the fault of researchers, instead the norms of publishing likely reinforce this pattern of reporting (Schimmack, 2014). It is only in recent years that psychology has begun to evaluate publication biases and attempted to more systematically replicate studies in psychology (and not all psychological studies are replicating; Pashler & Wagenmakers, 2012). It is possible that the nature and aspiration relationship does not replicate, or it may replicate, but researchers have not narrowed down the precise conditions where the relationship is the strongest or most consistent. Future research could examine these conditions.

This failure to conceptually replicate may also be due to older publishing requirements compared to the current publication process. Years ago, researchers were given freedom over what studies, conditions, and analyses they wished to report in the paper (i.e., researcher degrees of freedom). This means researchers could conduct studies but decide not to include them the final write up (most likely they were not statistically significant), and explore the dataset but only report the findings that were statistically significant (rather than all analyses that were conducted even if they were not significant). This can make it difficult to distinguish between true effects and chance findings. For example, psychology assumes there is 5% chance of finding false positives, but if researchers explore the dataset, or run additional analyses that were not hypothesized (possibly without replication or transparency), this can increase false positives to about 61% (Simmons, Nelson, & Simonsohn, 2011). These practices (e.g., researcher degrees of freedom) are beginning to improve. Beginning in 2011 social and personality psychology moved towards more transparency in data collection and analyses (e.g., Simmons, Nelson, & Simonsohn, 2011; 2013). Journals now encourage authors to post their hypotheses before data collection, to state explicitly how many studies they are conducting (and therefore reporting), and to post their power analyses. For example, *Psychological Science*, one of the most prestigious journals in psychology, included these requirements (or asked for a justification of why these requirements were not met): preregistration of studies (where researchers state the study details before data collection begins), and preregistration of analysis plans (where researchers specify the details of how they plan on analyzing the data; *Psychological Science*, 2017). This registration does not mean all researchers use or follow these guidelines, but there is greater awareness and understanding of the problem today compared to a decade ago.

To narrow down the precise conditions that the Weinstein and colleagues (2009) finding

replicates, researchers would need to conduct an exact replication (e.g., same photoset, pre/post design, and additional variables such as autonomy and immersion measured). Completing this exact replication would inform researchers if the results were a false positive finding, or if the results are a true finding but they require specific situations to replicate (i.e., there may be a hidden moderator or complex relationship). If it does replicate under these specific situations, then researchers could begin to conduct more conceptual replications (similar to this line of research) to further refine under what situations the effect is present and how generalizable the results may be. It is possible that something about the studies in this dissertation was too different from the methodology in Weinstein and colleagues, partly explaining why the effect did not replicate. Based on this dissertation, it seems that there may be some limits on the generalizability of the Weinstein and colleagues finding. For example, walking in nature for 20 minutes without controlling for immersion (among other variables) does not seem to increase intrinsic aspirations and decrease extrinsic aspirations (Pilot Study, Study 1); viewing photographs and/or with advertisements does not seem to increase intrinsic aspirations and decrease extrinsic aspirations (Study 2); and the effect of spending 20-minutes in nature over 10 days on aspirations may not last until the next day (Study 3). These results suggest the relationship between nature exposure and aspirations may be more limited.

Nature Relatedness

Finally, this dissertation built on the research area of nature relatedness. I examined if time in nature increased *trait* nature relatedness (Study 3 intervention) and if trait relatedness was related to aspirations (Pilot Study, Study 3). In Study 3, trait nature relatedness was difficult to assess because participants in the nature condition were already higher on nature relatedness at Time 1. Trait nature relatedness did correlate positively with REIVO (in the Pilot Study, and at

Time 2 in Study 3). This suggests that people who feel connected to nature at the trait level also value intrinsic aspirations more than extrinsic aspirations (although not at Time 1 in Study 3). In Study 3, nature relatedness also correlated negatively with materialism (at Time 1 and 2) suggesting they are less materialistic. Broadly, these results suggest that trait nature relatedness may be beneficial for fostering intrinsic goals and decreasing materialism.

I also examined if time in nature increased *state* nature relatedness (Pilot Study – Study 2). State nature relatedness was also malleable and increased in the moment with nature exposure (the exception was Study 2 where participants were exposed to nature photographs - the weakest nature manipulation of the four studies). This suggests that real nature might be more effective at increasing state nature relatedness. Next, I conducted correlations, mediations, and indirect path analyses to test if nature relatedness was related to aspirations. State nature relatedness was positively correlated with REIVO (in Pilot 1 and Study 1) suggesting individuals who are more connected to nature value intrinsic aspirations more than extrinsic aspirations. In Study 1, state nature relatedness had a significant indirect effect between nature exposure and aspirations suggesting participants' connection to nature may be more important than immediate nature exposure (considering nature exposure was not related to aspirations). This is broadly consistent with Weinstein et al. (2009) who found that nature relatedness was a significant mediator in their moderated mediation model. In Study 2, the mediation model or indirect pathway and correlations between nature relatedness and REIVO were not significant (the weaker manipulation with photos compared to real nature is a possible explanation).

These inconsistent results for the mediation models and indirect effects; and lack of between group differences for the nature and built conditions on aspirations makes it difficult to conclude there is a significant mediation or significant indirect effect here. The significant

mediation from Study 1, may have been significant because state nature relatedness has overlapping variance with nature and aspirations (essentially a third variable) but state nature relatedness may not be an indirect path in the study as there is no significant relationship to mediate (even though MacKinnon et al., 2002; Preacher & Hayes, 2004; Shrout & Bolger, 2002 recommend testing the mediation or indirect path). In other words, a reasonable conclusion (considering these four studies) might be that controlling for immediate nature exposure, participant's momentary nature relatedness predicts their REIVO scores. This might be more appropriate given that nature exposure was not related to aspirations in any of the studies.

These inconsistent mediation models may also highlight some of the problems with mediation models. Mediation models can be difficult to make causal inferences from because of the difficulty of manipulating one mediator without accidentally manipulating another variable (that is measured in the study design or not; Bullock, Green, & Ha, 2010). In my studies, I attempted to manipulate nature relatedness (with nature exposure), but it is possible a different third variable (e.g., vitality, cognitive restoration) was inadvertently manipulated and this contributed to the significant indirect effects. Mediation models may also be problematic because participants in a study may be affected by changes in the mediator (nature relatedness) and independent variable (nature exposure) differently and this also leads to higher estimates of the indirect effect (Bullock et al., 2010). This occurred in Weinstein et al. (2009) where participants who were more immersed in the nature photographs had higher intrinsic and lower extrinsic aspirations. Participants may vary in their levels of immersion and this creates heterogeneous groups that makes it more difficult to accurately estimate. Mediation analyses may need to be more closely examined in this line of research.

To further the research on nature relatedness, I also examined the relationship between

nature relatedness and environmental concern (Study 2 and 3). Trait nature relatedness was correlated with biospheric and altruistic reasons for being concerned about the environment (only at Time 1 however in Study 3), but not egoistic concern. This generally replicates past research which has reported a significant relationship between trait nature relatedness and environmental concern (Mayer & Frantz, 2004; Leary et al., 2008; Nisbet et al., 2009). State nature relatedness was not related to the subscales of environmental concern in this dissertation. Past research has examined the relationship between nature relatedness and environmental concern with *trait* nature relatedness and not *state* nature relatedness. This suggests that for changing environmental concern, fostering trait nature relatedness might be more effective (although it takes much more time). For example, trait nature relatedness and environmental concern may be more effectively fostered throughout childhood exposure to nature and/or through environmental education. This is consistent with past research which found that adults' pro-environmental behaviours, were found to depend on their childhood experiences in nature (Wells & Lekies, 2006). In this study, playing outside in wild nature (e.g., hiking, camping) and engaging in domesticated nature activities (e.g., gardening, caring for plants) before age 11 was found to predict pro-environmental attitudes and behaviours as an adult. However, pro-environmental behaviours are distinct from reasons why someone may be concerned about the environment, future research would need to systematically examine this relationship.

Throughout this dissertation, I conceptualized nature relatedness as a need, which when satisfied, leads to benefits (i.e., higher need satisfaction which orients people more towards intrinsic goals). The significant correlations between nature relatedness and REIVO support the idea that nature relatedness may orient people more towards behaviours that lead to intrinsic goals. Related to this idea, I conducted exploratory analyses examining if growing up in a rural

area (with presumably more nature) is related to higher intrinsic aspirations. People who grew up in a rural area may have their nature relatedness need met and this increases the likelihood that participants engage in behaviours that further fulfill their psychological needs (i.e., intrinsic aspirations). Overall, participants who grew up in a rural area, compared to an urban area, scored higher on intrinsic and lower on extrinsic aspirations (Study 1 – 3). This finding may further highlight the importance of nearby nature for the development of children's intrinsic aspirations. Of course, not all parents can move towards rural areas but future research could examine how summer camps and weekend activities may affect children's aspirations. Maybe taking breaks from urban environments over the summer and weekends is still positively related to intrinsic aspirations.

Broader Implications for Environmental Psychology

Across the four studies included in this dissertation, exposure to nature did not change aspirations, at least not in the way nature was manipulated and the way aspirations were measured; however, concluding that nature does not change aspirations seems premature without further research and/or study designs. In this dissertation, I used nature that was most likely lower on immersion (i.e., urban nature) but was easily assessable for participants. In future studies, researchers may wish to utilize more immersive nature as a reasonable way to change aspirations and environmental concern. Urban nature contains elements of nature (e.g., trees/shrubs, plants, flowers) but are most likely manicured by people, and contain less biodiversity. In contrast to urban nature, wild nature is generally non-manicured trees/plants and there is a higher probability of seeing wild plants or animals (i.e., a greater biodiversity). People living in the cities can typically access urban nature nearby but would have a more difficult time finding wild nature nearby. Wild nature might offer more benefits because of the more

immersive experiences (e.g., less people around, quieter than urban parks, an element of getting away, and people may find it easier stay longer). In other words, it is easier to become immersed in these environments as there are less distractions. According to attention restoration theory (Kaplan & Kaplan, 1989) natural environments are most beneficial if they contain (1) an element of being away (i.e., escape); (2) feelings of extend (i.e., feeling immersed in environment); (3) fascination (i.e., mind engaged with features of the environment); and (4) compatibility (i.e., easier to concentrate). If participants in these studies were going to nearby urban nature (parks, or the canal; places close to their work, and school where they still heard traffic and signs of human activity), this may have limited the benefits nature can have because participants are not away from their routine, most likely do not feel a sense of extend, fascination, or compatibility.

There is not a large body of research systematically examining wild nature. Of those that have, Kaplan and Kaplan (1989) describe the results of the Outdoor Challenge Program in Michigan. In this program, participants spent between 9 - 14 days in the wilderness while keeping journals that documented the change they experienced from their time in nature and answering short questionnaires (pre/during/post wilderness experience). The researchers found that participants wrote in their journals about developing concern for others and a desire to be closer and kinder to others (i.e., facets of intrinsic aspirations), they also wrote about a desire to be more involved in nature, to try to slow down, and simplify/consume less (Kaplan, 1974, 1983; Kaplan & Talbot, 1983; Talbot & Kaplan, 1986). This idea of simplifying and consuming less seems to be the opposite of materialism. In a more recent study, undergraduate participants felt a stronger sense of group cohesion and sense of community (an intrinsic aspiration) after a six-day wilderness trip (Breunig et al., 2008). However, these studies were not completed with an experimental design (or a control group), there was no random selection/assignment, and

sometimes the questionnaires were not well-validated. This means it is difficult to tell how effective wilderness trips are at changing sense of community without having a group for comparison.

Wild nature may also be more effective at increasing nature relatedness as some of the items from the nature relatedness scale ask specifically about wild nature (e.g., my ideal vacation spot would be a remote, wilderness area; the thought of being deep in the woods, away from civilization, is frightening (this second item is reversed scored)). This means that to be high on nature relatedness, people may also need exposure to wild nature and develop some connection to wild features of nature rather than only urban features. Thus, wild nature may be more effective at increasing trait nature relatedness which generally correlated with intrinsic aspirations and negatively correlated with extrinsic aspirations. In addition, growing up in rural areas, with presumably more access to wild nature, was related to higher intrinsic aspirations and lower extrinsic aspirations further supporting the potential of wild nature to contribute to happiness and well-being. Finally, wild nature compared to urban nature, seems more likely to contribute to people's understanding of nature, and how human actions affect nature. This in turn may motivate more environmental concern because people see the effects of human behaviours on the environment. This is consistent with past research that found children have higher pro-environmental behaviours as an adult if they played in wild nature as a child compared to domesticated nature activities (even though domesticated nature activities were still significantly related to pro-environmental behaviours; Wells & Lekies, 2006).

This idea of using specific types of nature to find specific benefits assumes that different types of nature might offer unique benefits. For example, urban nature may be more likely to lead to mood benefits, but perhaps wild nature may be more likely to lead to lasting social

benefits or pro-environmental behaviours. This is difficult to examine, however, because there is not a consistent definition of nature nor a breakdown of the essential elements that are needed to call an environment nature. To accomplish this, researchers would need to narrow down the specific elements of nature and detail what benefits they produce (i.e., a nature taxonomy). Again this is difficult because the benefit may not be apparent (or take years to observe), or the benefit may be impacted by other variables (i.e., an indirect relationship; Shanahan et al., 2015). Direct pathways with physical outcomes are easier to model, for example trees filter particulate matter leading to better health e.g., less respiratory illnesses (Shanahan et al., 2015). Indirect pathways are more difficult, especially if there are moderating factors. For example, living near urban nature (e.g., trees, parks) can provide a source of structural complexity (e.g., shrubs, trees, plants, or a body of water) and this restores directed attention to increase positive affect and well-being. But these benefits may depend on cultural background, social norms, and personal preferences. Therefore, under some conditions, these individuals may experience greater mental health due to their increased mood and increased cognitive resources (consistent with Attention Restoration Theory). There are most likely large individual differences in how individuals feel about nature that need to be further refined.

Researchers may also need to further specify the effects of nature (i.e., what is it exactly that nature is changing in people?) Currently in the literature it seems that nature leads to many positive effects but researchers have not narrowed down what specifically changes. This is similar to Shanahan's et al. (2015) idea that as the types of nature may need to be further nuanced, so might the effects of nature. As an example, nature seems to increase pro-social or helping behaviours but it is unclear if all pro-social behaviours increase or only a select few. There is evidence that people help someone else pick up a glove while in nature (Guéguen &

Stefan, 2014), donate money (Weinstein et al., 2009), and cooperate more (Zelenski et al., 2015). When these behaviours change, however, it is unclear whether they are changing because nature increases pro-sociality or for other reasons. An alternative interpretation may be that people are more cognitively restored when in nature meaning they are less distracted (ART; Kaplan & Kaplan, 1989) and better able to think through decisions. This highlights the importance of understanding the different processes of how nature changes dependent measures within the environmental research area.

Conclusion

Although nature exposure did not significantly decrease materialism or increase intrinsic aspirations and environmental concern (as manipulated and measured in this dissertation), there are reasons to be optimistic about the value of nature for human and environmental well-being. First, it is possible that nature exposures over a longer period of time with more immersive nature experiences (e.g., wild nature) are more beneficial compared to short, urban exposures. This highlights the need for future research to continue narrowing down the relationship and causal processes of nature exposure on dependent outcomes, including aspirations. Second, although this dissertation was not able to establish causality between nature and aspirations, these studies support Greenfield's (2013) idea that growing up in rural areas with presumably more access to nature, compared to urban areas, shape our values and aspirations. Perhaps nature exposure and materialistic aspirations are related as hypothesized but the relationship progresses over a much longer period of time. This of course, is tentative and requires much more research. Third, time in nature generally increased state nature relatedness and state nature relatedness was correlated with REIVO. Although trait nature relatedness was only measured in two studies, these findings were supportive of the idea that as people feel more connected to nature at the trait

level, they also reported higher intrinsic aspirations relative to extrinsic aspirations. Over time, as people spend time in nature and feel more connected to nature in the moment, this may lead to higher trait and state nature relatedness (e.g., Nisbet, 2013) highlighting the potential of nature relatedness for future interventions. Although correlational, this research highlights the usefulness of nature relatedness to encourage people to engage in behaviours that align with their own well-being, the well-being of others, and the environment.

References

- Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin*, 120, 338-375. doi:10.1037/0033-2909.120.3.338
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182. doi:10.1037/0022-3514.51.6.1173
- Bauer, M. A., Wilkie, J. E. B., Kim, J. K., & Bodenhausen, G. V. (2012). Cuing consumerism: Situational materialism undermines personal and social well-being. *Psychological Science*, 23, 517-523. doi:10.1177/0956797611429579
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological bulletin*, 117, 497-529. doi:10.1037/0033-2909.117.3.497
- Belk, R. W. (1985). Materialism: Trait aspects of living in the material world. *Journal of Consumer Research*, 12, 265-280. doi:10.1086/208515
- Berman M. G., Hout, M. C., Kardan O., Hunter M. R., Yourganov, G., Henderson J. M., ... Jonides, J. (2014). The Perception of Naturalness Correlates with Low-Level Visual Features of Environmental Scenes. *PLoS ONE*, 9, e114572. doi:10.1371/journal.pone.0114572
- Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, 19, 1207-1212. doi:10.1111/j.1467-9280.2008.02225.x
- Bringslimark, T., Hartig, T., & Patil, G. G. (2011). Adaptation to windowlessness: Do office workers compensate for a lack of visual access to the outdoors? *Environment and Behaviour*, 43, 469-487. doi:10.1177/0013916510368351
- Brown, K. W., & Kasser, T. (2005). Are psychological and ecological well-being compatible?

- The role of values, mindfulness, and lifestyle. *Social Indicators Research*, 74, 349-368.
doi:1007/s11205-004-8207-8
- Brown, K. W., Kasser, T., Ryan, R. M., Linley, P. A., & Orzech, K. (2009). When what one has is enough: Mindfulness, financial desire discrepancy, and subjective well-being. *Journal of Research in Personality*, 43, 727-736. doi:10.1016/j.jrp.2009.07.002
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84, 822-848.
doi:10.1037/0022-3514.84.4.822
- Breunig, M., O'Connell, T., Todd, S., Young, A., Anderson, L. & Anderson, D. (2008). Psychological sense of community and group cohesion on wilderness trips. *Journal of Experiential Education*, 30, 258–261. doi:10.1177/105382590703000307
- Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical Turk: A new source of inexpensive, yet high quality data? *Perspectives on Psychological Science*, 6, 3-5.
doi:10.1177/1745691610393980
- Bullock, J. G., Green, D. P., & Ha, S. E. (2010). Yes, but what's the mechanism? (Don't expect an easy answer). *Journal of Personality and Social Psychology*, 98, 550–558.
doi:10.1037/a0018933
- Burroughs, J. E., & Rindfleisch, A. (2002). Materialism and well-being: A conflicting values perspective. *Journal of Consumer Research*, 29, 348-370. doi:10.1086/344429
- Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafò, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, 14, 365-376. doi:10.1038/nrn3502
- Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature

- connectedness and happiness: A meta-analysis. *Frontiers in Psychology*, 5:976.
doi:10.3389/fpsyg.2014.00976
- Caprara, G. V., Alessandri, G., & Eisenberg, N. (2012). Prosociality: The contribution of traits, values, and self-efficacy beliefs. *Journal of Personality and Social Psychology*, 102, 1289-1303. doi:10.1037/a0025626
- Caprariello, P. A., & Reis, H. T. (2013). To do, to have, or to share? Valuing experiences over material possessions depends on the involvement of others. *Journal of Personality and Social Psychology*, 104, 199-215. doi:10.1037/a0030953
- Cervinka, R., Roderer, K., & Hefler, E. (2012). Are nature lovers happy? On various indicators of well-being and connectedness with nature. *Journal of Health Psychology*, 17, 379-388. doi:10.1177/1359105311416873
- Chang, L., & Arkin, R. M. (2002). Materialism as an attempt to cope with uncertainty. *Psychology & Marketing*, 19, 389-406. doi:10.1002/mar.10016
- Clayton, S. (2003). Environmental identity: A conceptual and operational definition. In S. Clayton & S. Opatow (Eds.), *Identity and the natural environment: The psychological significance of nature* (pp. 45-65). Cambridge, MA: MIT Press.
- Clifford, S. & Jerit, J. (2014). Is there a cost to convenience? An experimental comparison of data quality in laboratory and online studies, *Journal of Experimental Political Science*, 1, 120–131. doi:10.1017/xps.2014.5.
- Cohen, J. (1992). A power primer. *Psychological bulletin*, 112, 155-159. doi:10.1037/0033-2909.112.1.155
- Crompton, T., & Kasser, T. (2009). *Meeting Environmental Challenges: The Role of Human Identity*. Godalming, UK: WWF-UK, 2009.

Cumming, G. (2014). The new statistics: Why and how. *Psychological Science*, 25, 7-29.

doi:10.1177/0956797613504966

De Groot, J. I. M. & Steg, L. (2007). Value orientations and environmental beliefs in five countries: Validity of an instrument to measure egoistic, altruistic, and biospheric value orientations. *Journal of Cross-Cultural Psychology*, 38, 318-332.

doi:10.1177/0022022107300278

De Silva, P., Rachman, S., & Seligman, M. (1977). Prepared phobias and obsessions: Therapeutic outcome. *Behavioral Research and Therapy*, 15, 65–77. doi:10.1016/0005-7967(77)90089-4

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (1995). Human autonomy: The basis for true self-esteem. (pp. 31-49) Plenum Press, New York, NY.

Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.

doi:10.1207/S15327965PLI1104_01

Diener, E., & Oishi, S. (2000). Money and happiness: Income and subjective well-being across nations. In E. Diener & E. M. Suh (Eds.), *Subjective well-being across cultures* (pp. 185-218). Cambridge: MIT Press.

Dittmar, H., Bond, R., Hurst, M., & Kasser, T. (2014). The relationship between materialism and personal well-being: A meta-analysis. *Journal of Personality and Social Psychology*, 107, 879-924. doi:10.1037/a0037409

Donovan, G. H., & Prestemon, J. P. (2012). The effect of trees on crime in Portland, Oregon.

- Environment and Behavior*, 44, 3-30. doi:10.1177/0013916510383238
- Egger, C. J. (2017, June). *Attention moderates the beneficial effects of nature exposure for self but not other*. Poster presented at the meeting of International Positive Psychology Association, Montreal, QC.
- Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin*, 101, 91-119. doi:10.1037/0033-2909.101.1.91
- Emmons, R. A. (1986). Personal strivings: An approach to personality and subjective well-being. *Journal of Personality and Social Psychology*, 51, 1058–1068. doi:10.1037/0022-3514.51.5.1058
- Evans, G. W., & McCoy, J. M. (1998). When buildings don't work: The role of architecture in human health. *Journal of Environmental Psychology*, 18, 85-94. doi:10.1006/jevp.1998.0089
- Fairchild, A.J. & MacKinnon, D.P. (2009). A general model for testing mediation and moderation effects, *Prevention Science*, 10, 87-99. doi:10.1007/s11121-008-0109-6
- Fleeson, W. (2001). Toward a structure- and process-integrated view of personality: Traits as density distributions of states. *Journal of Personality and Social Psychology*, 80, 1011-1027. doi:10.1037/0022-3514.80.6.1011
- Fleeson, W. (2007). Situation-Based Contingencies Underlying Trait-Content Manifestation in Behaviour. *Journal of Personality*, 75, 825- 862. doi:10.1111/j.1467-6494.2007.00458.x
- Frumkin, H. (2001). Beyond toxicity: human health and the natural environment. *American journal of preventive medicine*, 20, 234-240. doi:10.1016/S0749-3797(00)00317-2
- Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L. (2010). Upward spirals of positive emotions counter downward spirals of negativity: Insights

- from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology. *Clinical Psychology Review*, 30, 849-864. doi:10.1016/j.cpr.2010.03.002
- Gosling, S. D., Vazire, S., Srivastava, S., & John, O. P. (2004). Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. *American Psychologist*, 59, 93-104. doi:10.1037/0003-066X.59.2.93
- Gould, S. J. J., Cox, A. L., Brumby, D. P., & Wiseman, S. (2015). Home is where the lab is: A comparison of online and lab data from a time-sensitive study of interruption. *Human Computation*, 2, 45-67. doi:10.15346/hc.v2i1.4
- Greenberg, J., Pyszczynski, T., Solomon, S., Rosenblatt, A., Veeder, M., Kirkland, S., & Lyon, D. (1990). Evidence for terror management theory II: The effects of mortality salience on reactions to those who threaten or bolster the cultural worldview. *Journal of Personality and Social Psychology*, 58, 308-318. doi:10.1037/0022-3514.58.2.308
- Greenfield, P. M. (2013). The changing psychology of culture from 1800 through 2000. *Psychological Science*, 24, 1722-1731. doi: 10.1177/0956797613479387
- Grouzet, F. M. E., Kasser, T., Ahuvia, A., Dols, J. M. F., Kim, Y., Lau, S., . . . Sheldon, K. M. (2005). The structure of goal contents across 15 cultures. *Journal of Personality and Social Psychology*, 89, 800-816. doi:10.1037/0022-3514.89.5.800
- Guéguen, N., & Stefan, J. (2014). "Green altruism": Short immersion in natural green environments and helping behavior. *Environment and Behavior*, 48, 324-342. doi:10.1177/0013916514536576.
- Guéguen, N., Stefan, J., Jacob, C., & Sobiecki, M. (2014). She wore a red/white flower in her hair: The effect of hair ornamentation on compliance with a survey request. *Marketing*

Bulletin, 25.

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*, 23, 109-123.

doi:10.1016/S0272-4944(02)00109-3

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, 76, 408-420.

doi:10.1080/03637750903310360

Hayes, A. F. (2013). PROCESS macro for SPSS and SAS [SPSS code and syntax file]. Retrieved from <http://www.processmacro.org/index.html>

Heatherton, T. F., & Polivy, J. (1991). Development and validation of a scale for measuring state self-esteem. *Journal of Personality and Social Psychology*, 60, 895-910.

doi:10.1037/0022-3514.60.6.895

Hirsh, J. B., & Dolderman, D. (2007). Personality predictors of consumerism and environmentalism: A preliminary study. *Personality and Individual Differences*, 43,

1583-1593. doi:10.1016/j.paid.2007.04.015

Howard, G. S. (1997). Ecological psychology: Creating a more earth-friendly human nature. Notre Dame, IN: University of Notre Dame Press.

Howell, A. J., Dopko, R. L., Passmore, H., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences*,

51, 166-171. doi:10.1016/j.paid.2011.03.037

Howell, A. J., Passmore, H., & Buro, K. (2013). Meaning in nature: Meaning in life as a mediator of the relationship between nature connectedness and well-being. *Journal of*

Happiness Studies, 14, 1681-1696. doi:10.1007/s10902-012-9403-x

- Howell, R. T., & Hill, G. (2009). The mediators of experiential purchases: Determining the impact of psychological needs satisfaction and social comparison. *The Journal of Positive Psychology*, 4, 511-522. doi:10.1080/17439760903270993
- Howell, R. T., Pchelin, P., & Iyer, R. (2012). The preference for experiences over possessions: Measurement and construct validation of the experiential buying tendency scale. *The Journal of Positive Psychology*, 7, 57-71. doi:10.1080/17439760.2011.626791
- Hurst, M., Dittmar, H., Bond, R., & Kasser, T. (2013). The relationship between materialistic values and environmental attitudes and behaviors: A meta-analysis. *Journal of Environmental Psychology*, 36, 257-269. doi:10.1016/j.jenvp.2013.09.003
- John, O. P., & Srivastava, S. (1999). The big five inventory. In L.A. Pervin & O.P. John (Eds.), *Handbook of personality: Theory and research* (p.132). New York: Guilford Press.
- Kabat-Zinn, J. (2005). Wherever you go, there you are: Mindfulness meditation in everyday life (10th Edition). New York: NY: Hyperion.
- Kahn, P. H., Jr. (2011). Technological nature: Adaptation and the future of human life. Cambridge, MA: MIT Press.
- Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behavior*, 31, 178-202. doi:10.1177/00139169921972056
- Kanner, A. D., & Gomes, M. E. (1995). The all-consuming self. In T. Roszak, M.E. Gomes, & A. D. Kanner (Eds.), *Ecopsychology: Restoring the earth healing the mind*. San Francisco: Sierra Club Books.
- Kaplan, R. (1974). Some psychological benefits of an outdoor challenge program. *Environment and Behaviour*, 6, 101-116. doi:10.1177/001391657400600107

- Kaplan, S. (1983). A model of person-environment compatibility. *Environment and Behaviour*, 15, 311-332. doi:10.1177/0013916583153003
- Kaplan, S., & Berman, M. G. (2010). Directed attention as a common resource for executive functioning and self-regulation. *Perspectives on Psychological Science*, 5, 43-57. doi:10.1177/1745691609356784
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge, UK: Cambridge University Press.
- Kaplan, S., & Kaplan, R. (2003). Health, supportive environments, and the reasonable person model. *American Journal of Public Health*, 93, 1484-1489. doi:10.2105/AJPH.93.9.1484
- Kaplan, S., & Kaplan, R. (2009). Creating a larger role for environmental psychology: The reasonable person model as an integrative framework. *Journal of Environmental Psychology*, 29, 329-339. doi:10.1016/j.jenvp.2008.10.005
- Kaplan, S., & Talbot, J. F. (1983). Psychological benefits of a wilderness experience. In I. Altman and J. F. Wohlwill (Eds.), *Behavior and the Natural Environment*, Vol VI of *Human Behaviour and Environment*, New York: Plenum.
- Karabati, S., & Cemalcilar, Z. (2010). Values, materialism, and well-being: A study with Turkish university students. *Journal of Economic Psychology*, 31, 624-633. doi:10.1016/j.joep.2010.04.007
- Kasser, T. (2002). Sketches for a self-determination theory of values. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 123 – 140). Rochester, NY: University of Rochester Press.
- Kasser, T. (2006). Materialism and its alternatives. In M. Csikszentmihalyi & I. Csikszentmihalyi (Eds.), *A life worth living: Contributions to positive psychology* (pp.

- 200-214). Toronto, Canada: Oxford University Press.
- Kasser, T. (2009). Values and ecological sustainability: Recent research and policy possibilities. In S. R. Kellert & J. G. Speth (Eds.), *The coming transformation: Values to sustain human and natural communities* (pp. 180–204). New Haven, CT: Yale School of Forestry & Environmental Studies.
- Kasser, T. (2016, June 1). *Aspiration Index*. Retrieved from <http://faculty.knox.edu/tkasser/aspirations.html>
- Kasser, T., & Ryan, R. M. (1993). A dark side of the American dream: Correlates of financial success as a central life aspiration. *Journal of Personality and Social Psychology*, 65, 410-422. doi:10.1037/0022-3514.65.2.410
- Kasser, T., & Ryan, R. M. (1996). Further examining the American dream: Differential correlates of intrinsic and extrinsic goals. *Personality and Social Psychology Bulletin*, 22, 280-287. doi:10.1177/0146167296223006
- Kasser, T., & Ryan, R. M. (2001). Be careful what you wish for: Optimal functioning and the relative attainment of intrinsic and extrinsic goals. In P. Schmuck & K. M. Sheldon (Eds.), *Life goals and well-being: Towards a positive psychology of human striving* (pp. 116-131). Gottingen: Hogrefe & Huber Publishers.
- Kasser, T., Ryan, R. M., Couchman, C. E., & Sheldon, K. M. (2004). Materialistic values: Their causes and consequences. In T. Kasser & A. D. Kanner (Eds.), *Psychology and consumer culture: The struggle for a good life in a materialistic world* (pp. 11 - 28). Washington, DC: American Psychological Association.
- Kasser, T., Rosenblum, K. L., Sameroff, A. J., Deci, E. L., Niemiec, C. P., Ryan, R. M., ... Hawks, S. (2014). Changes in materialism, changes in psychological well-being:

- Evidence from three longitudinal studies and an intervention experiment. *Motivation and Emotion*, 38, 1-22. doi: 10.1007/s11031-013-9371-4
- Kasser, T., & Sheldon, K. M. (2000). Of wealth and death: Materialism, mortality salience, and consumptive behavior. *Psychological Science*, 11, 348-351. doi:10.1111/1467-9280.00269
- Kasser, T., & Sheldon, K. M. (2002). What makes for a merry Christmas? *Journal of Happiness Studies*, 3, 313-329.
- Katcher, A., & Beck, A. (1987). Health and Caring for Living Things. *Anthrozoos*, 1, 175-183. doi:10.2752/089279388787058461
- Kay, A. C., Wheeler, S. C., Bargh, J. A., & Ross, L. (2004). Material priming: The influence of mundane physical objects on situational construal and competitive behavioral choice. *Organizational Behavior and Human Decision Processes*, 95, 83-96. doi:10.1016/j.obhdp.2004.06.003
- Kellert, S. R. (1997). *Kinship to mastery: Biophilia in human evolution and development*. Washington, DC: Island Press.
- Kesebir, S., & Kesebir, P. (2017). A Growing Disconnection From Nature Is Evident in Cultural Products. *Perspectives on Psychological Science*, 12, 258–269. doi:10.1177/1745691616662473
- Kingsley, J., & Townsend M. (2006). “Dig in” to social capital: Community gardens as mechanisms for growing urban social connectedness. *Urban Policy and Research*, 24, 525–537. doi:10.1080/08111140601035200.
- Kuo, F., & Faber-Taylor, A. (2004). A potential natural treatment for attention-deficit/hyperactive disorder. Evidence from a national study. *American Journal of Public*

- Health*. 94, 1580-1586. doi:10.2105/AJPH.94.9.1580
- Kuo, F. E., & Sullivan, W. C. (2001). Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behavior*, 33, 343-367.
doi:10.1177/00139160121973025
- Lambert, N. M., Fincham, F. D., Stillman, T. F., & Dean, L. R. (2009). More gratitude, less materialism: The mediating role of life satisfaction. *The Journal of Positive Psychology*, 4, 32-42. doi:10.1080/17439760802216311
- Leary, M. R., Tipsord, J. M., & Tate, E. B. (2008). Allo-inclusive identity: Incorporating the social and natural worlds into one's sense of self. In H. A. Wayment & J. J. Bauer (Eds.). *Transcending self-interest: Psychological explorations of the quiet ego* (pp. 137-147). Washington: APA
- Lekes, N., Hope, N. H., Gouveia, L., Koestner, R., & Philippe, F. L. (2012). Influencing value priorities and increasing well-being: The effects of reflecting on intrinsic values. *The Journal of Positive Psychology*, 7, 249-261. doi:10.1080/17439760.2012.677468
- Leonard, A. (2011). *The story of stuff: How our obsession with stuff is trashing the planet, our communities, and our health- And a vision for change*. New York: Free Press.
- Lerner, J. S., Small, D. A., & Loewenstein, G. (2004). Heart strings and purse strings: Carry-over effects of emotions on economic transactions. *Psychological Science*, 15, 337-341.
- Louv, R. (2005). *Last child in the woods: Saving our children from nature-deficit disorder*. Chapel Hill, NC: Algonquin.
- Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin*, 131, 803-855.
- MacKerron, G., & Mourato, S. (2013). Happiness is greater in natural environments. *Global*

- Environmental Change*, 23, 992-1000. doi:10.1016/j.gloenvcha.2013.03.010
- Maio, G. R., Pakizeh, A., Cheung, W., & Rees, K. J. (2009). Changing, priming, and acting on values: Effects via motivational relations in a circular model. *Journal of Personality and Social Psychology*, 97, 699-715. doi:10.1037/a0016420
- Maller, C., Townsend, M., Pryor, A., Brown, P., & St Leger, L. (2006). Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International*, 21, 45-54. doi:10.1093/heapro/dai032
- Mayer, F. S., & Frantz, C. M. (2004). The Connectedness to Nature Scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, 24, 504-515. doi:10.1016/j.jenvp.2004.10.001
- Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior*, 41, 607-643. doi:10.1177/0013916508319745
- Maxwell, S. E. (2004). The persistence of underpowered studies in psychological research: Causes, consequences, and remedies. *Psychological Methods*, 9, 147-163. doi:10.1037/1082-989X.9.2.147
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7, 83-104. doi:10.1037/1082-989X.7.1.83
- McMahan, E. A., & Estes, D. (2015). The effect of contact with natural environments on positive and negative affect: A meta-analysis. *The Journal of Positive Psychology*, 10, 507-519. doi:10.1080/17439760.2014.994224
- Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health

- inequalities: An observational population study. *The Lancet*, 372, 1655-1660.
- Montoya, A. K., & Hayes, A. F. (2017). Two-condition within-participant statistical mediation analysis: A path-analytic framework. *Psychological Methods*, 22, 6-27.
doi:10.1037/met0000086
- Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The path taken: Consequences of attaining intrinsic and extrinsic aspirations in post-college life. *Journal of Research in Personality*, 43, 291-306. doi:10.1016/j.jrp.2008.09.001
- Nisbet, E. K. (2011). *A nature relatedness intervention to promote happiness and environmental concern*. (Unpublished doctoral dissertation). Carleton University, Ottawa, Canada.
- Nisbet, E. K. (2013). *David Suzuki Foundation 30x30 Nature Challenge: English survey*.
Available online at: <http://goo.gl/5vpmG8>
- Nisbet, E. K., & Zelenski, J. M. (2013). The NR-6: A new brief measure of nature relatedness. *Frontiers in Psychology*, 4. doi:10.3389/fpsyg.2013.00813
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior*, 41, 715-740. doi:10.1177/0013916508318748
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies*, 12, 303-322. doi:10.1007/s10902-010-9197-7
- O'Brien, C. (2008). Sustainable happiness: How happiness studies can contribute to a more sustainable future. *Canadian Psychology/Psychologie canadienne*, 49, 289-295.
doi:10.1037/a0013235
- O'Brien, C. (2013). Happiness and Sustainability Together at Last! *Canadian Journal of*

Education, 36, 228-256.

Pashler, H., & Wagenmakers, E. J. (2012). Editors' introduction to the special section on replicability in psychological science: a crisis of confidence? *Perspectives on Psychological Science* 7, 528–530. doi:10.1177/1745691612465253

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments & Computers*, 36, 717-731. doi:10.3758/BF03206553

Psychological Science (2017). *Sharing Data and Materials in Psychological Science*.
<http://journals.sagepub.com/doi/full/10.1177/0956797617704015>

Raihani, N. J., & Bshary, R. (2012). A positive effect of flowers rather than eye images in a large-scale, cross-cultural dictator game. *Proceedings of the Royal Society B Series*, 279, 3556-3564. doi:10.1098/rspb.2012.0758

Richins, M. L. (2004). The material values scale: Measurement properties and development of a short form. *Journal of Consumer Research*, 31, 209-219. doi:10.1086/383436

Richins, M. L. & Dawson, S. (1992). A consumer values orientation for materialism and its measurement: Scale development and validation. *Journal of Consumer Research*, 19, 303–316. doi:10.1086/209304

Rindfleisch, A., Burroughs, J. E., & Denton, F. (1997). Family structure, materialism, and compulsive consumption. *Journal of Consumer Research*, 23, 312-325.
doi:10.1086/209486

Rogers, C. (1959). A theory of therapy, personality and interpersonal relationships as developed in the client-centered framework. In (ed.) S. Koch, *Psychology: A study of a science. Vol. 3: Formulations of the person and the social context*. New York: McGraw Hill.

- Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, 86, 638-641. doi:10.1037/0033-2909.86.3.638
- Roszak, T. (1995). Where psyche meets Gaia. In T. Roszak, M.E. Gomes, & A. D. Kanner (Eds.), *Ecopsychology: Restoring the earth healing the mind*. San Francisco: Sierra Club Books.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55, 68-78. doi:10.1037/0003-066X.55.1.68
- Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality*, 65, 528-565. doi:10.1111/j.1467-6494.1997.tb00326.x
- Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. *Journal of Personality and Social Psychology*, 45, 736-750. doi:10.1037/0022-3514.45.4.736
- Ryan, R. M., Sheldon, K. M., Kasser, T., & Deci, E. L. (1996). All goals are not created equal: An organismic perspective on the nature of goals and their regulation. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 7-26). New York: Guilford Press.
- Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagné, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology*, 30, 159-168. doi:10.1016/j.jenvp.2009.10.009
- Saunders, S., & Munro, D. (2000). The construction and validation of a consumer orientation questionnaire (SCOI) designed to measure Fromm (1955) 'marketing character' in

- Australia. *Social Behavior and Personality*, 28, 219-240. doi:10.2224/sbp.2000.28.3.219
- Schimmack, U. (2014). Quantifying Statistical Research Integrity: The Replicability Index. *Unpublished manuscript*.
- Schroeder, J. E., & Dugal, S. S. (1995). Psychological correlates of the materialism construct. *Journal of Social Behavior & Personality*, 10, 243-253.
- Schultz, P. W. (2001). Assessing the structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, 21, 1-13.
- Schultz, P. W. (2002). Inclusion with nature: The psychology of human-nature relations. In P. Schmuck & W. P. Schultz (Eds.), *Psychology of sustainable development* (pp. 62-78). Norwell, MA: Kluwer Academic.
- Schultz, P. W., Gouveia, V. V., Cameron, L. D., Tankha, G., Schmuck, P., & Franěk, M. (2005). Values and their relationship to environmental concern and conservation behavior. *Journal of Cross-Cultural Psychology*, 36, 457-475. doi:10.1177/0022022105275962
- Schmuck, P., Kasser, T., & Ryan, R. M. (2000). The relationship of well-being to intrinsic and extrinsic goals in Germany and the U.S. *Social Indicators Research*, 50, 225-241. doi:10.1023/A:1007084005278
- Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 25, pp. 1 – 65). Orlando, FL: Academic Press.
- Schwartz, S. H. (1996). Value priorities and behavior: Applying the theory of integrated value systems (Vol. 8). Mahwah, NJ: Erlbaum.
- Selhub, E. M., and Logan, A. C. (2012). *Your brain on nature*. Mississauga, ON: John Wiley and Sons Canada, Ltd.

- Sevgili, F., & Cesur, S. (2014). The mediating role of materialism on the relationship between values and consumption. *Educational Sciences: Theory and Practice*, 14, 2083-2096.
- Shanahan, D. F., Lin, B. B., Bush, R., Gaston, K. J., Dean, J. H., Barber, E., & Fuller, R. A. (2015). Toward improved public health outcomes from urban nature. *American Journal of Public Health*, 105, 470-477. doi:10.2105/AJPH.2014.302324
- Shavit, T., Shahrabani, S., & Benzion, U. (2006). WTP-WTA disparity among competitive and non-competitive subjects – An experimental study. *Applied Financial Economic Letters*, 2, 333-336.
- Sheldon, K. M., Gunz, A., Nichols, C. P., & Ferguson, Y. (2010). Extrinsic value orientation and affective forecasting: Overestimating the rewards, underestimating the costs. *Journal of Personality*, 78, 149-178. doi:10.1111/j.1467-6494.2009.00612.x
- Sheldon, K. M., & Kasser, T. (1995). Coherence and congruence: Two aspects of personality integration. *Journal of Personality and Social Psychology*, 68, 531-543. doi:10.1037/0022-3514.68.3.531
- Sheldon, K. M., & Kasser, T. (2008). Psychological threat and extrinsic goal striving. *Motivation and Emotion*, 32, 37-45. doi:10.1007/s11031-008-9081-5
- Sheldon, K. M., & McGregor, H. A. (2000). Extrinsic value orientation and “the tragedy of the commons.” *Journal of Personality*, 68, 383-411. doi:10.1111/1467-6494.00101
- Sheldon, K. M., Nichols, C. P., & Kasser, T. (2011). Americans recommend smaller ecological footprints when reminded of intrinsic American values of self-expression, family, and generosity. *Ecopsychology*, 3, 97-104. doi:10.1089/eco.2010.0078
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7, 422-445.

doi:10.1037/1082-989X.7.4.422

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant.

Psychological Science, 22, 1359-1366. doi:10.1177/0956797611417632

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2013, January). *Life after p-hacking*. Paper presented at the meeting of the Society for Personality and Social Psychology, New Orleans, LA.

Simonsohn, U. (2015). Small telescopes: Detectability and the evaluation of replication results.

Psychological Science, 26, 559-569. doi:10.1177/0956797614567341

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014a). p-curve: A key to the file-drawer.

Journal of Experimental Psychology: General, 143, 534-547.

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014b). p-curve and effect size: Correcting for publication bias using only significant results. *Perspectives on Psychological Science*, 9, 666-681.

Solberg, E. C., Diener, E., & Robinson, M. (2004). Why are materialists less satisfied? In T.

Kasser & A. D. Kanner (Eds.), *Psychology and consumer culture: The struggle for a good life in a materialistic world* (pp. 29-48). Washington, DC: American Psychological Association.

Soper, D. (2006). Post-hoc Statistical Power Calculator for a Student t-Tests [online calculator].

Available from: <http://www.danielsoper.com/statcalc3/calc.aspx?id=49>

Stefan, J., & Guéguen, N. (2014). Effect of hair ornamentation on helping. *Psychological*

Reports, 114, 491-495. doi:10.2466/21.17.PR0.114k18w8

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review

- and research agenda. *Journal of environmental psychology*, 29, 309-317.
doi:10.1016/j.jenvp.2008.10.004
- Stern, P. C., & Dietz, T. (1994). The value basis of environmental concern. *Journal of Social Issues*, 50, 65-84. doi:10.1111/j.1540-4560.1994.tb02420.x
- Stigsdotter, U. K., Ekholm, O., Schipperijn, J., Toftager, M., Kamper-Jørgensen, F., & Randrup, T. B. (2010). Health promoting outdoor environments—Associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey. *Scandinavian Journal of Public Health*, 38, 411-417.
doi:10.1177/1403494810367468
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics, 6th ed.* Boston: Pearson.
- Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: The importance of walkable green spaces. *Journal of Epidemiology and Community Health*, 56, 913-918. doi:10.1136/jech.56.12.913
- Talbot, J. F., & Kaplan, S. (1986). Perspectives on wilderness: Re-examining the value of extended wilderness experiences. *Journal of Environmental Psychology*, 6, 177-188.
doi:10.1016/S0272-4944(86)80021-4
- Tam, K. P. (2013). Concepts and measures related to connection to nature: Similarities and differences. *Journal of Environmental Psychology*, 34, 64-78.
doi:10.1016/j.jenvp.2013.01.004
- Taylor, A. F., & Kuo, F.E. (2009). Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders*, 12, 402-409. doi:10.1177/1087054708323000
- Tsunetsugu, Y., Park, B. J., & Miyazaki, Y. (2010). Trends in research related to “Shinrin-yoku” (taking in the forest atmosphere or forest bathing) in Japan. *Environmental Health*

- Prevention*, 15, 27-37. doi:10.1007/s12199-009-0091-z
- Twenge, J. M., & Kasser, T. (2013). Generational changes in materialism and work centrality, 1976-2007: Associations with temporal changes in societal insecurity and materialistic role modeling. *Personality and Social Psychology Bulletin*, 39, 883-897. doi:10.1177/0146167213484586
- Ulrich, R. S. (1981). Natural versus urban scenes: Some psychophysiological effects. *Environment and Behavior*, 13, 523-556. doi:10.1177/0013916581135001
- Ulrich, R. S. (1993). Biophilia, biophobia, and natural landscapes. In S. Kellert & E. O. Wilson (Eds.), *The biophilia hypothesis* (pp. 73-137). Washington, DC: Island Press.
- United Nations Population Division. (2011). *World Urbanization Prospects, the 2011 Revision*. New York, NY: United Nations Population Division. Retrieved from http://esa.un.org/unup/pdf/WUP2011_Highlights.pdf
- van den Berg, A. E., Koole, S. L., & van der Wal, A. J. (2003). Environment preference and restoration: (how) are they related? *Journal of Environmental Psychology*, 23, 135-146. doi:10.1016/S0272-4944(02)00111-1
- van der Wal, A. J., Schade, H. M., Krabbendam, L., & van Vugt, M. (2013). Do natural landscapes reduce future discounting in humans? *Proceedings of the Royal Society B: Biological Sciences*, 280, 1-6. doi:10.1098/rspb.2013.2295
- Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration*, 23, 263-280. doi:10.1037/a0032359
- Vinning, J., Merrick, M. S., & Price, E. A. (2008). The distinction between humans and nature: Human perceptions of connectedness to nature and elements of the natural and unnatural.

- Human Ecology Review*, 15, 1-11.
- Vohs, K. D., Mead, N. L., & Goode, M. R. (2006). The psychological consequences of money. *Science*, 314, 1154-1156. doi:10.1126/science.1132491
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070. doi:10.1037/0022-3514.54.6.1063
- Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. *Personality and Social Psychology Bulletin*, 35, 1315-1329. doi:10.1177/0146167209341649
- Weiten, W., & McCann, D. (2013). *Psychology: Themes and variations* (Third Canadian edition). Toronto: Nelson Education ISBN 0176432418
- Wells, G. L., & Windschitl, P. D. (1999). Stimulus sampling and social psychological experimentation. *Personality and Social Psychology Bulletin*, 25, 1115 – 1125. doi:10.1177/01461672992512005
- Wells, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment and Behavior*, 35, 311-330. doi:10.1177/0013916503035003001
- Wells, N. M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children, youth, and environments*, 16, 1-24.
- White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science*, 24, 920-928. doi:10.1177/0956797612464659
- Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.

- Zelenski, J. M., Dopko, R. L., & Capaldi, C. A. (2015). Cooperation is in our nature: Nature exposure may promote cooperative and environmentally sustainable behavior. *Journal of Environmental Psychology, 42*, 24-31. doi:10.1016/j.jenvp.2015.01.005
- Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and feeling connected: The distinct role of nature relatedness. *Environment and Behavior, 46*, 3-23. doi:10.1177/0013916512451901
- Zhang, J. W., Piff, P. K., Iyer, R., Koleva, S., & Keltner, D. (2014). An occasion for unselfing: Beautiful nature leads to prosociality. *Journal of Environmental Psychology, 37*, 61-72. doi:10.1016/j.jenvp.2013.11.008

Appendix A: Modified Big Five Factor Inventory (BFFI)

Instructions: For each of the characteristics listed below, rate how descriptive each characteristic is of you using the scale from 1 to 5 as shown below:

1	2	3	4	5
Disagree strongly	Disagree a little	Neither Agree or disagree	Agree a little	Agree strongly

I see myself as someone who/whose . . .

1. Is talkative _____
2. Tends to find fault with others _____
3. Admires people who own expensive homes, cars, and clothes (materialism) _____
4. Does a thorough job _____
5. Is depressed, blue _____
6. Is original, comes up with new ideas _____
7. Is reserved _____
8. Is helpful and unselfish with others _____
9. Can be somewhat careless _____
10. Is relaxed, handles stress well _____
11. Is curious about many different things _____
12. Is full of energy _____
13. Starts quarrels with others _____
14. Is a reliable worker _____
15. Believes the things I own say a lot about how I'm doing in life (materialism) _____
16. Can be tense _____
17. Is ingenious, a deep thinker _____
18. Generates a lot of enthusiasm _____
19. Takes notice of wildlife wherever I am (nature relatedness) _____
20. Has a forgiving nature _____
21. Tends to be disorganized _____
22. Gets a lot of pleasure from buying things (materialism) _____
23. Worries a lot _____
24. Has an active imagination _____
25. Tends to be quiet _____

26. Is generally trusting _____
27. Tends to be lazy _____
28. Is emotionally stable, not easily upset _____
29. Ideal vacation spot would be a remote, wilderness area (nature relatedness) _____
30. Is inventive _____
31. Has an assertive personality _____
32. Can be cold and aloof _____
33. Perseveres until the task is finished _____
34. Always thinks about how my actions affect the environment (nature relatedness) _____
35. Can be moody _____
36. Values artistic, aesthetic experiences _____
37. Is sometimes shy, inhibited _____
38. Is considerate and kind to almost everyone _____
39. Likes a lot of luxury in my life (materialism) _____
40. Does things efficiently _____
41. Remains calm in tense situations _____
42. Prefers work that is routine _____
43. Feels very connected to all living things and the earth (nature relatedness) _____
44. Is outgoing, sociable _____
45. Believes my life would be better if I owned certain things I don't have (materialism) _____
46. Is sometimes rude to others _____
47. Makes plans and follows through with them _____
48. Gets nervous easily _____
49. Connection to nature and the environment is a part of my spirituality (nature relatedness) _____
50. Likes to reflect, play with ideas _____
51. Has few artistic interests _____
52. Relationship to nature is an important part of who I am (nature relatedness) _____
53. Likes to cooperate with others _____
54. Is easily distracted _____
55. Is sophisticated in art, music, or literature _____
56. Believes I would be happier if I could afford to buy more things (materialism) _____

Please answer the following open-ended questions as best you can.

1. _____
2. _____
3. _____
4. _____
5. _____

[illegible]

Appendix C: Aspiration Index

These questions ask about your future. Rate each item by circling how important it is to you that it happen in the future. Then circle the chances that it will happen in the future.

IN THE FUTURE...

1. You will be physically healthy.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

2. Your name will be known by many people.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

3. You will have people comment often about how attractive you look.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

4. You will have a lot of expensive possessions.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

5. You will be famous.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

6. You will donate time or money to charity.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

7. You will feel good about your level of physical fitness.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

8. You will be the one in charge of your life.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

9. You will have good friends that you can count on.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

10. You will keep up with fashions in hair and clothing.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

11. You will teach others the things that you know.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

12. You will have a job that pays well.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

13. You will exercise regularly.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

14. You will share your life with someone you love.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

15. You will be admired by many people.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

16. At the end of your life, you will look back on your life as meaningful and complete.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

17. You will avoid things bad for your health (such as smoking, excessive alcohol, etc.)

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

18. You will have people who care about you and are supportive.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

19. You will work for the betterment of society.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

20. You will be married to one person for life.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

21. You will be your own boss.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

22. You will achieve the "look" you've been after.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

23. You will deal effectively with problems that come up in your life.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

24. You will feel energetic and full of life.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

25. You will have a job with high social status.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

26. You will have good, open relationships with your children.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

27. You will work to make the world a better place.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

28. You will successfully hide the signs of aging.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

29. Your name will appear frequently in the media.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

30. You will know people that you can have fun with.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

31. You will be relatively free from sickness.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

32. You will help others improve their lives.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

33. Your body shape and type will be fairly close to ideal.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

34. You will buy things just because you want them.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

35. You will know and accept who you really are.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

36. You will eat healthfully and moderately.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

37. You will be financially successful.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

38. You will do something that brings you much recognition.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

39. You will help people in need.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

40. You will have a couple of good friends that you can talk to about personal things.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

41. You will be talked about years after your death.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

42. Your image will be one others find appealing.

Importance	not at all	a little	so/so	pretty impt.	very impt.
	1	2	3	4	5

Appendix D: Willingness-to-pay

Please look at each image and then fill in the blank how much money you would be willing to pay for each item.

Appendix E: Positive and Negative Affect Schedule

Below is a scale which consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way **right now**. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

<input type="text"/>	interested	<input type="text"/>	<input type="text"/>	irritable
<input type="text"/>	distressed	<input type="text"/>	<input type="text"/>	alert
<input type="text"/>	excited	<input type="text"/>	<input type="text"/>	ashamed
<input type="text"/>	upset	<input type="text"/>	<input type="text"/>	inspired
<input type="text"/>	strong	<input type="text"/>	<input type="text"/>	nervous
<input type="text"/>	guilty	<input type="text"/>	<input type="text"/>	determined
<input type="text"/>	scared	<input type="text"/>	<input type="text"/>	attentive
<input type="text"/>	hostile	<input type="text"/>	<input type="text"/>	jittery
<input type="text"/>	enthusiastic	<input type="text"/>	<input type="text"/>	active
<input type="text"/>	proud	<input type="text"/>	<input type="text"/>	afraid
<input type="text"/>	fascinated	<input type="text"/>	<input type="text"/>	in awe
<input type="text"/>	curious	<input type="text"/>	<input type="text"/>	peaceful
<input type="text"/>	relaxed	<input type="text"/>	<input type="text"/>	content

Appendix F: Inclusion with Nature in Self Scale

Please circle the picture below that best describes your relationship with family at this moment in time. How interconnected are you with your family **right now**?

Please circle the picture below that best describes your relationship with friends at this moment in time. How interconnected are you with your friends **right now**?

Please circle the picture below that best describes your relationship with the natural environment at this moment in time. How interconnected are you with nature **right now**?

Please circle the picture below that best describes your relationship with your community at this moment in time. How interconnected are you with your community **right now**?

Please circle the picture below that best describes your relationship with an urban center (or city) at this moment in time. How interconnected are you with an urban center (or city) **right now?**

Please circle the picture below that best describes your relationship with common humanity (C.H.) at this moment in time. How interconnected are you with common humanity (C.H.) **right now?**

Appendix G: General Information

Sex: Female/ Male (please circle one)

Age: _____

What is your current year of study at Carleton University?

☐ 1st year (undergraduate) ☐ 2nd year (undergraduate)
☐ 3rd year (undergraduate) ☐ 4th year (undergraduate)
☐ master's ☐ doctoral

What is your major: _____

Where did you spend the most time while growing up? (please choose only one response from the options below)

☐ city ☐ small town ☐ rural or farm
☐ other (please specify: _____)

Where do you live now?

☐ campus residence ☐ small town
☐ city ☐ rural or farm
☐ other (please specify: _____)

Overall, where would you place yourself, on the following scale of liberalism-conservatism?

1	2	3	4	5
Extremely Liberal				Extremely Conservative

In terms of social and cultural issues (e.g., abortion, separation of church and state, affirmative action), where would you place yourself on the following scale?

1	2	3	4	5
Extremely Liberal				Extremely Conservative

In terms of economic issues (e.g., taxation, welfare, privatization), where would you place yourself on the following scale?

1	2	3	4	5
Extremely Liberal				Extremely Conservative

Now, please think back to where you were just before you came to participate in the study.

Were you already on campus? ____ yes ____ no

If 'yes,' where (e.g., building/location)? _____

If 'no', how did you get to campus (e.g., car, bus, walk)? _____

When travelling across campus to the study (Loeb Building), was your route ____ ?

1	2	3	4	5
Completely Indoors		An even mix of In & Outdoors		Completely Outdoors

Appendix H: Mindfulness Instructions

Verbally to participants (before walk begins):

For the next 20 minutes, we will be going on a nature walk. During this walk we will be trying to increase mindfulness, by exercising awareness and observation of the present moment in nature. During the day, our minds usually wander. For example, as you walked here you may have been thinking about schoolwork, or food, etc. You probably were not thinking about the colours, textures, or sounds in your surroundings. Since many of us walk these paths everyday, we may stop paying attention and then let our mind wander. The goal for this walk is to try focusing on our surroundings through our senses.

There will be two parts to this walk. During the first part, I will be asking you to pay attention to one of your senses (either sight, sound, smell, or touch). For example, if you choose sight then you could concentrate on the sunlight on the water, how the colours and textures flow together, the clouds, or the movement of water. If you choose touch, you could concentrate on how the breeze feels on your skin. Alternatively, you could pay attention to only the sounds you hear (birds chirping or leaves rustling together) or scents that you may smell along the way (flowers, bark). The goal here is to encounter this aspect as you are experiencing it for the very first time. Whatever you pick, try to maintain your attention focused on it, observe it curiously and in detail, but not judge its qualities. Do not think about “Oh I like this, and do not like that,” just try to remain an objective observer. If your mind wanders from this task, again, just gently pull it back onto the task. Please try to remain present and in the moment.

In the second part of the walk I will ask you to engage all your senses. Here, the goal will be to become completely absorbed in experiencing nature. You should allow all your senses to take in this experience. For example, you could choose to focus on the detail in the leaves, the sound they make when they rustle in the wind, and how the wind feels on your skin. Is there any smell to the trees or bark? This is only one example; you can choose many different examples but try to engage all your senses and focus on nature as a whole.

Is everyone clear on what we will be doing? Do you have any questions?

Script for during the walk:

05-10 minutes—Ok, let’s start then. Please relax, take a deep breath and then place your attention on the nature elements in front of you. Select one of your senses and try to pay attention to it but try to refrain from judging these experiences as good or bad, just simply let them be. It’s natural for your mind to wander a little, but when you notice this try to focus back on your senses and the nature in front of you.

15-20 minutes (Stop)—At this point, please allow all your senses to become absorbed in nature. Do this with a beginner’s mind; become aware of all your senses and how they integrate together. Concentrate on nature as a whole and how it works together. Please try to remain present and in the moment.

Appendix I: Coding and Analysis of Open-Ended Responses

To analyze the three open-ended questions, I read through all questions to come up with a categorical coding system to encompass all answers. Two independent coders who did not know the study design or the hypothesis coded the open-ended questions. I met with the two coders to go over the coding categories and complete a practice session before the coders completed the rest on their own. The first question, “What do you feel like doing now?” was coded according to the following categories: mental activity (scored as 1), physical activity (2), relaxing (3), sleeping (4), eating/drinking (5), and a leftover category of items that did not fit into the above 5 categories (6). Answers could only be scored into one category (i.e. an answer could not get a 2 and a 3). If a participant listed a second or third answer they were also given a score for this so it was possible for a participant to get 3 for mental activity if they listed 3 mental activities they wanted to do (e.g., in Table 5, the physical activity category and relaxing category were the most popular because these ranges are the highest). To assess reliability, an Intraclass Correlation Coefficient (ICC) was used to measure the reliability between the coders (McGraw & Wong, 1996). The ICC indicated good reliability, $\alpha = .95$. As can be seen in Table 5, participants in the nature condition scored higher in the physical activity domain and lower in the eating/drinking category (it should be noted that the indoor route ended near the Tim Hortons in the Athletics building. When reading over the responses for this questions, many students in the indoor route reported they wanted a coffee, tea, donut, etc. which might explain this significant finding).

Table 5

Descriptives of open-ended question 1

Category	Outside M (SD)	Inside M (SD)	Range	Test statistic	<i>d</i>
Mental activity	0.28 (.46)	0.33 (.48)	0 - 1	.40	.11
Physical activity	1.52 (1.56)	.75 (.68)	0 - 5	-2.26**	.64
Relaxing	.48 (.51)	.29 (.55)	0 - 2	-1.24	.36
Sleeping	.36 (.49)	.25 (.44)	0 - 1	-.82	.24
Eating/drinking	.08 (.28)	.58 (.50)	0 - 1	4.31**	1.23
Leftover	.04 (.20)	.08 (.28)	0 - 1	.62	.16

Note. * $p < .05$. ** $p < .01$. $n = 24$ for Indoor condition; $n = 25$ for Nature condition. $df = 47$

The second question, “What 5 items would you take if going away for awhile?” was coded into 7 categories; food/water, electronics, essentials (i.e. toothbrush, flashlight, sleeping items, money, keys), company (i.e. friends or pets), books or crafts, sport items, and a leftover category. The ICC showed acceptable reliability ($\alpha = .90$). Table 6 displays the descriptives.

There were no significant differences between the conditions on this question.

Table 6

Descriptives for question 2

Category	Outside M (SD)	Inside M (SD)	Range	Test statistic	<i>d</i>
Food/water	.88 (.78)	.58 (.65)	0 - 2	-1.44	.42
Electronics	1.60 (.82)	1.83 (.96)	0 - 4	.92	.26
Essentials	1.16 (.94)	1.42 (1.02)	0 - 4	.92	.27
Company	.12 (.33)	.04 (.20)	0 - 1	-.99	.29
Books	.48 (.77)	.46 (.66)	0 - 2	-.106	.03
Sport items	.04 (.20)	.17 (.48)	0 - 2	1.21	.35
Leftover	.56 (.77)	.38 (.58)	0 - 2	-.95	.26

Note. $n = 24$ for Indoor; $n = 25$ for Nature. $df = 47$.

The third question, “What would you do with a million dollars?” was coded into the following 4 categories; generous cause (i.e. charity, house for someone), selfish cause (i.e. diamonds, make up, clothes, electronics), save money or invest, and a leftover category. This also demonstrated a good ICC ($\alpha = .93$). As Table 7 shows, there is one marginally significant difference between the two conditions. People in the indoor condition indicated they would like to save the money more than those in the nature category.

Table 7

Descriptives for question 3

Category	Nature $M (SD)$	Built $M (SD)$	Range	Test statistic	d
Generous cause	2.05 (1.20)	1.70 (.86)	1 - 6	-1.06	.34
Selfish cause	3.67 (1.81)	2.96 (1.06)	1 - 7	-1.65	.48
Save money	1.00 (.00)	1.35 (.63)	1 - 3	2.11 [†]	.95
Leftover	1.13 (.35)	1.20 (.42)	1 - 2	.43	.18

Note. [†] $p < .10$. $n = 24$ for built condition, $n = 25$ for nature condition. $df = 47$

Appendix J: Positive Affect and Negative Affect Schedule (PANAS)

Below is a scale, which consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way **right now**. Use the following scale to record your answers.

1	2	3	4	5
not at all	a little	moderately	quite a bit	extremely

_____	interested		_____	irritable
_____	distressed		_____	alert
_____	excited		_____	ashamed
_____	upset		_____	inspired
_____	strong		_____	nervous
_____	guilty		_____	determined
_____	scared		_____	attentive
_____	hostile		_____	jittery
_____	enthusiastic		_____	active
_____	proud		_____	afraid
_____	fascinated		_____	in awe
_____	curious		_____	peaceful
_____	relaxed		_____	content
_____	alive and vital		_____	so alive I want to burst
_____	full of energy and spirit		_____	looking forward to each new day
_____	alert and awake		_____	energized

Appendix K: Aspiration Index (Abbreviation Version)

Below are goals that you may have for the future. Please rate how important each goal is to you using the following scale.

1. Someone in my life will accept me as I am, no matter what

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

2. People will show affection to me, and I will to them.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

3. I will deal effectively with problems in my life.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

4. I will feel free.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

5. I will find religious or spiritual beliefs that help me make sense of the world.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

6. I will find satisfying religious and/or spiritual activities.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

7. I will help the world become a better place

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

8. I will assist people who need it, asking nothing in return.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

9. I will be polite and obedient.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

10. I will “fit in” with others.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

11. I will be in good physical shape.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

12. I will be physically healthy.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

13. I will have a lot of excitement in my life.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

14. I will experience a great deal of sensual pleasure.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

15. I will keep up with fashions in clothing and hair.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

16. People will often comment about how attractive I look.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

17. I will have a job that pays well

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

18. I will have enough money to buy everything I want.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

19. I will be admired by many people.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

20. My name will be known by many different people.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

21. My basic needs for food, shelter and clothing will be met.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

22. I will feel safe and secure.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

23. I will be careful not to overspend.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
------------------------------	---	----------------------------	---	------------------------------	---	------------------------	---	-----------------------------

24. I will put some money into savings on a regular basis.

Not at all important 1	2	A little important 3	4	Moderately important 5	6	Very important 7	8	Extremely important 9
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Appendix L: Windfall

Imagine you unexpectedly received \$ 20,000 and could spend it in any of the ways below. How would you spend it? You can divide the money however you want but make sure it totals \$20,000 in the end.

1. Buy stuff I want or need \$ _____
2. Give to church organization or charity \$ _____
3. Give or lend to friends or relatives \$ _____
4. Travel \$ _____
5. Pay off debts \$ _____
6. Savings or investments \$ _____
7. Other \$ _____

Total of the above 7 categories: \$ _____ Hint: It should equal \$20,000 ☺

Appendix M: Self Esteem

This is a questionnaire designed to measure what you are thinking at this moment. There is, of course, no right answer for any statement. The best answer is what you feel is true of yourself at this moment. Be sure to answer all of the items, even if you are not certain of the best answer. Again answer these questions, as they are true for you RIGHT NOW.

1. I feel confident about my abilities.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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2. I am worried about whether I am regarded as a success or failure.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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3. I feel satisfied with the way my body looks right now.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

4. I feel frustrated or rattled about my performance.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

5. I feel that I am having trouble understanding things that I read.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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6. I feel that others respect and admire me.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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7. I am dissatisfied with my weight.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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8. I feel self-conscious.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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9. I feel as smart as others.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

10. I feel displeased with myself.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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11. I feel good about myself.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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12. I am pleased with my appearance right now.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

13. I am worried about what other people think of me.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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14. I feel confident that I understand things.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

15. I feel inferior to others at this moment.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

16. I feel unattractive.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

17. I feel concerned about the impression I am making.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

18. I feel that I have less scholastic ability right now than others.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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19. I feel like I'm not doing well.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
---------------------------	---	---------------------------	---	--------------	---	------------------------	---	------------------------

20. I am worried about looking foolish.

1 Strongly disagree	2	3 Disagree a little	4	5 Neutral	6	7 Agree a little	8	9 Strongly agree
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Appendix N: Examples of Materialistic Images (Women)

Appendix O: Examples of Materialistic Images (Men)

Appendix P: Nature Photographs

Appendix Q: Built Photographs

Appendix R: Environmental Concern

People around the world are generally concerned about environmental problems because of their consequences that result from harming nature. However, people differ in the consequences that concern them most. Please rate each item below from 1 (not important) to 7 (supreme importance) in response to the question: I am concerned about environmental problems because of the consequences for _____

1. _____ Animals
2. _____ Plants
3. _____ Marine Life
4. _____ Birds
5. _____ Me
6. _____ My future
7. _____ My lifestyle
8. _____ My health
9. _____ All people
10. _____ Children
11. _____ People in my community
12. _____ My children

Appendix S: Instructions for Intervention and Daily Log Questionnaire

In both conditions, participants were given some guidance for the daily activity while also trying to ensure some flexibility so that participants could tailor the activities for themselves (as recommended by Lyubomirsky & Layous, 2013). The activities were chosen because they are relatively easy to find, cover the main aspects of nature (e.g., trees, water, plants), and can be roughly compared to features in a built environment. The participants read over the activity for that day, completed the activity alone (for approximately 20 minutes), and then complete a 5- 10-minute questionnaire of what the activity entailed each day. Participants were instructed to try to find environments that are not in their everyday routine.

The intervention is 10 days long so there were 5 recommended activities that repeated twice. The instructions were emailed to the participants along with the daily log questionnaire. If the weather was unpleasant that day, I emailed participants and instructed them to use virtual nature/built as a substitute (participants were allowed to use virtual nature some days if they could not make it to the actual environment).

First day

Nature: Please visit a nearby garden or vegetation area for about 20 minutes sometime today (e.g., any garden area, the living wall in the River Building on campus, or a greenhouse). When you first get to the garden, try to notice all aspects of your environment. Look for colours in the plants, and different textures in the environment. Listen for any sounds you can hear. Is there a breeze? Can you feel the sun? Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., colours, textures in the environment, and sounds).

Architecture/interior design: Please visit a nearby café/restaurant for about 20 minutes sometime today (e.g., any café of your choice that you do not normally go to). When you first get to the café, try to notice all aspects of your environment. Look for colours. Listen for any sounds you can hear. Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? How is it decorated? What is the furniture layout? What is the lighting like? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., decorations, colours, and sounds).

Second day

Nature: Please visit an area with trees for about 20 minutes sometime today (e.g., the arboretum by campus or a park that you do not regularly visit). When you first get to an area with trees, look around, and try to notice all aspects of your environment. Look for colours, look for different textures in the environment. Listen for any sounds you can hear. Is there a breeze? Can you feel the sun? Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to

describe some of the features of the environment you visited online (e.g., colours and textures in the environment).

Architecture/interior design: Please visit a building or room with high ceilings for about 20 minutes sometime today (e.g., a room with high ceilings on campus that you do not typically go to or a public place/mall). Try to notice all aspects of your environment. Look for colours. Listen for any sounds you can hear. Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? How is it decorated? What is the furniture layout? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., decorations and colours).

Third day

Nature: Please visit an area by a river or body of water for about 20 minutes sometime today (an example could be the Rideau Canal, or Dow's Lake). When you first get here, look around, and try to notice all aspects of your environment. Look for colours, look for different textures in the environment. Listen for any sounds you can hear. Is there a breeze? Can you feel the sun? What are the colours you see in the water? Are animals there? Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., colours and sounds).

Architecture/interior design: Please visit a place today with roads and cars that you do not normally pay attention to. Try to notice all aspects of your environment. Look for colours. Listen for any sounds you can hear. Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? How busy is the road? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., colours and sounds).

Fourth day

Nature: Please visit a forested area for about 20 minutes sometime today (an example could be the arboretum or any park with lots of trees that you do not typically visit). When you first get there, look around, and try to notice all aspects of your environment. Look for colours, look for different textures in the environment. Listen for any sounds you can hear. Is there a breeze? Can you feel the sun? Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., colours and textures in the environment).

Architecture/interior design: Please visit a downtown area with lots of buildings for about 20 minutes sometime today (an example could be the Byward Market or any mall that you do not typically visit). When you first get to the building, look at it from the outside and then (if

possible) view the building from the inside (try to stay focused on elements of the building). Try to notice all aspects of your environment. Look for colours. Listen for any sounds you can hear. Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? How is it decorated? What is the furniture layout? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., decorations and colours).

Fifth day

Nature: Please visit a nature area with flowers for about 20 minutes sometime today (an example could be a park, greenhouse, or garden). When you first get there, look around, and try to notice all aspects of your environment. Look for colours, look for different textures in the environment. Listen for any sounds you can hear. Is there a breeze? What are the colours like? Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., colours and sounds).

Architecture/interior design: Please visit a room that is full of colour and brightly decorated for about 20 minutes sometime today (an example could be a mall/clothing stores that you do not usually visit). Try to notice all aspects of your environment. Look for colours. Listen for any sounds you can hear. Pay attention to movement in the environment. Try to look at the environment as a whole, how is it organized? How is it decorated? What is the furniture layout? Try to immerse yourself in this environment and stay here for 20 minutes (with no distractions – although feel free to take this script). You will be asked to describe some of the features of the environment you visited online (e.g., decorations and colours).

Once back from the 20-minute activity, participants completed the following questions sometime that same day:

Daily Log Questionnaire

Please indicate the level to which you believe you completed the planned behaviour below. You will not be penalized for not completing the task. Your truthfulness is essential to the accuracy of our research. I...

☐ Did complete the behaviour as planned.

☐ Somewhat completed the behaviour.

☐ Did not complete the behaviour.

If you did complete the behaviour, please answer the following questions:

Where did you go? If possible, please say the name of the location you went or a location nearby where you went.

Please describe in 3-5 sentences where you went and what the setting was like. That is, please describe the environment and report any smells, sounds, weather, texture, etc.

How familiar is the place you went to?

1 not at all familiar	2 a little familiar	3 moderately	4 quite a bite familiar	5 extremely familiar
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How did you arrive at this location? Did you walk or commute from your house or school? How long did it take you to get to this area?

Intrinsic Motivation Inventory

For each of the following statements, please indicate how true it is for you, using the scale provided.

1. I enjoyed this activity very much.

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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2. This activity was fun to do.

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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3. I thought this was a boring activity (reverse scored)

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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4. This activity did not hold my attention at all (reverse scored)

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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5. I would describe this activity as very interesting

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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6. I thought this activity was quite enjoyable

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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7. While I was doing this activity, I was thinking about how much I enjoyed it.

1 Not at all true	2	3	4 Somewhat true	5	6	7 Very true
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8. How immersed did you feel?

1 Not at all immersed	2	3	4 Somewhat immersed	5	6	7 Very immersed
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Appendix T: Correlations of the Aspirations Subscales

To further understand how intrinsic and extrinsic aspirations were associated in this dissertation, I correlated the subscales of intrinsic and extrinsic aspirations together (e.g., financial success with affiliation). The raw correlations within intrinsic aspirations generally correlated positively with other subscales of intrinsic aspirations (and vice versa with the extrinsic aspirations). These correlations within subscales were generally large correlations. But the subscales of the intrinsic aspirations did not negatively correlate with the subscales of the extrinsic aspirations (again vice versa with the extrinsic aspirations). They ranged from being uncorrelated to a small positive correlation. The subscales of the relative aspirations correlated positively with other subscales from the same subscale and negatively with other subscales. This offers support to the idea of a tradeoff between goals (but only when scored as relative indices). Computing the relative indices is recommended because extrinsic aspirations are hypothesized to decrease well-being only if they are valued more than intrinsic aspirations (Kasser, 2016).

Table 1

Correlations of Raw Aspiration Subscales for Pilot 1

Variable	α	1.	2.	3.	4.	5.	6.
1. Self-Acceptance	.37	-					
2. Affiliation	.75	.39**	-				
3. Community	.82	.28 [†]	.22	-			
4. Fitness	.72	.52**	.27 [†]	.55**	-		
5. Financial	.67	.22	.39**	.27 [†]	.17	-	

6. Social Recognition	.83	.11	.16	.35*	.26 [†]	.53**	-
7. Appearance	.80	.28 [†]	.30*	.15	.17	.73**	.54**

Note. $N = 49$. [†] $p < .10$, * $p < .05$, ** $p < .001$.

Table 2

Correlations of Raw Aspiration Subscales for Study 1

Variable	α	1.	2.	3.	4.	5.	6.
1. Self-Acceptance	.44	-					
2. Affiliation	.68	.29**	-				
3. Community	.66	.37**	.26**	-			
4. Fitness	.86	.39**	.21*	.21*	-		
5. Financial	.79	.12	.09	-.05	.16*	-	
6. Social Recognition	.86	-.04	.16 [†]	.05	.11	.36**	-
7. Appearance	.78	.003	.23**	.02	.36**	.38**	.44**

Note. $N = 146$. [†] $p < .10$, * $p < .05$, ** $p < .001$.

Table 3

Correlations of Raw Aspiration Subscales for Study 2

Variable	α	1.	2.	3.	4.	5.	6.
1. Self-Acceptance	.69	-					
2. Affiliation	.75	.52**	-				
3. Community	.88	.49**	.44**	-			
4. Fitness	.76	.61**	.50**	.47**	-		

5. Financial	.81	.20**	.15**	.09*	.28**	-	
6. Social Recognition	.87	.18**	.27**	.08 [†]	.27**	.70**	-
7. Appearance	.84	.12*	.09 [†]	.21**	.19**	.60**	.62**

Note. $N = 473$. [†] $p < .10$, * $p < .05$, ** $p < .001$.

Table 4

Correlations of Raw Aspiration Subscales for Study 3

Variable	α	1.	2.	3.	4.	5.	6.	7.
1. Self-Acceptance	.72 - .78	-	.68**	.62**	.69**	.23*	.03	.02
2. Affiliation	.77 - .82	.65**	-	.48**	.53**	.24*	-.009	.07
3. Community	.87 - .91	.61**	.47**	-	.55**	.15	.20*	.15
4. Fitness	.69	.63**	.59**	.53**	-	.25*	.07	.11
5. Financial	.74	.22*	.13	.19	.28**	-	.65**	.74**
6. Social Recognition	.88	.16	.03	.24*	.13	.64**	-	.69**
7. Appearance	.83 - .85	.21*	.16	.28**	.29**	.75**	.73**	-

Note. $N = 101$. Below the diagonal is Time 1 and above the diagonal is Time 2. [†] $p < .10$, * $p < .05$, ** $p < .001$.