DOES PERSONALITY MEDIATE THE RELATIONSHIP BETWEEN SEX AND ENVIRONMENTALISM?

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Abstract

The finding that females hold more pro-environmental attitudes and engage in more conservation behavior, relative to males, is one of the most robust effects in the field of environmental psychology. Yet sparse research has attempted to understand why males are less pro-environmental than females. In three studies, the present thesis tested the hypothesis that sex differences in personality account for sex (Studies 1-3) and gender (Study 3) differences in both pro-environmental attitudes and behavior. Results from Study 1 demonstrated that conscientiousness mediated links between sex and attitudes toward environmental utilization, protectionism, and conservation behavior in an undergraduate sample. Results from Study 2 using a community sample demonstrated that conscientiousness, agreeableness, and neuroticism mediated the link between sex and environmental protectionism. Study 3 replicated the mediating effect of conscientiousness on sex differences in environmental behavior using the HEXACO model and extended this finding beyond biological sex to gender differences. Taken together, results suggest that core differences in personality traits partially explain sex and gender differences in environmentalism, offering new insight into how to potentially promote increased pro-environmental action among men.

Keywords

Sex differences; Gender differences; Pro-environmental behavior; Personality; Big Five; HEXACO; Personality; Pro-environmental attitudes

Co-Authorship Statement

Co-authors and their contributions are as follows:

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S. Arnocky developed the research question. S. Arnocky (Principle Investigator) and T. Milfont (co-Investigator) funded the research via a Social Sciences and Humanities Research Council of Canada (SSHRC) Insight Development Grant (file # 430-2016-00960). G. Albert collected the data for Study 2 on Mechanical Turk. B. Kelly provided assistance with the literature review on personality. All co-authors contributed to editing the manuscript published at *Personality and Individual Differences*. J. Desrochers developed all specific hypotheses, conducted the literature reviews on sex differences in environmentalism and on personality in relation to environmentalism, completed all data collection and entry for Studies 1 and 2, conducted all statistical analyses, and wrote the manuscript.

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Jessica Desrochers

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Chapter 1

1 Socialization of environmentalism

Environmental concern among the general public has been on the rise since the 1970s (Weart, 2016), coinciding with a growth in scientific evidence that humans are drastically and rapidly altering the climate. Human activities resulting in emission release, waste production, and water consumption are linked broadly to the deterioration of the environment. For example, the Intergovernmental Panel on Climate Change (IPCC) report states plainly that "human-induced warming reached approximately 1°C above pre-industrial levels in 2017, having increased at a rate of 0.2°C per decade" (Allen, et al., 2018). Due to the inclement pressures of climate change, there is general consensus among climate scientists that humans must act to alleviate some of the burgeoning negative effects on the environment. Although many individuals in Western Society are aware of climate change, many people nevertheless feel either a lack of concern or helpless in their endeavors to affect positive change (Beever, 2000; Landry, Gifford, Milfont, Weeks, & Arnocky, 2018; Orr, 2007; Orr, 2004; Swaisgood & Sheppard, 2010). Morrison (1999) described the human species as one having difficulty appreciating the long-term environmental risks or benefits involved in their lifestyle choices. Between 2001 and 2008, McCright (2010) found just over half of Americans believed that Global Warming was induced by human activity, but only one third of them were concerned about the seriousness and threat of such activity. Accordingly, it is important for researchers to reliably identify demographic variables that can predict environmental concern and participation in pro-environmental behavior. Indeed, "one of the ways psychologists can promote environmentalism is to understand the relationship between demographic variables and environmental attitudes and behaviors and the implications these human-environment relationships may have on theory, social action, and policy" (Zelezny, Chua & Aldrich, 2000, p. 443).

Environmentalism has been related to a multitude of demographic and individual difference variables such as age, political ideology, income, and education (Dunlap & Van Liere, 1978; Marquart-Pyatt, 2008). For specific behaviors, Oskamp and coworkers (1991) found recyclers had higher income, were more knowledgeable about conservation, perceived a greater risk associated with production of household waste, and were more likely to recycle if their friends or neighbors also recycled. Hinds and Sparks (2008) found those in the United Kingdom

living in rural areas during childhood had more pro-environmental behavioral intentions, perceived control over behavior, environmental identity (defined as how a person attributes themselves in relation to the environment; Stets & Biga, 2003), and subjective norms (participants' belief they should be in nature) relative to those living in urban environments. Of the multitude of variables associated with environmentalism, one of the strongest and most robust predictors of environmental attitudes and behavior is sex and gender[1] (for reviews, see Gifford & Nilsson, 2014; Zelezny, Chua & Aldrich, 2000). This first chapter will examine the previous literature on the gender difference in environmental concern, attitudes, and behavior.

1.1 Sex Differences in Environmental Attitudes and Behavior

Gifford and Nilsson's (2014) review of personal and social factors influencing environmental concern and behavior found the majority of studies observe women as more environmentally concerned than men; across ages and countries. It is noteworthy that in a small minority of studies, men were found to be more environmentally concerned than women (Arcury, Scollay, & Johnson, 1987; Shen & Saijo, 2008). Arcury and coworkers (1987) examined participants' stated concern (their general concern) about acid rain, relative concern (comparing the concern about acid rain to other non-environmental issues), active concern (surrounding what is being done about acid rain, such as which new policies the participant is willing to comply with), as well as general knowledge about acid rain (whereby the more correct answers about acid rain, the higher participant's knowledge). They found that there was no sex difference for both stated and relative concern, but there was a difference for active concern (Arcury, et al., 1987). Men self-reported being more actively concerned about acid rain than women. These results could be due to covariates. First, Arcury and co-researchers (1987) found men had more knowledge about acid rain. Therefore, men may have been more actively concerned because women were not sufficiently knowledgeable about acid rain to perceive it as an active threat. Second, as active concern encompasses political activity, the lack of general environmental concern may be fundamentally tied to broader political knowledge and understanding, which has traditionally been viewed as being greater among men (McStay and Dunlap, 1983; although see Stern, Dietz,

[1] In our research we refer to biological sex as a dichotomy (male/female) and gender as a spectrum ranging from masculinized to feminized. In most studies of sex and gender differences in environmentalism reported herein, the descriptions of the actual variables being measured were vague with respect to whether sex or gender were measured. We therefore adopt the terminology used in the original manuscripts when describing individual study results.

& Kalof, 1993 for evidence that women score higher on political support for environmental action). Third, the study was published in 1987. Sex differences in education and employment have changed over the past 30 years. There is now greater equality between the sexes in these domains (Ferrao, 2010).It is unclear whether this demographic shift would correspond to greater female endorsement of active environmental concern.

In a study from Shanghai, age and sex significantly correlated with environmental concern, but with a different direction than other studies. Shen & Saijo (2008) examined 1,200 participants from Shanghai on three environmental concern measurements. The first measurement examined participants' concern about general environmental issues. The second measurement examined individuals' concern for specific environmental issues such as local concerns about the environment to global warming. The third measurement investigated the tradeoff the participant would be willing to make between convenience and environmental protection. They found older residents of Shanghai were more environmentally concerned for both general and local issues, and were more likely to endorse pro-environmental behavior over life conveniences (Shen & Saijo, 2008). They also found men in Shanghai were more concerned over general and global environmental issues; as well, they preferred environmental behavior over life conveniences relative to women (Shen & Saijo, 2008). Again, this finding suggests that in some research across an array of cultures and measures, men sometimes report being more environmentally-concerned than women. These examples considered, the vast majority of research on sex differences in environmentalism demonstrates markedly greater concern and behavioral engagement among women, relative to men.

McStay and Dunlap (1983) found women were more concerned about pollution, resource management, and environmental regulations than men, regardless of whether they were from the general public or members of environmental organizations. Women had higher scores on all the dimensions, except for public behavior, which is defined as an individual's self-report frequency in engaging in socio-political activities aimed to help the environment (McStay & Dunlap, 1983). An early meta-analysis conducted by Zelezny and coworkers (2000) examined six studies using Dunlap and Van Liere's (1978) New Ecological Paradigm measure of environmental worldview. Of these studies, four showed women were more environmentally concerned than men, whereas the other two showed no sex difference (Zelezny et al., 2000). When Marquat-Pyatt (2008) subsequently examined a measure of General Environmental

Attitudes across 19 nations, she found females had significantly more positive environmental attitudes relative to males in 12 of those countries. Tindall, Davies and Mauboulès (2003) found women engaged in more pro-environmental behavior than men, even when controlling for education, income, age, parenthood (i.e. if they are a parent or not), environmental activism, and frequency of communication about environmental issues with others. In a study sampling across 32 nations, there was significant gender difference in environmental concern, where females were more environmentally concerned than males (Chan, Pong & Tam, 2019).

Since the majority of studies show women expressing more pro-environmental attitudes than men, it is important to try to understand this relationship. Below I detail previous hypotheses surrounding factors that may drive this important sex difference.

1.2 Understanding the Sex Differences in Environmental Attitudes and Behavior

1.2.1 Race

The gender difference seems to be less prominent for African Americans (Mohai, 1997). Mohai studied environmental issues through open-ended and closed-ended questions with a data set from the Detroit area. The questions ranged from pollution, preservation, and resource management, to neighborhood issues. Similar to other studies, women were more concerned about the environment than men in all the dimensions included in the closed-ended questions (Mohai, 1997). However, when it came to open-ended questions, there was no sex difference (Mohai, 1997). For the open-ended questions, white men were more likely to mention pollution as the biggest environmental problem relative to white women, but this sex difference was not found for African-American participants (Mohai, 1997). African-American men were less likely than African-American women to mention the need to recycle (Mohai, 1997). However, one potential caveat to this research is that the researchers failed to control for socio-economic status, or to report whether there was an ethnic difference between the groups across environmental variables.

1.2.2 Values

Gagnon-Thompson and Barton (1994) introduced the concept of ecocentric and anthropocentric attitudes held toward the environment. An ecocentric attitude is defined as having a positive attitude towards nature for its own sake, whereas anthropocentric attitude is

defined as having a positive attitude towards protecting the environment for the sake of humans' quality of life (Gagnon Thompson & Barton, 1994). Therefore, an ecocentric person is more likely to protect the environment due to nature's intrinsic value, whereas an anthropocentric person protects the environment primarily on the basis of extrinsic values. The two values have different motivations for protecting the environment (Gagnon-Thompson & Barton, 1994). Therefore, the message to preserve the environment must be presented in different manners to appeal to the different environmental values. In Zelezny, Chua, and Aldrich's meta-analytic study (2000), females across 14 countries had more ecocentric value towards the environment than males.

Stern, Dietz, and Kalof (1993) explored the way in which people's egoistic, altruistic, and biospheric value orientations may affect their perception of political actions to improve environmental quality. These three distinct value systems defined by Stern (2001) examine the degree to which a person values themselves (egoistic), others (altruistic) or nature (biospheric). College students from New York were asked to state if they would rather protect the environment for themselves, for the welfare of others, or for the biosphere itself. They compared these results to the participants' willingness to take political action to protect the environment. They found those who think of environmental protection in relation to the self were more willing to pay taxes on gas and income for the environment than those who thought of environmental protection for others or the biosphere (Stern, Dietz, & Kalof, 1993). Women were found to be more environmentally concerned than men, but, when the three environmental value orientations were taken into account, the sex difference disappeared, suggesting that sex differences in the sources of individuals' environmental concern (i.e., for the self, others, or the biosphere) could partially account for sex differences in environmental concern. Specifically, women scored higher than men on all three value orientations, each of which predicted support for pro-environmental political action (Stern, Dietz, & Kalof, 1993).

1.2.3 Motherhood Effect

Women appear to be more concerned about local versus general environmental issues (Blocker & Eckberg, 1989; Brody, 1984). Brody (1984) compared sex differences between support for having a power plant in one's local community versus the appeal of nuclear power plants in general. They were also asked about economic benefits and the safety risks associated with nuclear power. Women were found to be more opposed to local nuclear power than general

use of nuclear energy, even if they found the energy crisis more serious than men (Brody, 1984). Women discouraged nuclear power because of the safety risks associated with it (Brody, 1984). Additionally, Hamilton (1985) found mothers with young children were more concerned about the contamination of toxic waste in local water than women without children and men (regardless of if these men had children). This result was interpreted by the authors within the context of Blocker and Eckberg's (1989) Motherhood Effect. The Motherhood Effect is defined as a mother's socialization to be more nurturing and family oriented; therefore, in terms of environmentalism, a mother should be more environmentally concerned for the health and safety risk posed to their children (Blocker & Eckberg, 1989). In Blocker and Eckberg's (1989) research, they found there was only a sex difference in local environmental concern, where women were more environmentally concerned when it came to local issues than were men. Additionally, Mohai (1992) found the gender gap in environmentalism shifted when examining the difference through forced-choice versus continuous items. Women reported more concern about the seriousness of different environmental issues than men, but when given the option to allocate a percentage of limited resources to alternative uses (e.g. household, energy development, industrial, agriculture or environmental use) there was a distinct pattern that prevailed. Women reported wanting to allocated more limited resources to alternatives when it dealt with household or family than the environment (Mohai, 1992), tying into the Motherhood effect.

The previous research focused on the Motherhood Effect is presented under the lens of socialization. The socialization theory insists that females are influenced to be more nurturing, compassionate, cooperative, and hold more a caregiver role than males (Eagly, 1987). However evolutionary psychologists would argue that these sex differences are not socialized, but rather are biologically driven. The Primary Caregiver Hypothesis by Babchuk, Hames & Thompson (1985) states that women have evolved specific skills that are beneficial to the survival of offspring. Owing to a women's lower reproductive rate, their certainty of relatedness to offspring, and their larger requisite investment in their offspring (Geary, 2000), mothers are generally more protective and careful when it comes to their children (Eckel & Grossman, 2008). In terms of environmentalism, females perceived environmental issues as posing a larger risk, and were more likely to behave pro-environmentally due to this risk, than males (O'Connor, Bard & Fisher, 1999).

These findings putatively tie into the Fatherhood Effect (George & Southwell, 1986). The Fatherhood Effect regards when males with young children are more concerned about economics than environmental problems (George & Southwell, 1986; Hamilton, 1985). The Fatherhood Effect links to Jones and Dunlap's (1992) proposed economic contingency hypothesis. This hypothesis questions if we can be concerned about the environment if the economy of the nation is not stable (Jones & Dunlap, 1992).

More recently, when the Motherhood and Fatherhood Effects were tested empirically, they were not supported. Strapko, Hempel, Macllroy, and Smith (2016) found women showed more environmental concern than men (Strapko, et al., 2016). However, there was no effect on environmental concern based on number of hours worked, the number of children at home, or if they were a homemaker (Strapko, et al., 2016). Moreover, the more women believed in traditional gender roles (homemaker for women and resource provider for men), the less environmentally concerned they were (Strapko, et al., 2016). This appears to contradict the Motherhood Effect. The authors did find that ethic of care, defined as a person's feeling of being more nurturing or compassionate towards others, positively predicted environmental concern, suggesting the socialization of ethic of care is important in relation to environmentalism, but it may be gender neutral given that this link appeared for both men and women (Strapko, et al., 2016).

Thomas, Fisher, Whitmarsh, Milfont, and Poortinga (2018) examined the impact of parenthood on environmentalism. Regression analyses explored if having a newborn and becoming a new parent predicted pro-environmental attitudes and behaviors, while controlling for age, annual income, and baseline environmental attitudes and behaviors. Having a newborn during the course of the longitudinal study showed a decrease in environmental behaviors, such as "'wearing more clothes instead of heating', 'use public transport instead of car' and 'carshare with others'" (Thomas et al., 2018, p. 269). Becoming a new parent (i.e. having a newborn and not previously being a parent) showed a reduction on the pro-environmental behavior of turning off the light after leaving a room (Thomas et al., 2018). New parents who had a higher baseline environmental concern were more likely to have higher attitudes towards wanting to increase a greener lifestyle, but there was no relation to any of the measured environmental behaviors (Thomas et al., 2018). There were no sex differences in any of these findings. Furthermore, when examining parenthood (i.e. if the individual was a parent or not) at any stage, Tindal and

coworkers (2003) found parenthood was a significant predictor of environmental friendly behavior for women, however, other variables, such as the frequency of communication about environmental issues to others, postmaterial values, and their engagement in environmental activism, were stronger predictors (Tindal et al., 2003). This finding demonstrates that there could be distinct individual difference variables other than parenthood that could help explain the sex-environmentalism relationship.

1.3 Mediation Analysis for Sex-Environmental Relationship

These aforementioned works attempted to explain the gender difference in environmental attitudes and behavior, yet they generally appear to lack replicability. Moreover, none of these studies employed appropriate statistical methods to actually test these variables as potential explanations of observed sex differences. One way to do so is via testing mediation models using a multiple regression analysis. Mediation is an analysis of the indirect effect of variables X (independent or predictor variable) and Y (dependent variable) through a third (mediating) variable. Therefore, the third variable helps to explain the relationship between variables X and Y. To the extent that the third variable mediates the X-Y relationship, the direct X-Y relationship will be statistically-significantly reduced.

The first study to directly examine mediation effects regarding gender and environmentalism was conducted by Arnocky and Stroink (2011). With 202 undergraduate students from Ontario, Arnocky and Stroink (2011) examined whether empathy mediated the gender differences in both a self-report ecological commons dilemma scenario and self-report conservation behavior. They expected to find this mediation effect because empathy has been previously related to environmentalism. For instance, Berenguer (2007) found manipulating empathy would induce undergraduate students to have higher levels of pro-environmental attitudes and more willingness to act in protecting the environment—in addition, changing the object of the empathy moderated the type of value to motivate pro-environmentalism (i.e. human actor induced anthropocentricism, whereas natural object induced ecocentrism). Emotional empathy is more prominent in women than men (Eagly, 1987). Controlling for age, Arnocky and Stroink (2011) found empathy mediated the gender differences in the following pro-environmental outcome variables: altruistic environmental concern, competitiveness, and ecological cooperation in a self-report commons dilemma scenario.

Milfont, Ritchter, Sibley, Wilson, and Fischer (2013) examined the potential role of Social Dominance Orientation (SDO) in mediating the gender difference in beliefs that human were the cause of the drastic changes to climate (i.e. anthropogenic beliefs of climate change). SDO is defined as a person's desire for a social hierarchy where the superior individuals rule over the inferior individuals (Sidanius & Pratto, 1999). Females held more anthropogenic beliefs about climate change and had lower SDO than males; moreover, SDO mediated the gender difference in anthropogenic beliefs (Milfont, et al., 2013). This was the first study to examine SDO as a mediator for the gender-environmentalism relationship.

Milfont and Sibley (2016) sought to replicate the mediation finding of both Arnocky and Stroink (2011) and Milfont et al. (2013), as well as examine both of these variables (empathy and SDO) together as mediators to try to explain the gender difference in environmental attitudes. They hypothesized women would show positive environmental attitudes because of their high levels of empathy and low levels of SDO. Milfont & Sibley (2016) found New Zealand women were lower in social dominance, as well as higher in empathy than New Zealand men. Moreover, gender indirectly predicted environmental attitudes through empathy and social dominance as mediators (Milfont & Sibley, 2016).

These studies highlight the strength of mediation research in explaining the gender-environmental findings. Yet to date, little research has explored whether other important predictors of environmentalism, such as personality, which are also known to vary by sex, might help to explain sex and gender differences in environmentalism. One previous study examined personality as a mediating variable for the sex difference in sustainable consumer behavior. Luchs and Mooradian (2011) found agreeableness mediated the sex difference in participant's self-report importance of organizations having high environmental responsibility through a single-item measure; however, when examining agreeableness's ability to mediate to the sex difference in sustainable consumer choices (i.e. the participant would choose to buy from a company that was viewed as environmentally responsible versus socially-responsible), the mediating effect was marginal. This research shows personality's ability to mediate sex differences in sustainable consumer choices; however it is lacking in its generalizability to other pro-environmental variables, such as attitudes and more general environmental behavior. Therefore, further psychological research should examine personality dimensions, such as Big

Five and HEXACO models of personality, as mediators of sex differences in environmental attitudes and more general pro-environmental behavior, such as recycling, composting, etc.

Chapter 2

2 Personality Traits

If personality is to mediate the sex-environmentalism relationship, then it must relate to both sex and environmentalism. This chapter focuses on the literature examining the sex differences in personality traits, as well as personality's links to pro-environmental attitudes and behavior.

2.1 Big Five Personality Traits

Personality refers to individual differences in patterns of thinking, feeling, and behaving (Eagly, 1987). Allport and Odbert's (1936) pioneering lexical research on personality paved the way toward the contemporary Big Five taxonomy. The researchers found 18,000 identifiable terms from an unabridged English dictionary to distinguish between individuals; these terms were categorized into four groups: personality traits, temporary moods, judgments of reputation, and physical characteristics (Allport & Odbert, 1936). Cattell (1943) removed 99% of the terms Allport and Odbert (1936) identified through semantic and empirical clustering. With the 35 terms he identified, he created the 16 Personality Factors (16PF) questionnaire (Cattell, Ebert & Tatsuoka, 1970). Tupes and Christal (1961) reduced Cattell's (1943) work to five reliable and stable factors. These five factors were: 1) extraversion or surgency, 2) agreeableness, 3) conscientiousness, 4) emotional stability versus neuroticism, and 5) intellect or openness (Tupes & Christal, 1961). The term Big Five was introduced by Goldberg (1992) to emphasize not all personality traits can be categorized into five factors, but, rather, these personality traits are broad in the sense of each factor encompassing a larger number of more specific personality traits. The five factors are defined as follows: an extraverted person is a person who is outgoing, talkative, and friendly; openness encompasses qualities such as originality, imagination, and having broad interests; an agreeable person is someone who trusts in others, is cooperative, and sympathetic; low emotional stability is defined as an individual being worrisome, self-conscious, and insecure; and a conscientious person is energetic, hardworking, and ambitious (John & Srivastava, 1999).

2.2 HEXACO Personality Traits

When the Big Five personality traits were analyzed through factor analysis across different languages, there were six factors, rather than five, that emerged (Ashton et al., 2004). With these six factors, Lee and Ashton (2004) introduced the new personality measure of HEXACO, which

includes honest-humility (H), emotionality (E), eXtraversion (X), agreeableness (A), conscientiousness (C), and openness (O). The new honest-humility factor is defined as a person who is fair, sincere, modest, and lacks greed (Lee & Ashton, 2004). Other differences HEXACO has from Big Five are the characteristics of emotionality differing from emotional stability and different subfacets being shifted between factors to create simplicity in the theoretical interpretation of the dimensions (Lee & Ashton, 2004). Specifically, emotional stability from Big Five has neuroticism and temperamentality at the negative pole of the factor, and a person's ability to remain stable in their reactivity of emotions on the positive end (Coast & McCrae, 1992), whereas emotionality from HEXACO includes sensitivity, dependence, and emotional reactivity on the negative pole, and self-assurance, bravery, and toughness on the positive pole (Lee & Ashton, 2004). Extraversion in both HEXACO and Big Five are highly correlated; however, the bravery, toughness, and self-assurance components of extraversion in Big Five are instead included as subfacets of emotionality in the HEXACO (Lee & Ashton, 2004). Agreeableness is also highly correlated between the measures, but the negative pole of HEXACO's agreeableness now includes temperamentality and irritability (Lee & Ashton, 2004). HEXACO's openness to experience excludes intelligence as a sub-factor because Ashton, Lee, Vernon and Jang (2000) believed that intelligence is not a personality construct. Lastly, conscientiousness is the most similar factor between the two measures, remaining almost identical between HEXACO and Big Five theories (Lee & Ashton, 2004).

2.3 Sex Difference in Personality Traits

Sex differences in Big Five and HEXACO personality traits have been robustly identified in previous research (see Feingold, 1994). For example, women often score lower on emotional stability (neuroticism) and higher in agreeableness, openness, and conscientiousness (Renau, Oberst, Gosling, Rusiñol, & Chamarro, 2013). This finding has also been demonstrated longitudinally from adolescence to young adulthood (Vecchione, Alessandri, Barbaranelli, & Caprara, 2012). Lehman, Denissen, Allemand, and Penke (2013) found men consistently reported being higher in openness than women at all age categories, whereas women reported being higher in conscientiousness than men. For HEXACO, women tend to score higher on conscientiousness, emotional instability, and altruism (Bashiri, Barahmand, Azkabri, Ghamari & Vusugi, 2011). Female undergraduate kinesiology students reported higher scores of emotionality, honest-humility, and conscientiousness than male students (Lodewyk & Sullivan,

2017). When Schmitt, Voracek, Realo, and Allik (2009) examined sex differences in Big Five personality traits through the Big Five Inventory (BFI) cross-nationally, they found women reported significantly higher conscientiousness in over half of the countries studied. However, they found mixed results of sex differences in openness to experience between countries (Schmitt et al., 2009); highlighting the fact that personality dimensions can be sensitive to environmental context (see Eagly, 1987). The variability between studies in the sex difference in personality literature may be driven, in part, by the lower-order facets of each personality dimension.

2.3.1 Extraversion

In the Big Five personality traits, extraversion is defined by the facets of warmth, gregarious, assertiveness, activity, excitement-seeking, and positive emotions (Costa & McCrae, 1992). Three facets of extraversion have shown a sex difference: gregariousness, assertiveness, and activity (Feingold, 1994); Males are more assertive and slightly more active than females, but females are more gregarious. Costa, Terracciano, and McCrae (2001) found a significant gender difference in warmth, gregariousness, assertiveness, and excitement seeking across three samples of adults from the United States of America, college students from 24 cultures, and adults from 14 cultures, where women were warmer and more gregarious, but less likely to seek excitement and be assertive.

In terms of HEXACO, extraversion is defined by facets of social self-esteem, social boldness, sociability, and liveness (Lee & Ashton, 2004). Lee and Ashton (2018) found very small sex differences in extraversion for both a student sample and a community sample where males were more extraverted than females. When examining facets of extraversion, male students had higher levels of social self-esteem and social boldness than female students, whereas, for the community respondents, only social boldness was significantly higher for males than females (Lee & Ashton, 2018).

2.3.2 Agreeableness

Agreeableness is defined by lower-order facets such as trust, compliance, altruism, straightforwardness, modesty, and tender-mindedness in the Big Five personality traits (Costa & McCrae, 1992). Females are more trusting and tender-minded than males (Feingold, 1994). Across samples from adults from the United States, college students from 24 countries, and adults from 14 countries, there was a significant gender difference in compliance and tender-

mindedness, whereby women scored higher than men (Costa et al., 2001). Weisberg, De Young, and Hirsh (2011) examined the possibility of ethnicity and age moderating the gender differences in two subfactors (compassion and politeness) of agreeableness that were defined by DeYoung, Quilty and Peterson (2007). They found ethnicity moderated the gender difference in agreeableness with Caucasians having a larger gender gap than Asians. This moderation was found for the compassion sub-facet of agreeableness, but not for the politeness factor (Weisberg, DeYoung, & Hirsh, 2011). Age also moderated the relationship where there was a larger gender difference in compassion and overall agreeableness for older adults than for younger adults (Weisberg et al., 2011).

In HEXACO, agreeableness's domains are forgiveness, gentleness, flexibility and patience (Lee & Ashton, 2004). Conversely, Lee and Ashton (2018) did not find a sex difference in agreeableness among community online respondents; moreover, they found a small sex difference in the opposite direction within an undergraduate student sample, whereby males were slightly more agreeable than females. When examining the lower-order factors, the male students were more forgiving and more patient than female students, whereas community females were more flexible than male community members (Lee & Ashton, 2018).

2.3.3 Conscientiousness

Conscientiousness is defined by lower-order factors of competence, order, dutifulness, achievement-striving, self-discipline, and deliberation (Costa & McCrae, 1992). Across three samples of American adults, college students from 24 nations, and adults from 14 nations, women had significantly higher levels of competence and dutifulness than men (Costa et al., 2001).

Conscientiousness is defined by the organization, diligence, perfectionism, and prudence domains in HEXACO (Lee & Ashton, 2004). Lee and Ashton (2018) found a significant sex differences in overall conscientiousness for both undergraduate students and community members where females were more conscientious than males. When examining lower-order facets, there was a significant sex difference for all four facets where females had higher levels of organization, diligence, perfectionism, and prudence than males (Lee & Ashton, 2018). MeĎedović, Čolović, Dinić, and Smederevac (2017) found significant sex difference for three of the four facets; females had higher levels of organization, diligence, and perfectionism than males.

2.3.4 Neuroticism/Emotional Stability

In the Big Five personality traits, neuroticism or emotional stability is defined by anxiety, hostility, depression, self-conscientiousness, impulsivity, and vulnerability factors (Costa & McCrae, 1992). A consistent sex difference in two facets of emotional stability has been examined; women are more anxious than males, and males are more impulsive than females (Feingold, 1994). Women have also shown higher scores on depression (Nolen-Hoeksema, 1987) and lower scores on self-esteem (Kling, Hyde, Showers, & Buswell, 1999) which are also related to the neuroticism trait (Schmitz, Kugler & Rollnik, 2003). Women were found to have higher scores of anxiety, depression, self-conscientiousness, impulsivity, and vulnerability in three independent samples (Costa et al., 2001). Weisberg and coworkers examined the ability of ethnicity and age as moderators of the gender difference in subfacets of neuroticism (volatility and withdrawal), which were defined by DeYoung et al. (2007). When examining ethnicity as a moderator, the gender difference in the volatility lower-order factor of neuroticism was significant. However, the pattern of the difference was distinct between Asians and Caucasians: Asian women scored higher than Asian men, but Caucasian men scored higher than Caucasian women (Weisberg et al., 2011). Age also moderated the relationship where, in younger adults, women were more neurotic, but, it older adults, men were more neurotic (Weisberg et al., 2011).

In terms of HEXACO, emotionality is defined by domains of fearfulness, anxiety, dependence, and sentimentality (Lee & Ashton, 2004). Emotionality is consistently higher in women than it is in men (Lee & Ashton, 2004, 2018). Females were significantly higher in levels of all four domains of emotionality than males (Lee & Ashton, 218). MeĎedović et al. (2017) found women scored higher on fearfulness, anxiety, dependence, and sentimentality facets of HEXACO.

2.3.5 Openness

Openness is defined by subfacets of fantasy, aesthetics, feelings, actions, ideas, and values in the Big Five personality traits (Costa & McCrae, 1992). In Feingold's (1994) meta-analysis on sex differences in personality traits, there was no meaningful sex difference in the facets of openness. Costa and coworkers (2001) found men scored significantly higher in openness to ideas, feelings, action, and values in three separate samples. Age moderated the gender difference in the intellect sub-facet of openness, where there was a larger gender gap in younger than older adults (Weisberg et al., 2011).

In HEXACO, openness is defined by domains of aesthetic appreciation, inquisitiveness, creativity, and unconventionality (Lee & Ashton, 2004). Lee and Ashton (2018) found females had higher levels of esthetic appreciation and creativity than males, but males had higher levels of inquisition and unconventionality. MeĎedović and coworkers (2017) found only the aesthetic facet of openness in HEXACO had a significant sex difference, where females had higher levels. Other research on openness has shown no sex difference over three independent data sets (Botwin, Buss & Shackelford, 1997).

2.3.6 Honest-Humility

Honesty-humility is defined by the domains of sincerity, fairness, greed avoidance, and modesty (Lee & Ashton, 2004). Lee and Ashton (2004) found a significant sex difference in overall honesty-humility and in all four subfacets, where females had higher levels of sincerity, fairness, greed avoidance, and modesty than males. Lee and Ashton (2018) found significant sex difference for fairness, greed avoidance, and modesty, but not for sincerity. MeĎedović and coworkers (2017) found women had overall higher levels of honesty-humility; however, when examining at the lower-order facets, only the fairness facet had a significant sex difference, where women had higher scores than men. In spite of the HEXACO model being relatively new, there is little research examining the lower-order factors of each of the HEXACO traits.

When examining the sex differences in higher order facets of personality, in terms of Big Five or HEXACO, there is more consistency than when examining the lower-order facet of each personality trait. The lack of stability in the sex differences of the lower-order facets indicates that there are no reliable facets that are driving these sex differences.

2.3.7 Hypotheses Surrounding Causes of Sex Differences

There are three working hypotheses on sex differences in personality.

1) The social psychological approach to personality emphasizes gender norms as being important socialized and culturally-determined traits that are reflected in our personalities. Socio-cultural factors influence expectations regarding the roles each gender takes in society. For example, in 82% of cultures, there is evidence that girls are taught to be more nurturing than boys (Low, 1989; Wood & Eagly, 2002). When examining how boys and girls differ in how they play, gender toys and activities are introduced as early as 17 months, which is when the child begins to become aware of their gender self-labeling (Zosuls et al., 2009). Girl toys are often directed towards

nurturing and beauty, while boy toys are direct more towards risk and completion (Zosuls et al., 2009). However, researchers have also identified challenges to this theory. First, Eagly's (1971) social role theory demonstrates how diverse roles, not specifically gender roles, affect how a person thinks and acts. For example, supervisors were more likely to behave more dominantly no matter their gender (Moskowitz, Suh & Desaulniers, 1994). This suggests that learned differences observed between men and women may be due to roles other than those influenced specifically by gender roles. Second, empirical research has largely contradicted the socio-cultural explanation of gender differences in personality. For instance, evidence has shown larger gender difference in Big Five Personality traits in more egalitarian societies, where there are fewer gender norm rules. For example: more egalitarian countries, such as France and the Netherlands, had a larger gender difference in Big Five personality traits, whereas low gender egalitarian cultures, such as Botswana and India, showed smaller gender differences (Schmitt, Reala, Voracek, & Alik, 2008).

2) Accordingly, additional biological explanations of personality have been examined. For instance, research exploring sex differences in personality has emphasized the role of various hormones, such as the androgen Testosterone (T), in relation to expressions of personality. Evidence suggests that testosterone levels affect personality-relevant attitudes and behavior, and can help to explain differences between men and women in these domains (Dabbs, Hargrove, & Heusel, 1996). For example, male fraternity members with lower testosterone (more feminine) were viewed as more agreeable, as smiling more, being more friendly and acting more pleasantly, as well as being more conscientious by being more academically inclined and more socially responsible (Dabbs et al., 1996). However, like social causation models, these findings are also correlational, and therefore cannot elucidate causation in the relationship.

3) Along the biological line of personality, the evolutionary approach postulates sex differences are due to the discrepancy in adaptive problems faced by ancestral males and females over human history. Human females have more obligatory parental investment than males, from initial investment in gametes to higher investment in their children's development and survival (Buss, 2012; Trivers, 1972). Conversely, males have adapted traits that emphasize competition for access to mates (Trivers, 1972). Evolutionary

psychologists believe that sex differences in personality reflect these ancestral pressures (Buss, 2009). For example, men high in the surgency subset of extraversion retained mates more by displaying resources, and women preferred surgency and dominance as traits in their mates more than men (MacDonald, 1998). Futhermore, MacDonald (1998) believes the adaptive function of conscientiousness is for monitoring the environment for dangers, which is viewed as primarily as a women's adaptive trait mother to protect her kin (Blocker & Eckberg, 1989). In relation to reproduction, increased levels of extraversion in men was related to higher social class standings and higher probability of polygamous marriage, which are closely related to providing reproductive opportunities for men (Alvergne, Jokela & Lummaa, 2010).

These three explanations of sex differences in personality may potentially work in conjunction with one another. Evolutionary psychology may be able to explain the existence of sex differences, but socialization and hormonal research may explain how these differences are exhibited within specific individuals.

2.4 Personality and Environmentalism

Previous research on personality and environmentalism has focused on the Big Five personality traits (Brick & Lewis, 2016; Goldberg, 1992; Hirsh, 2010; McCrae & Costa, 1987; Milfont & Sibley, 2012; Markowitz, Goldberg, Ashton & Lee 2012). Research has shown that higher levels of agreeableness, conscientiousness, and openness are associated with significantly higher attitudes in favor of environmental protectionism (Milfont & Sibley, 2012). This was also seen in a German population, where those with high levels of conscientiousness, openness to experience, and agreeableness reported more environmental concern, whereas those with high levels of emotional stability showed less environmental concern (Hirsh, 2010). As well, Nisbet, Zelenski, and Murphy (2009) found Nature Relatedness (NR), defined as an individual's perceived connection to nature, was positively correlated with openness, agreeableness, and conscientiousness.

Openness to experience, extraversion and conscientiousness have been correlated with pro-environmental behavior in both community and student samples (Markowitz, Goldberg, Ashton & Lee, 2012). When Brick and Lewis (2016) examined the Big Five personality dimensions and a more specific environmental behavior, reducing emission production, they found openness and conscientiousness predicted behavior to reduce emissions. Kvasova (2015)

found agreeableness, conscientiousness, neuroticism, and extraversion as predictors of eco-friendly tourist behavior; defined as actions an individual takes to reduce their impact on the environment while traveling (Dolnicar, Crouch & Long, 2008). Research on green consumer behavior has identified individuals with extraversion, agreeableness, and conscientiousness as the key targets to market their products (Fraj & Martinez, 2006). When examining waste management behavior in the United Kingdom, conscientiousness predicted both recycling and reuse of material behaviors (Swami, Chamorro-Premuzic, Snelgar & Furnham, 2011).

Brick & Lewis (2016) used the HEXACO personality measure to examine the relationship between personality and emission-reduction behavior. With a sample of 345 residents from the United States, they found all HEXACO personality traits, except for emotionality, predicted emission-reduction behavior (Brick & Lewis, 2016). However, only openness to experience and conscientiousness uniquely predicted these behaviors with all factors entered into a model simultaneously (Brick & Lewis, 2016). For conscientiousness, all facets of the personality trait predicted emission reduction (Brick & Lewis, 2016).

The previous literature indicates a strong relationship between personality traits and environmentalism, with openness, agreeableness, and conscientiousness being the most salient traits. Openness predicted pro-environmentalism (Brick & Lewis, 2016; Hirsh, 2010; Markowitz et al., 2012; Milfont & Sibley, 2012; Nisbet et al., 2009), however there were mixed results when examining the sex differences cross-culturally (Schmitt et al., 2009). Agreeableness was also predicted environmentalism (Fraj & Martinez, 2006; Hirsh, 2010; Kvasova, 2015; Milfont & Sibley, 2012; Nisbet et al., 2009), however the sex difference in agreeableness was moderated by both age and ethnicity (Weiseber et al., 2011). Lastly, environmentalism was predicted by conscientiousness (Brick & Lewis, 2016; Fraj & Martinez, 2006; Hirsh, 2010; Kvasova, 2015; Markowitz et al., 2012; Milfont & Sibley, 2012; Nisbet et al., 2009; Swami et al., 2011), and conscientiousness has also been found to have the most stable sex difference in the higher-order factors (Schmitt et al., 2009). This elicits the need to explore the capability of personality factors, such as conscientiousness, openness, and agreeableness, as a mediating variable in the gender-environmental relationship. However, the different studies mentioned above have used diverse measures of environmentalism in relation to personality, such that interpretation across the studies can be challenging. Therefore, the current thesis must first examine the strength of all personality traits (i.e. Big Five and HEXACO) relating to environmentalism.

Previous literature has indicated the potential importance of personality to explain the biological sex difference in environmentalism, however research is lacking in examining gender differences in environmentalism, as measured on a continuum from feminine to masculine. The characteristic of femininity has been shown to relate to the environmental attitudes (Zelezny et al., 2000) and consumer purchasing of green products (Brough, Wilkie, Ma, Isaac, & Gal, 2016). This raises the question of whether gender may be independently important to consider in terms of understanding individual differences in environmentalism. Emerging sociological research has shifted from focusing on personality traits as being purely biologically anchored, but rather may be embedded within social structure, situations, roles, and norms. For example, Lucas (1969) examined the leadership styles that emerged during the Canadian coalmine disaster of 1958. In the beginning, individuals took on more masculine-oriented leadership by taking control and being more assertive, however after 3 days passed, when failure, fear, and fatigue set in, a feminine orientation towards empathetic leadership materialized during the disaster (Lucas, 1969). Another example involves the personality shift in female flight attendants after 9/11. Airlines changed policy to allow female flight attendants to behave more assertively due to security being prioritized more than courtesy during air travel (Santin & Kelly, 2015). These examples demonstrate that both facets of personality and behavior typically tied more to one sex can be altered by environmental or social circumstance. In order to gain a more comprehensive picture of the relationship between both biological sex and gender in relation to environmentalism, the current studies aim to explore the potential mediating role of personality upon sex and gender differences in pro-environmental attitudes and behaviour.

Chapter 3

3 Manuscript

The following chapter consists of the current studies based on the manuscript detailing the results of three studies on personality as a mediator of sex and gender differences in environmentalism, which has been published in the peer-reviewed *Journal of Personality and Individual Differences*. The manuscript can be cited as:

Desrochers, J., Albert, G., Milfont, T. L., Kelly, B., & Arnocky, S. (2019). Does personality mediate the relationship between sex and environmentalism? *Personality and Individual Differences, 147*, 204–213. doi:10.1016/j.paid.2019.04.026

3.1 Introduction

Previous research has demonstrated clear sex and gender differences in environmentalism, such that women report stronger pro-environmental attitudes and more pro-environmental behavior relative to men (for reviews, see Gifford & Nilsson, 2014; Milfont & Schultz, 2016; Zelezny, Chua, & Aldrich, 2000). Moreover, observational and experimental studies indicate that women litter less than men (Kallgren, Reno, & Cialdini, 2000), and leave a smaller carbon footprint (i.e., lower energy consumption; Räty & Carlsson-Kanyama, 2010). This trend has been confirmed cross-culturally (Hunter, Hatch, & Johnson, 2004; Marquart-Pyatt, 2008; Zelezny et al, 2000, Study 2) and through systematic meta-analytic review (Zelezny et al., 2000, Study 1). Sex differences in environmental attitudes hold even when controlling for other important demographic characteristics including age, income, political conservatism, education, and geographic proximity to the potential effects of climate change (Milfont, Evans, Sibley, Ries, & Cunningham, 2014). Moreover, recent research has extended this finding beyond the general public and into the realm of political office such that female political leaders express more environmental concern than their male counterparts (Sundström & McCright, 2013), highlighting the potential societal ramifications of this sex difference in environmentalism. Indeed, nations with more women members of parliament are more likely to protect land areas and ratify international environmental treaties, and regions with more equitable treatment of women tend to

exhibit less forest depletion and air pollution (United Nations Development Programme Human Development Report, 2011).

Researchers have therefore attempted to identify individual difference variables that might help to explain women's higher levels of environmental concern and behavior relative to men. For example, Dietz, Kalof, and Stern (2002) examined sex differences in value structures that have previously been associated with environmental concern and behavior (altruism, traditionalism, self-interest, and openness to change). However, results found little evidence of sex differences in the proposed value priorities except for altruism. Similarly, Zelezny et al. (2000) found that women reported higher levels of being socially-oriented and other oriented, however neither of these variables were directly related to environmentalism in their study. Arnocky and Stroink (2011) found that emotional empathy mediated links between sex and both environmental concern and cooperation in a commons dilemma scenario, such that women were higher than men in emotional empathy, and empathy in turn predicted each pro-environmental variable. Extending their findings, Milfont and Sibley (2016) found that empathy and social dominance orientation mediated longitudinal associations between sex and environmentalism, and Gra a, Calheiros, Oliveira and Milfont (2018) found that both empathy and social dominance orientation also mediated associations between sex and support for animal exploitation.

Interestingly, variables that have been targeted as potential explanatory factors for this sex difference such as empathy, altruism, self-interest, and openness to change, fall well within the more comprehensive definitions of personality. However, to date, no research has directly examined the potential role of individual differences in personality traits as a potential factor that might help to better understand important sex differences in environmentalism.

Personality involves individual differences in manners of thought, emotion, and behavior that is simultaneously rooted in biological predisposition and influences by social forces, such as gender roles (Eagly, 1987). Most personality research focuses on the Big Five traits, which includes extraversion, openness, conscientiousness, neuroticism/emotion stability and agreeableness. An extraverted person is outgoing, talkative, and friendly; openness encompasses qualities such as originality, imagination, and having broad interests; an agreeable person is

someone who trusts in others, is cooperative, and sympathetic; low emotional stability is defined as an individual being worrisome, self-conscious, and insecure; and a conscientious person is energetic, hardworking, and ambitious (John & Srivastava, 1999). More recently, a six-dimension model of personality traits has been proposed. In the HEXACO model the sixth factor included is termed honesty-humility, described as an individual who does not feel entitled, is modest, and tries to be fair (Lee & Ashton, 2004).

Notably, personality has been identified as one of the most consistent predictors of environmental concern and behavior in the environmental psychology literature. For example, associations at the individual-level using both retrospective measurement of conservation behavior and a concurrent measure of interest in environmental protection found that environmentalism was positively associated with agreeableness, conscientiousness, and openness to experience; a finding that was also supported by data at a national level (Milfont & Sibley, 2012). The relationship between these three personality variables and environmental variables has also been positively demonstrated in a German community sample (Hirsh, 2010), and also positively demonstrated in Canadian students (Nisbet, Zelenski & Murphy 2009), and agreeableness and openness were also the personality traits more strongly correlated with climate change beliefs (Milfont, Milojev, Greaves, & Sibley, 2015). When Brick and Lewis (2016) examined the Big Five personality dimensions and specific environmental behavior, such as reducing emission production, they found that openness and conscientiousness predicted behavior aimed at reducing emissions. Markowitz, Goldberg, Ashton and Lee (2012) suggested personality dimensions are an indirect indicator of environmental behavior, and found that the relationship between openness to experience and environmental behavior was mediated by environmental attitudes and connectedness to nature.

Interestingly, sex and gender differences in Big Five personality traits are also well established in the personality psychology literature (see Feingold, 1994). For example, women often score lower on emotional stability and higher in agreeableness, openness, and conscientiousness (Renau, Oberst, Gosling, Rusiñol, & Chamarro, 2013). This finding has also been demonstrated longitudinally from adolescence to young adulthood (Vecchione, Alessandri, Barbaranelli, & Caprara, 2012). Lehmann, Denissen, Allemand and Penke (2013) found that men consistently report being higher in openness than women at all age categories, whereas women

report being higher in conscientiousness than men. When Schmitt, Realo, Voracek, and Allik (2009) examined sex differences in Big Five personality traits through the Big Five Inventory (BFI) cross-nationally, they found that women reported significantly higher conscientiousness in over half of the countries studied; however, they found mixed results of gender differences in openness to experience between countries, highlighting the fact that personality dimensions can be sensitive to environmental context (see Eagly, 1987; Fedadjiev & van de Vijver, 2015).

3.1.1 The Current Study

Although Big Five personality and conscientiousness in particular, have been robustly linked to both sex and environmentalism, we are unaware of any research to date that has explored personality as a mediator of the relationship between sex and environmentalism. Therefore, the goals of the current studies are to examine if personality traits may mediate the sex-environmentalism relationship and to identify which personality trait in particular would emerge as the main mediator. Across three data sets that differed from one another in terms of sample composition and/or measurements, the present contribution tested the following general predictions: (1) female and male participants will differ in environmental attitudes and behavior, and (2) personality traits (particularly conscientiousness, agreeableness, and/or openness) will mediate sex and gender differences in environmental attitudes and behavior. Specifically, women will be higher in measures of environmentalism as well as in personality factors previously linked to environmentalism, and that these personality traits will mediate (i.e., account for) links between sex/gender and environmentalism. To test these hypotheses, we conducted three studies which built on each other in terms of breadth of both sampling and measurement, as guided by extant literature.

Study 1 examined these hypotheses in a student sample using a brief measure of Big Five personality. Study 2 extended this design within a community sample. Because personality differs across different socio-demographic groups, including within different educational and vocational streams (e.g., Vedel, 2016), it is possible that these personality traits matter more for environmentalism among more diverse groups of individuals. Indeed, previous studies linking agreeableness and neuroticism to environmentalism have largely relied upon community samples (Brick & Lewis, 2016; Hirsh, 2010; Milfont & Sibley, 2012), suggesting there may be fundamental differences in the personality factors linked to environmentalism between students

and non-students. Study 3 explored then tested these hypotheses using the HEXACO model of personality in a student sample, with the addition of gender, as measured on a spectrum of masculinity and femininity, as a predictor of both personality and environmentalism. Most environmental psychology research to date has conceptualized and measured differences in environmental attitudes and behavior as occurring across dichotomous conceptualizations of gender or biological sex (see Zelezny et al., 2000). Study 1 (student sample) and Study 2 (community sample) therefore utilize this measurement of sex as it extends to our mediation model. Yet given that biological sex can sometimes differ from one's gender identity, and some research suggests that these constructs can vary in their prediction of environmentalism (Zelezny et al., 2000), Study 3 extends the testing of our model by also including gender, or the degree to which one identifies along a continuum of femininity and masculinity, in order to examine the degree of concordance as it pertains to the models tested. Finally, following Markowitz et al. (2012) who demonstrated that environmental attitudes mediated links between personality and environmental action, we tested subsequent multiple mediation models whenever possible (i.e., when links between personality, attitudes, and behavior were present) to determine if multiple-mediation effects were present, whereby sex differences in behavior were explained by personality effects on pro-environmental attitudes.

3.2 Study 1

In Study 1, we investigated whether Big Five personality mediates the relationship between sex and environmental attitudes and behavior using well-established self-report measures. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in all three studies.

3.2.1 Methods

3.2.1.1 Personality

A G*Power analysis indicated that a sample size of 391 was needed to detect an effect size of .17, which was chosen due to previous research on gender and environmentalism (Arnocky & Stroink, 2011) indicating a similarly small effect between sex and environmentalism, with 95% power and an alpha of .05. The final sample comprised 437 students (244 females) recruited from a small university in Canada (M_{age} = 20.6, SD = 4.32; 81% Caucasian, 6% First Nations,

5% Asian, 3% Black, 5% Mixed heritage). All procedures were approved by the university research ethics board.

3.2.1.2 Procedure and Measures

As part of a larger protocol examining environmentalism, personality, and learned helplessness, participants received $5 CAD remuneration and completed a counter-balanced survey package that included basic demographic information (e.g., sex) and self-report measures, including the measures detailed below (see Appendix C for measures included in our survey).

Personality. Big Five personality dimensions were assessed using the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). The TIPI consists of ten items (two for each personality dimension) assessing Openness, Agreeableness, Conscientiousness, Emotionality, and Extraversion scored using a 7-point Likert-type scale ranging from 1 = *Disagree strongly* to 7 = *Agree strongly*. The measure has been previously shown to have good content validity and stability over time (Gosling, et al., 2003). In the current study, the correlations between the two items comprising each TIPI subscales were as follows: conscientiousness ($r = 0.39$, $p < .001$), extraversion ($r = 0.55$, $p < .001$), agreeableness ($r = 0.13$, $p = .008$), openness ($r = 0.25$, $p < .001$), and emotionality ($r = 0.48$, $p < .001$).

Environmental attitude. Pro-environmental attitudes were measured using the brief version of the Environmental Attitude Inventory (EAI-24; Milfont & Duckitt, 2010). The EAI-24 consists of 24 items scored using a 7-point Likert-type scale anchored at 1 = *strongly disagree* and 7 = *strongly agree*. Items assess enjoyment of nature, support for interventionist conservation policies, environmental movement activism, conservation motivated by anthropocentric concern, confidence in science and technology, environmental fragility, altering nature, personal conservation behavior, human dominance over nature, human utilization of nature, ecocentric concern, and support for population growth policies. Items were combined and averaged to form two subscales assessing general attitudes towards environmental protectionism ($\alpha = 0.82$) and utilization ($\alpha = 0.75$), whereby preservation reflects the belief that priority should be given to preserving and protecting nature, and utilization reflects the belief that it is appropriate for nature to be used and altered for human objectives.

Pro-environmental behavior. Self-reported pro-environmental behavior was assessed using a measure developed by Schultz et al. (2005). The measure asks participants to indicate how often they have engaged in 12 acts of pro-environmental behavior during the past year. It covers a variety of domains and ranges from easy to difficult, including having: looked for ways to reuse things, recycled newspapers, recycled cans or bottles, encouraged friends or family to recycle, purchased products in reusable containers, picked up litter that was not your own, composted food scraps, conserved gasoline by walking or bicycling, written a letter supporting an environmental issue, voted for a candidate who supported environmental issues, donated money to an environmental group, and volunteered time to help an environmental group. Responses were scored along a 5-point Likert-type scale anchored at 1 = *never* and 5 = *very often*. A "not applicable" response was also provided "if there was no opportunity for the action." In the present study the measure of environmental behavior demonstrated good internal consistency, $\alpha = 0.83$.

In-vivo environmental behavior. Due to the overuse of self-report environmental behavior in environmental psychology research, this study utilizes a novel behavioral measure. Milfont (2009) found a weak relationship between image management, which is a part of social desirability responding, and self-report environmental behavior. Therefore, a behavioral measure could remove the effects of social desirability on responding environmental questionnaires. To improve self-report environmental behavior, two in-vivo behavioral measures were utilized. First, participants were given the opportunity to either keep their $5 remuneration, or to donate it to a well-known environmental organization (the World Wildlife Fund); 33.9% of participants donated their winnings. Consistent with previous research on donating (Arnocky, Piché, Albert, Ouellette, & Barclay, 2017), of those who donated females donated more often (males = 30.4%, females = 69.6%, χ^2 (1, N = 437) = 16.63, $p < .001$, Cramer's V = 0.2, $p < .001$). Second, participants were also given the opportunity to sign up for emails from a bogus university/college environmental group; 77.1% of participants did not opt-in to the bogus environmental group. Males were more likely to opt-in to the bogus environmental group than females (males = 57%, females = 43%, χ^2 (1, N = 437) = 8.99, $p = .003$, Cramer's V = 0.14, $p = .003$).

3.2.2 Identifying Testable Models

Preliminary analysis examined correlations between personality and environmental variables.

Extraversion, agreeableness, and emotional stability did not correlate with any of the environmental variables. Consistent with previous research, conscientiousness correlated with environmental protectionism (r = 0.15, p = .003), utilization attitude (r = -0.15, p = .002), self-report behavior (r = 0.12, p = .01), and willingness to donate (r = 0.16, p = .001). Openness also correlated with environmental protectionism (r = 0.24, p < .001), utilization (r = -0.23, p < .001), and behavior (r = 0.19, p < .001). Yet of these, point-biserial correlations showed that only conscientiousness (r = 0.17, p < .001), but not openness (r = 0.02, p = .71), correlated with sex (0 = male, 1 = female), such that females were more conscientious than males. Thus, only conscientiousness satisfied inclusion criteria for consideration as a mediator (see Kenny, 2016). The Supplementary Material (see Appendix F) presents all correlations among variables for each study.

Multiple mediation models (Model 4) (PROCESS, Hayes, 2013) examined the extent to which conscientiousness mediated sex differences in environmental attitudes (protectionism and utilization) and behavior (self-report and in-vivo).

3.2.3 Results

First, we examined the total effects model for sex as a predictor of environmental protectionism. Females reported stronger protection attitudes relative to males, (b = 0.28, SE = 0.08, t = 3.73, p = .0002). Sex predicted conscientiousness (b = 0.33, SE = 0.12, t = 2.61, p = .009), whereby females were more conscientious than males. With both variables in the model, conscientiousness predicted protectionism, (b = 0.07, SE = 0.03, t = 2.45, p = .014), indicating a partial mediation effect, (b = 0.26, SE = 0.08, t = 3.40, p =.0007, bootstrapping: 95% LL = 0.003, 95% UL = 0.061).

Second, we examined the total effects model for sex as a predictor of environmental utilization attitudes. Males reported stronger utilization attitudes relative to females, (b = -0.35, SE = 0.08, t = -4.34, p < .0001). Sex predicted conscientiousness (b = 0.39, SE = 0.12, t = 3.28, p = .001), whereby females were more conscientious than males. With both variables in the model, conscientiousness predicted utilization attitude, (b = -0.08, SE = 0.03, t = -2.41, p = .016), indicating a partial mediation effect, (b = -0.31, SE = 0.08, t = 3.93, p = .0001, bootstrapping: 95% LL = -0.08, 95% UL = -0.007).

Third, we examined the total effects model for sex as a predictor of pro-environmental behavior. Females reported engaging in more pro-environmental behavior relative to males, (b = 0.14, SE = 0.07, t = 2.06, p = .04). Sex significantly predicted conscientiousness (b = 0.43, SE = 0.12, t = 3.63, p = .0003), whereby females were more conscientious than males. With both variables in the model, conscientiousness predicted pro-environmental behavior (b = 0.06, SE = 0.03, t = 2.20, p =.03), indicating a full mediation effect, (b = 0.11, SE = 0.07, t = 1.66, p = .10, bootstrapping: 95% LL = 0.004, 95% UL = 0.06).

Fourth, we examined the total effects model for sex as a predictor of overt donating behavior. Females were more likely to donate their remuneration relative to males, (b = 0.86, SE = 0.21, *Wald* = 16.25, $p < .001$). Females were more conscientious than males, (b = 0.43, SE = 0.12, t = 3.6, p = .0004). With both in the model, conscientiousness predicted donating behavior, (b = 0.24, SE = 0.09, t = 2.74, p = .006), The indirect effect of sex on environmental behavior, due to the mediator, was reduced, indicating a partial mediation effect, (b = 0.77, SE = 0.05, t = 2.13, p = .03, bootstrapping: 95% LL = 0.03, 95% UL = 0.23).

Last, we tested a sequential mediation model (PROCESS Model 6, Hayes, 2013) based on Markowitz et al., (2012) who found the pro-environmental attitude mediated links between personality and behavior. Both conscientiousness and environmental attitudes (protectionism and utilization) were thus tested as successive mediators of the sex difference in pro-environmental behavior (self-report and in-vivo) such that environmental attitudes provided an additional mediation pathway between conscientiousness and behavior (Fig. 1; also see supplement for bivariate links between environmental attitudes and behavioral measures). We began by examining self-report conservation behavior. When entering protectionism attitudes into the model, results showed that conscientiousness and environmental protectionism attitudes together had a mediating effect on the sex difference in self-report pro-environmental behavior (b = 0.012 SE = 0.007, bootstrapping: 95% LL = 0.0009, bootstrapping: 95% UL = 0.03). Regarding donating behavior, conscientiousness and protectionism again had a significant mediating effect, (b = 0.01, SE = 0.009, bootstrapping: 95% LL = 0.0007, 95% UL = 0.04). Next, we considered utilization attitudes within the same context. Conscientiousness and environmental utilization attitude mediated the sex difference in self-report pro-environmental behavior (b = 0.1 SE = 0.03, bootstrapping: 95% LL = 0.05, 95% UL = 0.16) and donating behavior (b = 0.02, SE =

0.01, bootstrapping: 95% LL = 0.002, 95% UL = 0.04). In each case, the inclusion of environmental attitude (a) predicted self-report and in-vivo environmental action, (b) was predicted by conscientiousness, and (c) buffered the role of conscientiousness in predicting environmental action. This suggests a full mediation showing that sex differences in conscientiousness influence pro-environmental attitudes, such that women are more conscientious, which predicts their more pro-environmental attitudes, which in turn promote environmental behavior.

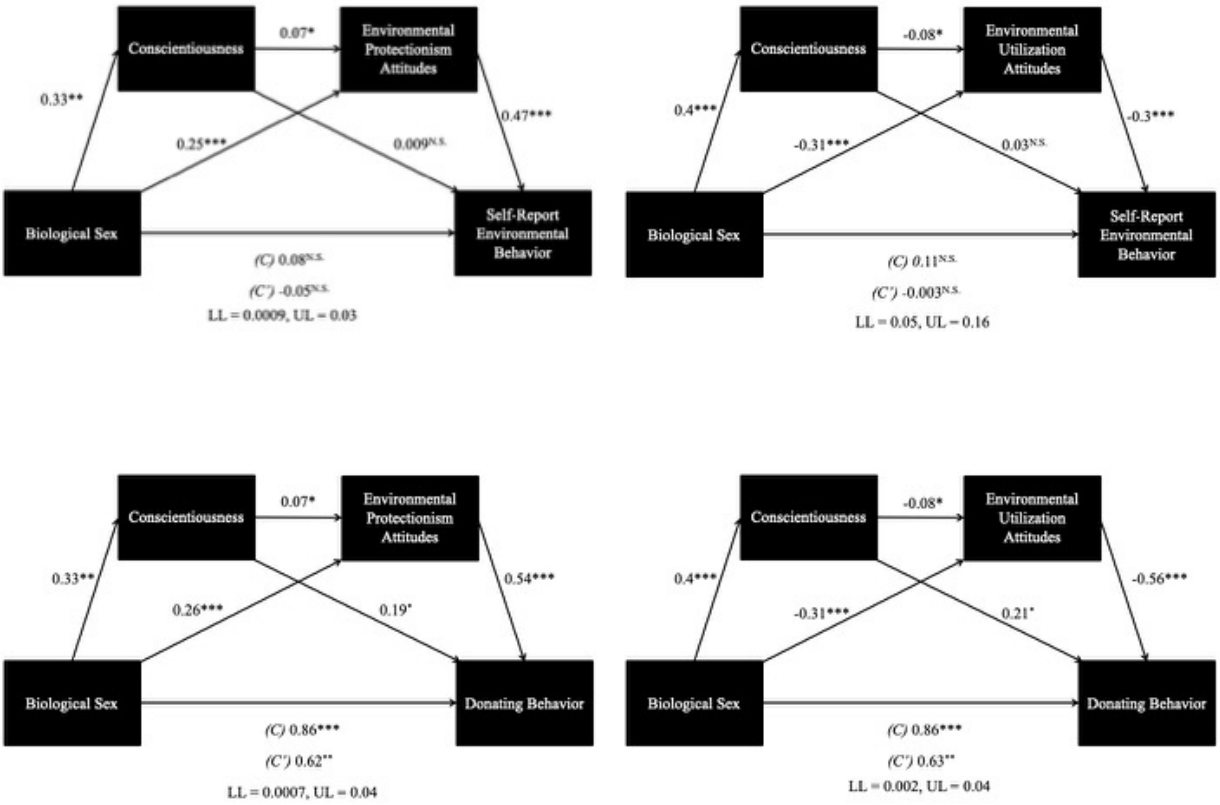

Figure 1: Sequential mediation model. Top left: conscientiousness and environmental protectionism mediated the link between sex and self-report environmental behavior. Top right: conscientiousness and environmental protectionism mediated the link between sex and in-vivo environmental behavior. Bottom left: conscientiousness and environmental utilization mediated the link between sex and self-report environmental behavior. Bottom right: conscientiousness and environmental utilization mediated the link between sex and in-vivo environmental behavior. Values represent unstandardized regression coefficients. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

3.3 Study 2

Abbreviated measures of reliable and valid scales are acceptable to use in group statistics; however, using abbreviated measures are often more efficient than they are internally consistent (Ziegler, Kemper & Kruyen, 2014). Shorter measures of personality are more susceptible to increased Type I and Type II errors due to the small variance among items and have also been argued to exhibit potentially lower criterion and content validity (Credé, Harms, Niehorster & Gaye-Valentine, 2012). Accordingly, we conducted Study 2 with the specific aim of addressing this limitation by examining Big Five personality using a longer well-established measure. Another potential limitation of Study 1 was the reliance on an undergraduate sample, which potentially restricts the generalizability of the findings. Accordingly, Study 2 utilized a community sample from distinct nations.

3.3.1 Methods

3.3.1.1 Participants

Using the average effect size from Study 1, a power analysis indicated a total sample of 331 would be required to detect an effect of 0.19 with a 95% power and an alpha set to 0.05. Participants were 321 (47.3% male) community members over the age of 18 recruited via Amazon's Mechanical Turk online sampling technologies (M_{age} = 35.2, SD = 10.64; 71% Caucasian, 37% South Asian, 23% Asian, 21% Black, 11% Latin-American). The respondents were recruited from the following countries: The United States of America (77.5%), India (14.5%), Canada (1.1%), Venezuela, The Philippines, Mexico, Romania, Bangladesh, The Dominican Republic, Bulgaria, Latvia, Portugal, Italy, Jamaica, Nicaragua, Greece, Egypt, Pakistan, Ecuador, Sweden, Poland and Hong Kong (all < 1%). Participants received $2 USD remuneration. All procedures were approved by the university research ethics board.

3.3.1.2 Procedure and Measures

Participants completed an online counter-balanced survey that included basic demographic information (e.g., sex) and self-report measures (see appendix D for measured used), including the following measures.

Personality. Personality traits were examined through the Big Five Inventory (BFI; John & Srivastava, 1999). This 44-item measure examines all Big Five personality traits with 8 to 10 items per trait, with items rated on a 5-point Likert scale from 1 = *Disagree Strongly* to 5 = *Agree Strongly*. The scale shows good reliability, content validity and stability over time (John & Srivastava, 1999). The internal consistencies for each personality trait were as followed: extraversion ($\alpha = 0.86$), agreeableness ($\alpha = 0.84$), conscientiousness ($\alpha = 0.87$), neuroticism ($\alpha = 0.89$), and openness ($\alpha = 0.82$).

Self-report environmental attitudes and behaviors. Following Study 1, self-report questionnaires on environmental attitudes and behaviors were assessed using EAI-24 (Milfont & Duckitt, 2010) and Schultz et al. (2005) environmental behavior scale respectively.

3.3.1.3 Identifying Testable Models

Primary analyses were run to examine the bivariate correlation of Big Five personality traits and environmental variables. Consistent with most of the previous literature, the participants' sex was positively correlated to environmental protectionism ($r = 0.11$, $p = .048$) and environmental utilization ($r = 0.13$, $p = .02$). Sex was also positively correlated with agreeableness ($r = 0.16$, $p = .003$), conscientiousness ($r = 0.14$, $p = .009$), and neuroticism ($r = 0.16$, $p = .004$). Next, bivariate correlations were analyzed between personality and environmental variables. Environmental behavior was positively related to extraversion ($r = 0.19$, $p = .001$), and openness ($r = 0.24$, $p < .001$). Environmental protection attitudes were positively related to agreeableness ($r = 0.23$, $p < .003$), conscientiousness ($r = 0.22$, $p < .001$), and openness ($r = 0.43$, $p < .001$). Environmental utilization was negatively correlated to neuroticism ($r = -0.11$, $p = .047$), and openness ($r = -0.32$, $p < .001$). Due to the sex differences in these personality dimensions at the bivariate level, agreeableness ($r = 0.11$, $p = .003$), conscientiousness ($r = 0.14$, $p = .009$), and neuroticism ($r = 0.16$, $p = .004$) were examined as mediators of the sex differences in environmental protection and environmental utilization (see correlations in Supplement Material Table 2 in Appendix F).

Multiple mediation models (model 4) (PROCESS, Hayes, 2013) were tested to examine the extent that personality traits, agreeableness, conscientiousness, and neuroticism, mediated the sex differences in environmental attitudes (protectionism and utilization). Sex, as a dichotomous

variable, was dummy-coded as 0 = male and 1 = female.

3.3.2 Results

First, the total effects model for sex predicting environmental protectionism was analyzed. The relationship between sex and protectionism was significant (b = 0.21, SE = 0.11, t = 1.98, p = .048), where females had more favorable attitudes towards protecting the environment than males. Sex statistically predicted agreeableness (b = 0.24, SE = 0.08, t = 3.0, p = .003), conscientiousness (b = 0.22, SE = 0.08, t = 2.64, p = .009), and neuroticism (b = 0.24, SE = 0.08, t = 2.94, p = .004), whereby females had higher levels of all three personality dimensions than males. With all variables entered in the model, environmental protectionism was significantly predicted by agreeableness (b = 0.27, SE = 0.08, t = 3.21, p = .002), conscientiousness (b = 0.26, SE = 0.08, t = 3.17, p = .002), and neuroticism (b = 0.26, SE = 0.09, t = 2.99, p = .003). With these personality traits entered into the model, the relationship between sex and protectionism was reduced to statistical non-significance (b = 0.03, SE = 0.11, t = 0.24, p = .81). Examining the confidence interval, each mediator had a significant effect (agreeableness: 95% LL = 0.02, 95% UL = 0.13; conscientiousness: 95% LL = 0.01, 95% UL = 0.12; neuroticism: 95% LL = 0.01, 95% UL = 0.13). The pairwise contrasts indicated no statistical difference between each indirect relationship.

Second, the total effects model for sex predicting environmental utilization was analyzed. The relationship between sex and utilization was significant (b = -.25, SE = 0.1, t = -2.35, p = .02), where females had less favorable attitudes towards utilizing the environment than males. Sex statistically predicted agreeableness (b = 0.24, SE = 0.08, t = 2.99, p = .003), conscientiousness (b = 0.22, SE = 0.08, t = 2.64, p = .009), and neuroticism (b = 0.24, SE = 0.08, t = 2.94, p = .004), whereby females were more agreeable, conscientious, and neurotic than males. With all variables entered in the model, environmental utilization was significantly predicted only by neuroticism (b = -0.26, SE = 0.087, t = -2.59, p = .01). With the personality variables entered into the model, the relationship between sex and protectionism was reduced to statistical non-significance (b = -.14, SE = 0.11, t = -1.28, p = .21), indicating a full mediation. Examining confidence intervals for each indirect relationship, only neuroticism had a significant mediating effect (95% UL = -0.13, 95% LL = -0.007). Given that there were no sex differences

or personality differences (in relation with sex) that predicted actual environmental *behavio*r, we could not test the more complex multiple mediation model examined in Study 1.

3.4 Study 3

Recently in personality research, there has been an emergence of a six-factor model of personality: the HEXACO model introduced by Lee and Ashton (2004). Regarding environmentalism, previous environmental psychology research has shown that all HEXACO personality dimension except for emotionality correlated with emission-reduction behavior; however, only openness to experience and conscientiousness uniquely predicted these behaviors—moreover, all facets of conscientiousness (organization, diligence, perfectionism and prudence) positively predicted emission-reduction (Brick & Lewis, 2016). Likewise, Markowitz et al. (2012) found that facets of HEXACO's conscientiousness, diligence and organization, related to self-report environmental practices. Milfont et al. (2015) found the highest levels of honesty-humility traits among climate skeptics (i.e., individuals who are skeptical about both reality and human cause of climate change were more honest and humble), whereas Lee, Ashton, Choi and Zachariassen (2015) found no relationship between honesty-humility and an individual's connectedness to nature, environmental attitudes, ecological behavior, or pro-animal attitudes.. Therefore, the links between honest-humility are mixed.

To test this empirically, Study 3 examined the mediating role of personality on sex differences in environmental attitudes and behavior using the HEXACO model. Study 3 also expanded upon our conceptualization of sex differences by also considering gender differences, as a distinct construct that differs from biological sex, in both personality and environmental variables. Therefore, gender was considered using a continuous spectrum, ranging from totally feminine to totally masculine along a well-established measure. Previous research has identified that gender role identity also maps onto environmentalism: femininity was positively associated with scores of the New Environmental Paradigm (NEP) scale, and it was found that the effect femininity had over NEP scores were stronger than the effect of biological sex differences (Zelezny, et al., 2000). More recent experimental research has identified that consumers who engage in green purchasing behavior rate themselves as being more feminine, and that men's willingness to engage in pro-environmental behavior can be manipulated by threatening or bolstering their masculinity (Brough, Wilkie, Ma, Isaac, & Gal, 2016). It was therefore expected

that the mediating role of HEXACO traits would be largely consistent across both sex and gender measures.

3.4.1 Methods

3.4.1.1 Participants

The same power analysis as Study 2 was used to indicate a total sample of 331 would be required to detect a direct effect of .19 with a 95% power and an alpha set to .05. Participants were 391 (44% males) students from Ontario recruited in classrooms and common spaces, and completed the survey in these locations (M_{age} = 21.59, *SD* = 4.91, 90.5% Caucasian, 4.3% Aboriginal, 3.6% African-Americans, 2.8% Asian, 2% South Asian, 1.3% Latin-American). Participants were included in a $100 draw as compensation for participating in the study. All procedures were approved by the university research ethics board.

3.4.1.2 Procedure and Measures

Participants completed a counter-balanced paper questionnaire that included basic demographic information (e.g., sex) and self-report measures (see appendix E for measured used), including the following measures.

Gender. Traditional Masculinity-Femininity Scale (TMF; Kachel, Steffens & Niedlich, 2016) is a 5-item scale to assess the individual's femininity and masculinity on a spectrum. Participants were asked to rate themselves from 1 = *very masculine* to 7 = *very feminine* for bipolar items, such as "I consider myself...", "Ideally, I would like to be...", "Traditionally, my interests would be considered as…", "Traditionally, my behaviour would be considered as...", "Traditionally, my outer appearance would be considered as...". In the present study the measure of gender demonstrated good internal consistency, α = 0.97. As theorized, the total sample mean was 4.04, while the male sample mean was 2.30, and the female sample mean was 5.38.

Personality. Personality traits were assessed with the Brief HEXACO Inventory (BHI; de Vries, 2013). This inventory consists of 24 items, where each of the six dimensions is represented by four items. The six dimensions of HEXACO being honesty-humility, agreeableness, emotional stability, openness and conscientiousness (Lee & Ashton, 2004). The BHI was shown adequate test-rest stability, self-agreement levels and highly correlated with

HEXACO-PI-R (de Vries, 2013). This widely used inventory initially showed poor internal consistencies during initial validation of the measure, however the creators of the scale argued that it nevertheless shows "adequate levels of test-retest stability, adequate levels of self-other agreement, and high levels of convergent correlations with the HEXACO-PI-R" (de Vries, 2013, p. 877). The BHI falls within a congeneric model, because each item represents its own unique sub-factor of the overarching personality construct. Therefore Cronbach's alpha is not best suited to assessing its internal consistency (Peters, 2014). Previous research has shown the value in examining omega instead of Cronbach's alpha when examining personality traits (Deng & Chan, 2017). The present study showed similar Chronbach's alphas to those reported in the initial validation research for this measure: openness (α = .46, omega = .38), conscientiousness (α = 0.58, omega = 0.62), agreeableness (α = 0.36, omega = 0.38), extraversion (α = 0.38, omega = 0.46), emotionality (α = 0.55, omega = 0.57), and honesty-humility (α = 0.42, omega = 0.43).

Self-report environmental attitudes and behaviors. Following Studies 1 and 2, self-report questionnaires on environmental attitudes and behaviors will utilize the EAI-24 (Milfont & Duckitt, 2010) and Schultz et al. (2005) environmental behavior scale, respectively.

In-vivo environmental behavior. Study 3 utilized similar behavioral measures as Study 1, where participants could donate their remuneration to an environmental cause and sign up for a bogus university/college environmental group. The difference between the studies was that participants in Study 3 were given the opportunity to either keep their $100 winnings (versus real remuneration), or to donate it to a well-known environmental organization (the World Wildlife Fund); 32.7% of participants wanted to donate their winnings. Consistent with our Study 1, of those who donated females donated more often (males = 38.1%, females = 61.9%), but this difference was only marginally statistically significant, χ^2 (1, N = 361) = 2.72, p = .10, Cramer's V = 0.09, p = .10). For the bogus environmental group, 72.1% of participants did not opt-in. There was no statistical sex difference in those who opted-in (males = 48%, females = 52%, χ^2 (1, N = 365) = 0.66, p = .42, Cramer's V = -0.04, p = .42).

3.4.1.3 Identifying Testable Models

Primary analyses were run to examine correlations between sex/gender and each of the environmental variables. Sex correlated with environmental protectionism attitudes (r = 0.12, p =

.02), environmental utilization attitudes (r = -0.11, p = .03), and self-report environmental behavior (r = 0.17, p = .001). Sex did not correlate with either of the two in-vivo behavior (donating r = 0.09, p = .1; opt-in r = -0.04, p = .42). TMF was only significantly correlated with environmental behavior (r = 0.16, p = .002). In relation to personality and each of the environmental variables, extraversion, agreeableness, and neuroticism are not correlated with any of the environmental variables. Consistent with previous research, conscientiousness correlated with environmental protectionism (r = 0.13, p = .02) and behavior (r = 0.15, p = .004). Openness also correlated with environmental protectionism (r = 0.35, p < .001), utilization (r = -0.2, p < .001), and behavior (r = 0.29, p < .001). Moreover, honesty-humility correlated with protectionism (r = 0.16, p = .003) and utilization (r = -0.22, p < .001). In relation to biological sex and personality traits, point-biserial correlation analysis showed conscientiousness (r = 0.12, p = .02), openness (r = -0.15, p = .003), and honesty-humility (r = 0.19, p = .001) were significantly correlated to sex. As well in relation to TMF, conscientiousness (r = 0.11, p = .04), openness (r = -0.13, p = .01), and honesty-humility (r = 0.13, p = .01) were significantly correlated. Therefore, both conscientiousness and honesty-humility correlated with sex and femininity in the same direction as the mediation model. Open people were more likely to engage in environmental behavior; however, because women were less open than men, openness did not satisfy criteria as a potential explanatory variable for why women are, overall, more pro-environmental than men. Thus, only conscientiousness and honesty-humility satisfied inclusion criteria for consideration as a mediator variable for both biological sex and TMF (i.e., correlations between X and M, and between M and Y; see Kenny, 2016). See all correlations in Supplement Table 3 (Appendix F).

Multiple mediation models (PROCESS, Model 4; Hayes, 2013) were tested to examine the extent that personality traits mediated the sex/gender differences, through biological sex and gender as a continuous variable, in environmental attitudes and behaviors. Sex, as a dichotomous variable, was dummy-coded as 0 = male and 1 = female. In this final study, there are four mediation analyses examined: 1. Conscientiousness and honesty-humility mediating the relationship between biological sex and environmental protectionist attitudes; 2. Honesty-humility mediating the relationship between biological sex and environmental utilization; 3. Conscientiousness mediating the relationship between biological sex and self-report environmental behavior; and 4. Conscientiousness mediating the relationship between gender

and self-report environmental behavior.

3.4.2 Results

First, the total effects model for sex predicting environmental protectionism attitudes was analyzed. The relationship between sex and environmental protectionism was significant (b = 0.17, SE = 0.07, t = 2.27, p = .02), where females had more favorable attitudes towards protecting the environment than males. Sex statistically predicted conscientiousness (b = 0.16, SE = 0.07, t = 2.34, p = .02) and honesty-humility (b = 0.26, SE = 0.07, t = 3.87, p < .001) whereby females were more conscientious and honest/humble than males. With all variables entered in the model, protectionism was not significantly predicted by conscientiousness (b = 0.09, SE = 0.06, t = 1.54, p = .12), but was significantly predicted by honesty-humility (b = 0.15, SE = 0.06, t = 2.66, p = .008). Due to conscientiousness and honesty-humility as mediators, the relationship between sex and protectionism was reduced to non-significant (b = 0.12, SE = 0.07, t = 1.68, p = 0.09), indicating a full mediation. Examining confidence intervals, only honesty-humility had a significant effect (95% UL = 0.009 LL = 0.08).

Second, the total effects model for sex predicting environmental utilization attitudes was analyzed. The relationship between sex and environmental protectionism was significant (b = -0.17, SE = 0.08, t = -2.22, p = .03), where females had fewer favorable attitudes towards the utilization of the environment than males. Sex statistically predicted honesty-humility (b = 1.05, SE = 0.27, t = 3.86, p < .001), whereby females were more honest/humble than males. With all variables entered in the model, utilization was significantly predicted by honesty-humility (b = -0.06, SE = 0.01, t = -3.96, p < .001). Due to honesty-humility as a mediator, the relationship between sex and utilization was reduced to non-significant (b = 0.11, SE = 0.08, t = 1.44, p = 0.15, bootstrapping: 95% LL = -0.09, 95% UL = -0.03), indicating a full mediation.

Third, the total effects model for sex predicting self-report environmental behavior was analyzed. The relationship between sex and environmental behavior was significant (b = 0.21, SE = 0.06, t = 3.29, p = .001), where females were more likely to report acts of environmentalism than males. Sex predicted conscientiousness (b = 0.65, SE = 0.27, t = 2.38, p = .02), whereby females were more conscientious than males. With all variables entered in the model, environmental behavior was predicted by conscientiousness (b = 0.03, SE = 0.01, t = 2.55, p =

.01). With conscientiousness included in the model, the relationship between sex and environmental behavior was statistically-significantly reduced (b = 0.19, SE = 0.06, t = 2.98, p = 0.003, bootstrapping: 95% LL = 0.004, 95% UL = 0.05), indicating a partial mediation.

Fourth, the total effects model for TMF predicting self-report environmental behaviors was analyzed. The relationship between TMF and environmental behavior was significant (b = 0.05, SE = 0.02, t = 3.10, p = .002), where those who were more feminine were more likely to report acts of environmentalism than masculine participants. TMF predicted conscientiousness (b = 0.16, SE = 0.08, t = 2.10, p = .04), where those who were more feminine were also more conscientious than masculine participants. With all variables entered in the model, environmental behavior was significantly predicted by conscientiousness (b = 0.03, SE = 0.01, t = 2.52, p = .01). With conscientiousness included as a mediator, the relationship between TMF and environmental behavior was statistically-significantly reduced (b = 0.05, SE = 0.02, t = 2.83, p =0.005, bootstrapping: 95% LL = 0.001, 95% UL = 0.01), indicating a partial mediation.

Last, we tested a sequential mediation model (PROCESS Model 6; Hayes, 2013) similar to that in Study 1. Specifically, environmental attitude may mediate links between personality (conscientiousness and honesty-humility) and behavior. Accordingly, environmental attitude was included in two separate multiple mediation model (as in Study 1). In the first model, conscientiousness mediated sex differences in environmental behavior, and where protectionism attitude simultaneously mediated the link between conscientiousness and behavior. In the second model, honesty-humility mediated the sex differences in environmental behavior, and where protectionism attitude also simultaneously mediated the link between honesty-humility and behavior. Because TMF scores did not relate to protectionism attitude, testing of this model was limited to sex. View Figure 2 for a visual of the multiple mediation model (see supplement for bivariate links between environmental attitudes and behavioral measures). Given that, unlike Study 1, utilization attitudes correlated only with honesty-humility, we limited testing of the multiple mediation model to honesty-humility. When entering protectionism into our model, results showed that conscientiousness and environmental protectionism mediated the sex difference effect in self-report environmental behavior (b = 0.01, SE = 0.01, bootstrapping: 95% LL = 0.00, 95% UL = 0.04). When entering protectionism into our second model, results showed that honesty-humility and environmental protectionism mediated the sex difference effect in self-

report environmental behavior (b = 0.02, SE = 0.009, bootstrapping: 95% LL = 0.004, 95% UL = 0.04). When entering utilization into the model, results showed that honesty-humility and environmental utilization mediated the sex differences effect in self-report environmental behavior (b = 0.02, SE = 0.007, bootstrapping: 95% LL = 0.006, 95% UL = 0.03). Similar to study 1, the addition of environmental protectionist attitudes (a) predicted both self-report, (b) was predicted by conscientiousness, and (c) influenced the strength of the link between conscientiousness and environmental behavior. Again, this suggests that females are more conscientiousness, which influences their environmental protectionist attitudes, which in turn affects their frequency of environmental behavior.

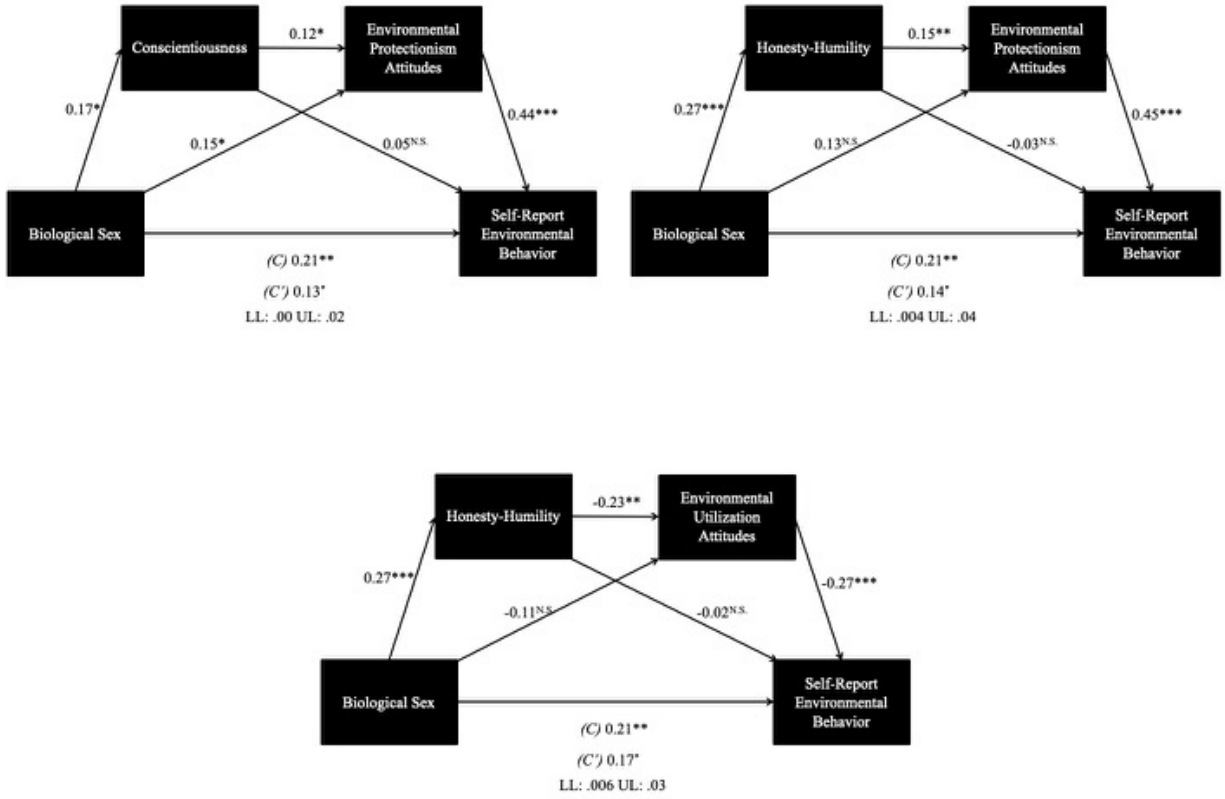

Figure 2: Sequential mediation models. Top left: Conscientiousness and environmental protectionism did significantly mediate links between sex and self-report environmental behaviors. Top right: honesty-humility and environmental protectionism attitudes did significantly mediate links between sex and self-report environmental behaviors. Bottom:

honesty-humility and environmental utilization attitudes mediated the links between sex and self-report environmental behaviors. Values represent unstandardized regression coefficients. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

3.5 Discussion

Women, relative to men, consistently score higher on measures of pro-environmental attitudes and conservation behavior. This finding has been replicated cross-nationally and has been cited as one of the most robust in the field of environmental psychology (Sundström & McCright, 2013). This sex difference holds considerable importance to societal efforts aimed at curbing environmental degradation. For instance, the theme of a recent International Women's Day focused specifically on "Planet 50-50 by 2030: Step It Up for Gender Equality" with the recognition that women play an important role in environmental sustainability (Elwell & Williams, 2016). Yet hitherto, there has been a surprising lack of research aimed at understanding this sex difference. Previous studies have considered a relatively narrow set of potential explanatory variables, and little research has appropriately modeled the relationship by testing the target variable as a mediator (Arnocky & Stroink, 2011; Gar a, et al., 2018). Concurrently, a separate yet potentially informative line of research has identified broad differences in personality, measured using both Big Five and HEXACO models, as important predictors of pro-environmental attitudes and behavior. In particular, conscientiousness appears to be consistently linked to greater engagement in environmentalism. The present research sought to align these important lines of inquiry by testing whether personality traits, as broad and relatively stable set of interrelated individual differences in attitudes and behavior, might account for sex and gender differences in environmentalism. Over the course of three studies, the sex difference in environmentalism was significantly mediated by personality traits, in particular conscientiousness.

To this end, Study 1 examined a brief measure of Big Five personality (TIPI) in a large undergraduate sample. Participants reported on pro-environmental attitudes and behavior, as well as engaged in novel in-vivo measures of pro-environmental behavior: Donating their remuneration to an environmental organization and indicating intention of joining an on-campus environmental group. Results showed that whereas trait agreeableness, neuroticism, openness, and extraversion were inconsequential to the environmental variables, conscientiousness

mediated observed sex differences in environmental protectionism, utilization, self-report conservation behavior, and donating to an environmental organization.

Study 2 examined Big Five personality using a longer measure, the Big Five Inventory, in a community sample recruited from Amazon's Mechanical Turk. Similar to Study 1, participants reported pro-environmental attitudes and behaviors. Results showed that conscientiousness, agreeableness, and neuroticism mediated sex differences in environmental protectionism attitudes. However, the sex differences in environmental utilization attitudes were only mediated by neuroticism. Findings from this study extended the role of conscientiousness in explaining sex differences in environmentalism in a less homogenous sample. However, some important differences were also observed in the similar mediating roles of neuroticism and agreeableness, which were not observed in either of the student samples (Studies 1 and 3). Accordingly, it is possible that in less heterogeneous samples (i.e., more diverse ethnic, educational, geographic, and socioeconomic backgrounds), these personality dimensions also play an important role in explaining men's and women's environmentalism. Future research should address this possibility by employing a mixed sample and testing the personality as a mediator in each concurrently.

More interestingly, conscientiousness did not mediate the sex-environmental utilization relationship in both Studies 2 and 3. However, conscientiousness mediated the sex difference in environmental *protectionist* attitudes in all three studies. The EAI subscales of protectionism and utilization differentiate between the two value systems when examining environmentalism, where protectionist attitudes encompass ecocentric concern (i.e., concern due to valuing the environment itself) and utilization attitudes engulf anthropocentric concern (i.e., concern due to valuing the environment for its benefits to oneself or humans) towards the environment. In relation to these two value systems, conscientiousness has previously been positively correlated with environmental ecocentrism (Boeve-de Pauw, Donche & Petegem, 2011), as well with concepts relating to ecocentrism, such as emotional affinity towards nature and commitment to nature (Tam, 2013). This demonstrates that conscientiousness may not be as important to sex differences in resource utilization as it is to individuals' willingness to conserve the environment for its own inherent value.

In Study 3, personality was assessed through the Brief HEXACO Inventory in a student sample. Results showed that honesty-humility mediated the link between sex and environmental protectionism attitude, whereas Conscientiousness mediated the sex differences in self-reported environmental behavior. Study 3 also extended beyond biological sex to examining gender differences using a continuous gender measure, the Traditional Masculinity-Femininity Scale. Results showed that conscientiousness again mediated the gender difference in self-report environmental behavior, but not environmental protectionism which was unrelated to gender. Past research using continuous measures of gender has identified potential differences from sex, such that gender may better capture individual differences in environmental outcomes (Zelezny et al., 2000). Our findings similarly demonstrated that when gender is considered instead of sex, the difference in protectionist attitudes dissipated; perhaps female masculinity and male femininity may bear upon mitigating established sex differences in this attitude. However, the difference in actual conservation behavior remained across both measures and was mediated consistently by conscientiousness.

It is also noteworthy that in Study 3, the sex difference observed in the in-vivo measure of donating to an environmental organization did not replicate findings from our first study. In Study 1, participants were remunerated with $5 CAD, whereas in Study 3 participants were remunerated with a chance to win $100. It is possible that the act of donating tangible money is conceptually different than agreeing to donate potential winnings. Indeed although the overall rates of donation were nearly identical between the two studies, the sex differences were not: with actual money females donated more and men less than when the remuneration involved potential draw winnings. In other words, the sex difference in donating was much more restricted in the monetary draw sample which could explain the null findings for Study 3. Future research should utilize actual monetary resources instead of potential winnings.

When additional analyses were run in Studies 1 and 3 examining the addition of environmental attitudes as further mediating the link between conscientiousness and environmental behavior, we observed that environmental attitudes (protectionism in Studies 1 and 2 and utilization in Study 1 only) served as an additional mediating variable such that females were more conscientious relative to males, which accounted for their greater pro-environmental attitude, whereby attitude in turn directly predicted pro-environmental action.

These results extend the results of Markowitz et al. (2012), where environmental attitudes mediated the relationship between personality traits and environmental behavior. Together, findings from this set of studies demonstrate a robust mediating effect of conscientiousness upon sex and gender differences in pro-environmental attitudes and behavior. The research also highlights two additional personality factors, agreeableness and neuroticism, as targets for future research which might also bear upon this link.

Over the course of three studies, conscientiousness was identified as an important mediator for the sex-environmentalism link. This information could be useful in discovering how to increase males' desire to help the environment and their subsequent actions. Previous research has explored the concept of inducing conscientiousness in participants. Participants primed with conscientious adjectives were more likely to have higher conscientiousness score on a complex personality measure of conscientiousness (Nordlund, 2009). Similarly, participants who went through self-regulating training for six-weeks had higher scores of conscientiousness (Della Porta, 2013). This research suggests male conscientiousness can be influenced. The present research suggests that in so doing, researchers could potentially promote environmentalism among men. Future research should examine the effect of priming conscientiousness on environmental attitudes and more importantly environmental behavior.

3.5.1 Limitations

In all three studies, both environmental attitudes, protectionism and utilization, had a sex difference, however results indicated an inconsistency in sex differences of self-reported environmental behavior. In Studies 1 and 3, with student samples, females reported engaging in more self-report pro-environmental behavior than males. In Study 2, with a community sample, there was no sex difference for environmental behavior. This demonstrates a potential difference between student and non-student samples. The difference in the self-report environmental behavior measures between Study 1 and 3 with Study 2 is that Study 2 did not have the 'Not Applicable' option when responding. This difference in measurement did not allow for the participants to respond in a way if they had no opportunity to engage in such a behavior. Interestingly, previous research on rural vs urban residents found urban residents engaged in more environmentally friendly behavior mostly due to the availability of the communities' environmental services (Huddart-Kennedy, Beckley, McFarlane & Nadeau 2009; Saphores,

Nixon, Ogunseitan, & Shapiro, 2006). For rural residents who do not have services, such as roadside recycling programs, recycling becomes more of an inconvenience to them (Saphores et al. 2006). This could help explain the difference found across our studies, although it should be noted that we employed different measures of environmentalism in our research. The student samples, from the same city, would have relatively the same availability in terms of environmental services, whereas a community sample, from different locations, predominately throughout the United States, could potentially have different options for their pro-environmental behaviors. Accordingly, if these community members did not have the option to respond with "Not Applicable", there could be a possibility of response skewness. This study lacks the ability to investigate the cause and effect relation of the variables due to the correlational design. However, it does elucidate a better understanding of the role personalities play in the gender differences in environmentalism. Future research should take this information into consideration when examining why men are less environmentally friendly. Another potential measurement limitation involves the utilization of a brief measure of HEXACO personality dimensions in Study 3. The subscales did not exhibit high internal consistency. Future research should employ a longer more detailed measure to address this limitation.

Large cross-cultural studies have demonstrated much consistency with adult sex differences in personality (see De Bolle et al., 2015). Yet some research suggests that personality is not purely biologically-driven, but rather is at least in part amenable to socio-cultural influence (Eagly, 1987). Some research has even investigated the effects of priming personality dimensions which appear to increase self-reports personality, including conscientiousness. From this perspective, future research could employ these priming techniques to identify whether attempts at increasing conscientiousness among men might enhance their pro-environmental attitudes and behavior.

The in-vivo behavior of environmentalism (donating to an environmental organization) should be examined cautiously as we did not rule out the possibility that this is merely an index of generalized altruism (e.g., see Kaiser & Byrka, 2011), rather than environmentalism specifically. However, when examining bivariate correlations between donating behavior and environmental variables, donating did relate to environmental attitudes and behaviors (Study 1 ranged from $r = .14$ to $r = .27$; Study 3 ranged from $r = .12$ to $r = .28$). This demonstrates that

environmental individuals were more likely to be the individuals who were donating to the environmental cause, suggesting it is a valid index of environmentalism. It is however, unclear whether there are potentially important differences between the actual donation of a relatively smaller amount of money (Study 1) versus the donation of a relatively larger amount money that is uncertain in the form of draw winnings (Study 3). Future research should consider including a control charity that is not associated with environmentalism to examine the true relationship with in-vivo environmental behavior, and allow for partial donation of real or potential earnings to allow for more flexibility in these measures.

3.5.2 Conclusion

A large body of research has identified robust sex differences between men and women in their pro-environmental attitudes and behavior. Yet to date, very little research has attempted to understand the underlying psychological characteristics that mediate the link between sex and environmentalism. The current set of studies demonstrated that sex differences in trait personality dimensions, and in particular, conscientiousness plays an important role in accounting for why women appear to care more about, and act to protect, the environment. Such a finding may have important implications for pro-environmental initiatives. These findings suggesting that increasing conscientiousness generally among males may be a viable strategy for mitigating environmental depletion.

Chapter 4

4 General Discussion

The current thesis demonstrated the ability of personality traits, mostly conscientiousness, to mediate the sex differences in environmentalism. However, further questions remain about the nature of these observed sex differences. In light of Arnocky and Stroink's (2011) findings of empathy mediating the sex differences, it is reasonably to consider whether empathy and conscientiousness might uniquely explain additional variance in these models, or whether they are essentially capturing the same construct. Previous research on empathy and conscientiousness is mixed. Some studies have found that conscientiousness did not relate to any empathy factors (i.e. fantasy, perspective taking, empathetic concern, and personal distress) in students (Furnham, McManus & Scot, 2015; Winning & Boag, 2015) or empathetic tendency in manufacturing plant employees (Ladd & Henry, 2000). However, conscientiousness and empathy significantly correlated in Portugal medical students, but when controlling for gender the relationship diminished (Costa, Alves, Neto, Marvão, Portela & João Costa, 2014; Magalhães, Costa & João Costa, 2012). This demonstrates the possibility that sex plays a role in the relationship between conscientiousness and empathy. Conscientiousness significantly correlated with empathy in both teenage boys and girls, but, this relationship is even stronger in the boy sample (Barrio, Aluja & Garcia, 2004). Additionally, the relationship between the Basic Empathy scale and conscientiousness was only significant in teenage boys, where boys with higher empathy also had higher levels of conscientiousness (Jolliffe & Farrington, 2006). This raises the question if perhaps a sequential mediation model with conscientiousness predicting empathy, in turn predicting environmentalism, might mediate links between sex and environmentalism.

The next question relates to work by Milfont et al (2013) on Social Dominance Orientation (SDO) mediating the gender differences in anthropogenic beliefs about climate change. Could conscientiousness and SDO both help to better explain the gender differences in pro-environmentalism? Conscientiousness does not significantly relate to SDO in university students (Ekehammar et al., 2004; Heaven & Bucci, 2001; Pratto, Sidanius, Stallworth & Malle, 1994' Perry & Sibley, 2012) or high school students even after controlling for gender and age (Akrami & Ekehammar, 2006). The lack of support for the relationship between

conscientiousness and SDO suggests that perhaps these are two unique sex-linked individual differences that might independently mediate the relationship between sex and environmentalism.

The openness to new experience personality trait interestingly did not play a role in any of the analysis of the current study. Following suit with previous research, openness related to environmentalism in all three studies, but there was a mix of results when examining its relationship with sex or gender. Openness did not significantly relate to sex in Study 1 and Study 2, but it did in Study 3. However in Study 3, openness did not satisfy the criteria for examining its potential to mediate the sex differences in environmentalism because openness was higher in males, but males were less pro-environmental than females. Future research could attempt to explain this relationship. When examining the subfacets of environmental protectionism and utilization attitudes, the strongest and most stable relationship was with enjoyment of nature (See Table 3). This links to the Markowitz et al. (2012) finding of individuals who have a better appreciation of aesthetics (i.e. aesthetic facet of openness) being more likely to self-report performing actions of pro-environmental behavior. When examining the correlation between openness in each subfacet of environmental attitudes split by sex in Study 3 (the analysis was only run in Study 3 because sex only correlated with openness in the third study), visually there seems to be a sex difference in the subscales, but only by using Fisher's r-to-z transformation one subscale had a significant sex difference. The belief that humans dominant over nature subscale is significantly different between the sexes (See Table 4), where open males were less likely to believe humans dominated nature. This may show that openness does not help explain the individual differences in environmental attitudes in males.

Correlation with Openness	Study 1	Study 2	Study 3
Enjoyment of Nature	.246**	.323**	.329**
Support for Interventionist Conservation Policies	.109*	.324**	.192**
Environmental Movement Activism	.205**	.279**	.226**
Conservation Motivated by Anthropocentric Concern	-.215**	-.274**	-.192**
Confidence in Science and Technology	-0.056	0.027	.120*
Environmental Threat	.180**	.352**	.170**
Altering Nature	-.141**	-.250**	-.113*
Personal Conservation Behaviour	.209**	.338**	.216**
Human Dominance Over Nature	-.126**	0.020	-.152**
Human Utilization of Nature	-.167**	-.328**	-.235**
Ecocentric Concern	.156**	.350**	.222**
Support for Population Growth Policies	0.007	.220**	.204**

Table 1: Bivariate correlations between openness and subfacets of environmental attitudes. Values represent correlation coefficients. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Correlation with Openness	Male	Female	*z*	*P* (one tailed)
Enjoyment of Nature	.413**	.268**	1.59	0.06
Support for Interventionist Conservation Policies	.215**	.218**	-0.03	0.5
Environmental Movement Activism	.198*	.295**	-1.00	0.16
Conservation Motivated by Anthropocentric Concern	-.195*	-.215**	0.20	0.42
Confidence in Science and Technology	0.095	0.092	0.03	0.5
Environmental Threat	.184*	.185**	-0.01	0.5
Altering Nature	-0.016	-.176**	1.55	0.05
Personal Conservation Behavior	.223**	.241**	-0.08	0.47
Human Dominance Over Nature	-.261**	-0.077	-1.83	0.03
Human Utilization of Nature	-.242**	-.256**	0.14	0.44
Ecocentric Concern	.337**	.210**	1.32	0.25
Support for Population Growth Policies	0.150	.216**	-0.66	0.51

Table 2: Bivariate correlations between openness and subfacets of environmental attitudes separated by each sex. Values represent correlation coefficients. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

4.1.1 Implications and Future Directions

The current studies focused on the role of personality in better understanding the sex difference in pro-environmental attitudes and behavior. Taking the three studies together, the findings from the present thesis are important to the field of environmental psychology because identifying those who exhibit environmentally conscientious behaviors will allow for a better strategy to entice those who are not. Similar to previous research, our research shows females are significantly more concerned about what is happening to the environment and they are more likely to want to, as well as actively do, something to help mitigate the effects of climate change. However, this research is limited to the understanding of this sex difference rather than identifying factors to influence the promotion of environmental action among men. Oskamp and coworkers (1991) believed that psychological research was important in promoting an increase in recycling and other pro-environmental behavior. Future research will be required to examine whether inducing or appealing to conscientiousness in males can actually increase their pro environmental attitudes and action.

The current studies are also lacking in the explanation of why *some* males might be more pro-environmental than others. Recent research has identified markers of phenotypic masculine traits, such as deeper voice and wider-shorter faces, which were linked to diminished environmental attitudes in a sample of males (Landry, Desrochers, Hodges-Simeon & Arnocky, 2019). This research demonstrated the possibility that males may not be as environmental as females because of biological factors. The future direction of research in examining the sex differences in pro-environmentalism should aim to examine both individual difference traits, such as personality or empathy, as well as biological traits.

Lastly, this research focused on identifying dependent variables centered upon concern and behavior to help the environment. Yet previous research has shown a disconnect with individual's environmental attitudes and their intention to perform actions to mitigate climate change. Gifford (2011) identified psychological barriers that may limit a person to do actions to mitigate climate change. The seven barriers are: limited cognition, ideologies, comparison with others, sunk costs, discredence, perceived risk, and limited behavior. As much as previous research has shown the connection between conscientiousness and self-efficacy (Lee & Klein, 2002), more research should examine conscientiousness' ability to link to the barriers to action to identify if a lack of conscientiousness could help explain these barriers to environmental action.

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Appendices

Appendix A: Environmental Attitudes Inventory (EAI-14; Milfont & Duckitt, 2010) was used unchanged in Studies 1, 2, and 3.

Please indicate the extent to which you agree or disagree with each of the following statements.

1. I really like going on trips into the countryside, for example to forests or fields.

O	O	O	O	O	O	O
Strongly disagree	**Disagree**	**Somewhat disagree**	**Unsure/ neutral**	**Somewhat agree**	**Agree**	**Strongly agree**

---

2. I DO NOT believe humans were created or evolved to dominate the rest of nature.

O	O	O	O	O	O	O

---

3. Protecting the environment is more important that protecting peoples' jobs.

O	O	O	O	O	O	O

---

4. Whenever possible, I try to save natural resources.

O	O	O	O	O	O	O

---

5. We need to keep rivers and lakes clean in order to protect the environment, and NOT as places to enjoy water sports.

O O O O O O O

---

6. I think nature is boring.

O O O O O O O

---

7. I do not believe that the environment has been severely abused by humans.

O O O O O O O

---

8. I'd much prefer a garden that is well-groomed and ordered to a wild and natural one.

O O O O O O O

---

9. Modern science will solve our problems.

O O O O O O O

---

10. One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports.

O O O O O O O

---

11. Protecting peoples' jobs is more important than protecting the environment.

O O O O O O O

---

12. Humans are severely abusing the environment.

O O O O O O O

---

13. Governments should control the rate at which raw materials are used to ensure that they last as long as possible.

O O O O O O O

---

14. Modern science will NOT be able to solve our environmental problems.

O O O O O O O

---

15. I would like to join and actively participate in an environmentalist group.

O O O O O O O

---

16. A married couple should have as many children as they wish, as long as they can adequately provide for them.

O O O O O O O

17. It makes me sad to see forests cleared for agriculture.

O O O O O O O

---

18. I would NOT get involved in an environmentalist organization.

O O O O O O O

---

19. Human beings were created or evolved to dominate the rest of nature.

O O O O O O O

---

20. I am NOT the kind of person who makes efforts to conserve natural resources.

O O O O O O O

---

21. I am opposed to governments controlling and regulating the way raw materials are used in order to try and make them last longer.

O O O O O O O

---

22. Families should be encouraged to limit themselves to two children or less.

O O O O O O O

---

23. I'd prefer a garden that is wild and natural to a well-groomed and ordered one.

O O O O O O O

---

24. It does NOT make me sad to see natural environments destroyed.

O O O O O O O

Appendix B: Self-reported pro-environmental behavior (Schultz et al., 2005) was used unchanged in Studies 1, 2, and 3.

Please indicate how often you have done each of the following behaviours.

1. Looked for ways to reuse things.

O O O O

Never **Monthly** **Weekly** **Daily**

---

2. Recycled newspapers, flyers, etc.

O O O O

---

3. Recycled cans or bottles.

O O O O

---

4. Encouraged friends or family to recycle.

O O O O

---

5. Purchased products in reusable or recyclable containers.

O O O O

---

6. Picked up litter that was not your own.

O O O O

---

7. Composted food scraps.

O O O O

---

8. Conserved gasoline by walking or bicycling.

O O O O

---

9. Written a letter, an email, or participated in a forum supporting an environmental issue.

O O O O

---

10. Voted for, or supported a candidate who supported environmental issues.

O O O O

Appendix C: Study 1: questionnaire material specific to S1

Instructions: Please complete the following survey. Remember, your responses will never be linked to your identity, so please answer as honestly as possible.

1. What is your sex? Please circle one of the following:

MALE FEMALE

2. Age _____ years

3. How would you best describe yourself in terms of ethnic or cultural heritage? Check any that apply.

- ○ White/Caucasian (e.g. British, German, Italian, Russian, Israeli, etc.)
- ○ Asian (e.g., Chinese, Japanese, Taiwanese, Korean, etc.)
- ○ South Asian (e.g., East Indian, Pakistani, Sri Lankan, Indo-Guyanese, etc.)
- ○ South East Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese, etc.)
- ○ Arab/West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan, etc.)
- ○ Black (e.g., African-American, Caribbean, Haitian, Jamaican, Somali, Nigerian, African)
- ○ Native/Aboriginal People (e.g., First Nations, Métis, Inuit, etc.)
- ○ Latin-American (e.g., Cuban, Puerto Rican, Salvadorian, Mexican, Argentinean, etc.)
- ○ Other (please specify) _____

Here are a number of personality traits that may or may not apply to you. Please indicate beneath each statement the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

I see myself as:

1. Extraverted, enthusiastic.

O	O	O	O	O	O	O
Disagree strongly	**Disagree moderately**	**Disagree a little**	**Neither agree nor disagree**	**Agree a little**	**Agree moderately**	**Agree strongly**

2. Critical, quarrelsome.

O	O	O	O	O	O	O

3. Dependable, self-disciplined.

O	O	O	O	O	O	O

4. Anxious, easily upset.

O	O	O	O	O	O	O

5. Open to experiences, complex.

O	O	O	O	O	O	O

6. Reserved, quiet.

O O O O O O O

---

7. Sympathetic, warm.

O O O O O O O

---

8. Disorganized, careless.

O O O O O O O

---

9. Calm, emotionally stable.

O O O O O O O

---

10. Conventional, uncreative.

O O O O O O O

EAI-24 (see Appendix A)

Self-report environmental behaviours (see Appendix B)

IMPORTANT PAYMENT INFORMATION

We are offering the opportunity for you to donate your prize money to the World Wildlife Foundation. WWF works to:

- Protect and restore species and their habitats
- Strengthen local communities' ability to conserve the natural resources they depend upon
- Transform markets and policies to reduce the impact of the production and consumption of commodities
- Ensure that the value of nature is reflected in decisions made by individuals, communities, governments and businesses
- Mobilize hundreds of millions of people to support conservation

PLEASE INDICATE WHETHER YOU WOULD LIKE TO KEEP THE MONEY YOU EARNED FROM THIS STUDY OR HAVE YOUR EARNINGS DONATED ANONYMOUSLY TO WWF

☐ I WOULD LIKE TO KEEP MY FIVE DOLLARS

☐ I WOULD LIKE TO DONATE MY FIVE DOLLARS TO WWF

NIPISSING U STUDENT ENVIRONMENTAL AWARENESS GROUP MEMBERSHIP

Nipissing University students have created a new Environmental Awareness group. Members attend meetings to discuss local environmental issues that are important to North Bay, attend political demonstrations relevant to environmental protection, and engage in activities such as community cleanups.

If you would like to join, please provide your name and email address here (this page will be removed from the rest of your anonymous survey):

NAME:_____

TELEPHONE OR EMAIL:_____

Appendix D: Study 2: questionnaire material specific to S2

Here are a number of characteristics that may or may not apply to you. Please indicate the extent to which you agree or disagree with that statement.

1. is talkative

O	O	O	O	O
Disagree Strongly	**Disagree a little**	**Neither agree nor disagree**	**Agree a little**	**Strongly agree**

---

2. tends to find fault with others

O	O	O	O	O

---

3. does a thorough job

O	O	O	O	O

---

4. is depressed, blue

O	O	O	O	O

---

5. is original, comes up with new ideas

O	O	O	O	O

---

6. is reserved

O O O O O

---

7. is helpful and unselfish with others

O O O O O

---

8. can be somewhat careless

O O O O O

---

9. is relaxed, handles stress well

O O O O O

---

10. is curious about many different things

O O O O O

---

11. is full of energy

O O O O O

---

12. starts quarrels with others

O O O O O

---

13. is a reliable worker

O O O O O

---

14. can be tense

O O O O O

---

15. is ingenious, a deep thinker

O O O O O

---

16. generates a lot of enthusiasm

O O O O O

---

17. has a forgiving nature

O O O O O

---

18. tends to be disorganized

O O O O O

---

19. worries a lot

O O O O O

---

20. has an active imagination

O O O O O

---

21. tends to be quiet

O O O O O

---

22. is generally trusting

O O O O O

---

23. tends to be lazy

O O O O O

---

24. is emotionally stable, not easily upset

O O O O O

---

25. is inventive

O O O O O

---

26. has an assertive personality

O O O O O

---

27. can be cold and aloof

O O O O O

---

28. perseveres until the task is finished

O O O O O

---

29. can be moody

O O O O O

---

30. values artistic, aesthetic experiences

O O O O O

---

31. is sometimes shy, inhibited

O O O O O

---

32. is considerate and kind to almost everyone

O O O O O

---

33. does things efficiently

O O O O O

---

34. remains calm in tense situations

O O O O O

---

35. prefers work that is routine

O O O O O

---

36. is outgoing, sociable

O O O O O

---

37. is sometimes rude to others

O O O O O

---

38. makes plans and follows through with them

O O O O O

---

39. gets nervous easily

O O O O O

---

40. likes to reflect, play with ideas

O O O O O

---

41. has a few artistic interests

O O O O O

---

42. likes to cooperate with others

O O O O O

---

43. is easily distracted

O O O O O

---

44. is sophisticated in art, music, or literature

O O O O O

EAI-24 (See appendix A)

Self-report environmental behaviours (See appendix B)

Appendix E: Study 3: questionnaire material specific to S3

Instructions: Please complete the following survey. Remember, your responses will never be linked to your identity, so please answer as honestly as possible.

1. What is your sex? Please circle one of the following:

MALE FEMALE

2. Age _____ years

3. How would you best describe yourself in terms of ethnic or cultural heritage? Check any that apply.

- ○ White/Caucasian (e.g. British, German, Italian, Russian, Israeli, etc.)
- ○ Asian (e.g., Chinese, Japanese, Taiwanese, Korean, etc.)
- ○ South Asian (e.g., East Indian, Pakistani, Sri Lankan, Indo-Guyanese, etc.)

- ○ South East Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese, etc.)
- ○ Arab/West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan, etc.)
- ○ Black (e.g., African-American, Caribbean, Haitian, Jamaican, Somali, Nigerian, African)
- ○ Native/Aboriginal People (e.g., First Nations, Métis, Inuit, etc.)
- ○ Latin-American (e.g., Cuban, Puerto Rican, Salvadorian, Mexican, Argentinean, etc.)
- ○ Other (please specify) _____

Please answer the following questions.

1. I consider myself to be …

O	O	O	O	O	O	O
Very Masculine						**Very feminine**

2. Ideally, I would like to be…

O	O	O	O	O	O	O
Very Masculine						**Very feminine**

3. Traditionally, my interests would be considered as….

O	O	O	O	O	O	O
Very Masculine						**Very feminine**

4. Traditionally, my behavior would be considered as…

O	O	O	O	O	O	O
Very Masculine						**Very feminine**

5. Traditionally, my outer appearance would be considered as …

O	O	O	O	O	O	O
Very Masculine						**Very feminine**

Here are a number of personality traits that may or may not apply to you. Please indicate, beneath each statement, the extent to which you agree or disagree with the given statement.

O	O	O	O	O
Disagree strongly	**Disagree**	**Neither agree nor disagree**	**Agree**	**Agree strongly**

1. I can look at a painting for a long time.

O	O	O	O	O

---

2. I make sure that things are in the right spot.

O	O	O	O	O

---

3. I remain unfriendly to someone who was mean to me.

O O O O O

---

4. Nobody likes talking to me.

O O O O O

---

5. I am afraid of feeling pain.

O O O O O

---

6. I find it difficult to lie.

O O O O O

---

7. I think science is boring.

O O O O O

---

8. I postpone complicated tasks as long as possible.

O O O O O

---

9. I often express criticism.

O O O O O

---

10. I easily approach strangers.

O O O O O

---

11. I worry less than others.

O O O O O

---

12. I would like to know how to make a lot of money in a dishonest manner.

O O O O O

---

13. I have a lot of imagination.

O O O O O

---

14. I work very precisely.

O O O O O

---

15. I tend to quickly agree with others.

O O O O O

---

16. I like to talk with others.

O O O O O

---

17. I can easily overcome difficulties on my own.

O O O O O

---

18. I want to be famous.

O O O O O

---

19. I like people with strange ideas.

O O O O O

---

20. I often do things without really thinking.

O O O O O

---

21. Even when I'm treated badly, I remain calm.

O O O O O

---

22. I am seldom cheerful.

O O O O O

---

23. I have to cry during sad or romantic movies.

O O O O O

---

24. I am entitled to special treatment.

O O O O O

EAI-24 (See appendix A)

Self-report environmental behaviours (See appendix B)

IMPORTANT PAYMENT INFORMATION

We are offering the opportunity for you to donate your prize money to the World Wildlife Foundation. WWF works to:

- Protect and restore species and their habitats
- Strengthen local communities' ability to conserve the natural resources they depend upon
- Transform markets and policies to reduce the impact of the production and consumption of commodities
- Ensure that the value of nature is reflected in decisions made by individuals, communities, governments and businesses
- Mobilize hundreds of millions of people to support conservation

PLEASE INDICATE WHETHER YOU WOULD LIKE TO KEEP THE MONEY YOU EARNED FROM THIS STUDY OR HAVE YOUR EARNINGS DONATED ANONYMOUSLY TO WWF

☐ I WOULD LIKE TO KEEP MY CHANCE AT $100

☐ I WOULD LIKE TO DONATE MY $100 WINNINGS TO WWF

NIPISSING U STUDENT ENVIRONMENTAL AWARENESS GROUP MEMBERSHIP

Nipissing University students have created a new Environmental Awareness group. Members attend meetings to discuss local environmental issues that are important to North Bay, attend political demonstrations relevant to environmental protection, and engage in activities such as community cleanups.

If you would like to join, please provide your name and email address here (this page will be removed from the rest of your anonymous survey):

NAME:_____

TELEPHONE OR EMAIL:_____

Appendix F: Supplementary material from published manuscript

Each table is a correlation matrix including all variables in each study.

Table 3 Correlation between sex, environmental variables, and personality traits for S1

Variables		1	2	3	4	5	6	7	8	9
1. Participant Sex (0= M, 1=F)	*r*	----								
	p									
	n									
2. Environmental Protectionism	*r*	.182	----							
	p	.000								
	n	406								
3. Environmental Utilization	*r*	-.205	-.599	----						
	p	.000	.000							
	n	430	404							
4. Environmental behavior	*r*	.099	.521	-.369	----					
	p	.04	.000	.000						
	n	435	405	429						
5. Willingness to donate	*r*	.195	.215	-.243	.138	----				
	p	.000	.000	.000	.004					
	n	437	407	431	436					

6. Extraversion	*r*	.012	.027	-.021	.058	-.085	----			
	p	.807	.589	.673	.234	.079				
	n	428	406	424	427	429				
7. Agreeableness	*r*	.159	.063	-.088	.027	.09	-.12	----		
	p	.001	.209	.071	.583	.06	.013			
	n	433	403	428	432	434	425			
8. Conscientiousness	*r*	.17	.147	-.148	.121	.163	.057	.102	----	
	p	.000	.003	.002	.012	.001	.241	.034		
	n	437	407	431	436	438	429	434		
9. Emotional Stability	*r*	-.23	.046	-.082	.094	.069	.137	.116	.241	----
	P	.000	.351	.092	.05	.152	.005	.016	.000	
	n	435	405	429	434	436	427	432	436	
10. Openness	*r*	.018	.236	-.225	.193	.035	.348	.039	.208	-180
	p	.705	.000	.0000	.000	.47	.000	.423	.000	.000
	n	436	406	430	430	437	428	433	437	435

Table 4 Correlations between sex, environmental variables, and personality traits in S2

Variables		1	2	3	4	6	7	8	9
1. Participant Sex (0=M, 1=F)	*r*	----							
	p								
	n								
2. Environmental Protectionism	*r*	.107	----						
	p	.048							
	n	338							
3. Environmental Utilization	*r*	-.127	-6.76	----					
	p	.02	.000						
	n	338	338						
4. Environmental behavior	*r*	-.104	.286	-.197	----				
	p	.055	.000	.000					
	n	338	338	338					
5. Extraversion	*r*	-.021	.017	.021	.185	----			
	p	.699	.75	.704	.001				
	n	338	338	338	338				
6. Agreeableness	*r*	.161	.220	-.072	-.029	.199	----		
	p	.003	.000	.184	.598	.000			

	n	338	338	338	338	338			
7. Conscientiousness	*r*	.143	.001	-.039	.029	.16	.517	----	
	p	.009	.985	.476	.592	.003	.000		
	n	338	338	338	338	338	338		
8. Neuroticism	*r*	.158	.001	-.108	-.046	-.403	-.445	-.502	----
	p	.004	.985	.047	.397	.000	.000	.000	
	n	338	338	338	338	338	338	338	
9. Openness	*r*	-.038	.428	-.316	.237	.252	.178	.251	-.072
	p	.487	.000	.000	.000	.000	.001	.000	.187
	n	338	338	338	338	338	338	338	338

Table 5 Correlations between sex, gender, environmental variables, and personality traits in S3

		1	2	3	4	5	6	7	8	9	10	11
1. SEX (F =1)	*r*	---										
	p											
	N	384										
2. TMF (F > M)	*r*	.853**	---									
	p	.000										
	N	383	383									
3. Protectionism	*r*	.117*	.062	---								
	p	.024	.233									
	N	375	374	375								
4. Utilization	*r*	-.114*	-.075	-.636**	---							
	p	.027	.146	.000								
	N	374	373	368	374							
5. Environmental Behavior	*r*	.166**	.157**	.530**	-.334**	---						
	p	.001	.002	.000	.000							
	N	384	383	375	374	384						
6. Donate	*r*	.084	.055	.226**	-.266**	.117*	---					
	p	.114	.298	.000	.000	.027						
	N	360	359	352	351	360	360					
7. Extraversion	*r*	-.065	-.045	.074	.021	.109*	-.063	---				
	p	.206	.375	.153	.691	.032	.234					
	N	384	383	375	374	384	360	384				
8. Agreeableness	*r*	.150**	.141**	-.010	-.045	.075	.130*	.107*	---			
	p	.003	.006	.846	.382	.142	.014	.036				
	N	384	383	375	374	384	360	384	384			
9. Conscientiousness	*r*	.116*	.101*	.122*	-.013	.147**	.016	.070	.069	---		
	p	.023	.048	.018	.801	.004	.758	.171	.175			
	N	384	383	375	374	384	360	384	384	384		

10. Emotionality	*r*	.393**	.445**	.077	-.089	.055	.146**	-.285**	.167**	-.125*	---	
	p	.000	.000	.135	.087	.284	.006	.000	.001	.014		
	N	384	383	375	374	384	360	384	384	384	384	
11. Openness	*r*	-.155**	-.128*	.350**	-.196**	.282**	.179**	.199**	-.003	.091	-.026	---
	p	.002	.012	.000	.000	.000	.001	.000	.950	.074	.609	
	N	384	383	375	374	384	360	384	384	384	384	384
12. Honesty-Humility	*r*	.190**	.124*	.153**	-.219**	.088	.217**	.062	.381**	.267**	.085	.003
	p	.000	.015	.003	.000	.085	.000	.222	.000	.000	.098	.954
	N	384	383	375	374	384	360	384	384	384	384	384

Appendix G: Supplementary analysis

Table 6 Bivariate correlations between sex and subfacets of environmental attitudes. Values represent correlation coefficients. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Correlation with Sex	Study 1	Study 2	Study 3
Enjoyment of Nature	.155**	.154**	-0.020
Support for Interventionist Conservation Policies	.209**	0.059	.126*
Environmental Movement Activism	.163**	0.071	.133**
Conservation Motivated by Anthropocentric Concern	-.159**	-0.091	-0.074
Confidence in Science and Technology	-.153**	-.143*	-.196**
Environmental Threat	.178**	0.111	0.078
Altering Nature	-0.051	-0.070	0.027
Personal Conservation Behaviour	.134**	.133*	0.088
Human Dominance Over Nature	-.200**	-0.017	-0.067
Human Utilization of Nature	-.099*	-0.074	-0.070
Ecocentric Concern	.245**	.120*	.253**
Support for Population Growth Policies	-0.070	-0.103	-.130*

Curriculum Vitae

Name:	Jessica Desrochers
Post-secondary Education and Degrees:	Nipissing University North Bay, Ontario, Canada 2013-2017 B.A.
Honours and Awards:	President Entrance Scholarship 2013 Car Sanders Scholarship 2014, 2015, 2016 NUFA Learning Opportunity Award – Undergraduate 2016, 2017 Ontario Graduate Scholarship 2018 Joseph-Armand Bombardier Canadian Graduate Scholarship 2018
Related Work Experience	Teaching Assistant Nipissing University 2016, 2017, 2018 2019 Research Coordinator Nipissing University 2018, 2019

Publications:

Landry, N., **Desrochers, J**., & Arnocky, S. Testosterone, physical masculinization, and low environmentalism in men.

Desrochers, J., Albert, G., Milfont, T. L., Kelly, B., & Arnocky, S. (2019) Does personality mediate the relationship between sex and environmentalism? *Journal of Personality and Individual Differences, 147(1),* 204-213. Doi: 10.1016/j.paid.2019.04.026

Davis, A. C**., Desrochers, J.,** DiFilippo, A., Vaillancourt, T., & Arnocky, S. (2018). Type of jealousy differentially predicts cost-inflicting and benefit-provisioning mate retention. *Personal Relationships 25(4), 596-610.* Doi: 10.1111/pere.12262

Davis, A. C., Dufort, C., **Desrochers, J**., Vaillancourt, T., & Arnocky, S. (2017). Gossip as an intrasexual competition strategy: Sec differences in gossip frequency, content, and attitudes. *Evolutionary Psychological Science 3 (11)*. Doi: 10.1007/s40806-017-01246

Papers in preparation

Arnocky, S., **Desrochers, J.**, Albert, G., Hodges-Simeon, C. R., Belanger, J., Locke, A., Lynch, D. The relationship between mate-value and sociosexual orientation: A meta-analysis.

Desrochers, J., MacKinnon, M., Kelly, B., & Arnocky, S. Sex differences in response to deception in online dating.

Locke, A., **Desrochers, J.,** & Arnocky, S. Size matters!
Induced Mate Abundance Increases Women's Expectations for Engagement Ring Size and Cost

Conference presentations and posters

Arnocky, S., **Desrochers, J.,** Albert, G., Carolyn Hodges-Simeon, Kelly, B., Lynch, D., Belanger, J., Mackinnon, M., & Locke, A. Do high-mate value males adopt a less restrictive sociosexual orientation? Paper presented at *The Northeastern Evolutionary Psychology Society's 13th Annual Evolutionary Behavioral Science Conference, 2019,* Boston, MA. (Presenter)

Mackinnon, M., **Desrochers, J.,** Kelly, B., & Arnocky, A. (June 2019). Sex differences in online dating deception: Attractiveness, job status, and altruism. Presented at *Northeastern Evolutionary Psychology Society's 13th Annual Evolutionary Behavioral Science Conference, 2019*, Boston, MA.

Desrochers, J., Locke, A., Albert, G., Kelly, B., & Arnocky, S. (May 30th 2019). Do high mate-value males adopt a less restricted sociosexuality orientation? A Meta-Analysis. Poster presented at *31st Annual Human Behavior & Evolution Society, 2019,* Boston, MA. (Presenter)

Morgan, R., Michaud, A., **Desrochers, J.,** Landry, N. & Arnocky, S. (May 30, 2019). Envy mediates the link between women's appearance comparison and mate retention. Poster presented at *31st Annual Human Behavior & Evolution Society, 2019,* Boston, MA.

Jenkins, G., Phillips, G., Albert, G., **Desrochers, J.,** & Arnocky, S. (May 30, 2019). Sociosexual orientation predicts trait, but not state aggression in women. Poster presented at *31st Annual Human Behavior & Evolution Society, 2019,* Boston, MA.

Haslehurst, C., Morgan, R., **Desrochers, J.,** Desmarais, R., & Arnocky, S. (May 30, 2019). Want to be with me? – You'd better commit: High mate value women enact longer-term mating strategy. Poster presented at *31st Annual Human Behavior & Evolution Society, 2019,* Boston, MA.

Locke, A., **Desrochers, J.**, Lynch, D., & Arnocky, S. (May 30, 2019). Priming mate abundance increases women's expectations for

engagement ring size and cost. Poster presented at *31st Annual Human Behavior & Evolution Society, 2019,* Boston, MA.

Locke, A., **Desrochers, J.**, Lynch, D., & Arnocky, S. (May 23-26, 2019). Look at that rock! : Induced mate abundance increases women's expectations for engagement ring size and cost. Poster presented at *31st Annual APS Conference*, *2019*, Washington, DC.

Desrochers, J. & Arnocky, S. (October 12, 2018). Online dating: Sex differences in what lies are most upsetting. Poster presented at *Darwin Day meeting 2018*. Lakehead University, Orillia, ON, Canada. (Presenter)

Locke, A., **Desrochers, J.,** & Arnocky, S. (October 12, 2018). Does men's mate value predict a less restricted sociosexual orientation? Poster presented at *Darwin Day meeting 2018*. Lakehead University, Orillia, ON, Canada

Davis, A., **Desrochers, J.**, DiFilippo, A., Vaillancourt, T., & Arnocky, S. (Octover 12, 2018). The relations between different type of romantic jealousy and mate retention domains. Poster presented at *Darwin Day meeting 2018*. Lakehead University, Orillia, ON, Canada

Desrochers, J. (2018). *Conscientiousness mediates the sex-environmentalism relationship*. Paper presented at the 29th annual International Congress of Applied Psychology, Palais de congrès de Montréal, Montreal, QE, Canada.

Desrochers, J., Milfont, T., Gifford, R., & Arnocky, S. (May 17-18 2018). Conscientiousness as a mediator of the sex-environmentalism relationship. Poster presented at *Interdisciplinary Conference in Psychology (ICP).* University of Ottawa, Ottawa, ON. (Presenter)

Desrochers, J., Landry, N., Hebert, R., & Arnocky, S. (May 25 – 28 2017). Entitlement predicts reduced environmental concern and behavior. Poster presented at *the Association for Psychological Science (APS) 29th Annual Convention*. Boston, MA, USA. (Presenter)

Desrochers, J., Landry, N., Hebert, R., & Arnocky, S. (March 24-25 2017). Entitlement predicts reduced environmental concern and behavior. Poster presented at *the 10th annual Undergraduate Research Conference*. Nipissing University, North Bay, ON. (Presenter)

Rybka, S., Dufort, C., **Desrochers, J.,** Landry, N., & Arnocky, S. (May 25-28, 2017). High mate-value men want it all: Exploring men's ate-preferences in relation to their own mate-value. Poster presented at *the Association for Psychological Science (APS) 29th Annual Convention*. Boston, MA, USA. (Presenter)

Desrochers, J., Albert, G., & Arnocky, A. (June 29 – July 2, 2016) Men's vocal pitch predicts their romantic jealousy and mate-retention behaviours. Poster presented at the *28th annual Human Behavior and Evolution Society conference*. Vancouver, BC, Canada. (Presenter)

Desrochers, J. & Arnocky, S. (June 29 – July 2, 2016). Does subjective assessment of own health correlate with self-perceived mate-value and actual mating outcomes? Poster presented at the *28th annual Human Behavior and Evolution Society conference*. Vancouver, BC, Canada. (Presenter)