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Claire Love

University of Nebraska-Lincoln

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BUILDING CONSERVATION THROUGH CYCLING:
EXPLORING THE RELATIONSHIP BETWEEN BICYCLING
AND ENVIRONMENTAL CONSERVATION

By

Claire Love

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BUILDING CONSERVATION THROUGH CYCLING: EXPLORING THE RELATIONSHIP
BETWEEN BICYCLING
AND ENVIRONMENTAL CONSERVATION

Claire Love, B.S.

University of Nebraska-Lincoln, 2013

Advisor: Hannah Dietrich, M.A.

Abstract

This research reports on an investigation of the relationship between individuals' biking behavior and their views on environmental sustainability. It was hypothesized that there would be a significant difference between those who regularly bicycle and those who rarely or never bicycle and their sustainable behaviors. This quantitative study used a survey of 169 people from the University of Nebraska-Lincoln and from the Lincoln, NE community. The survey was hosted online using Qualtrics Survey Software© and included questions about individuals' sustainable practices, as well as questions about their bicycling habits. The results showed that there was no significant difference in sustainable practices between people who regularly bicycle and those who do not. This leads us to believe that people who cycle are doing so for reasons other than concern for the environment. The information gathered in this research may also help to encourage bicycling in Lincoln, NE and provide some insight and guidance for how the city can encourage sustainability through bicycling.

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Introduction

Bicycle commuting has grown as much as 70% in metropolitan communities within the last decade (Wellington, 2012). Unfortunately, in the same time frame, carbon emissions have increased and the effects of global warming have become more apparent (NRC, 2010).

Motorized vehicles are a major contributing factor of the poor quality of our current environment. Vehicles contribute to environmental degradation by using natural resources such as oil and through significant carbon emissions. While the manufacturing of bicycles still requires the use of some natural resources, there are no ongoing emissions once the bicycle is made. Thus, regularly using a bicycle for transportation is more environmentally friendly than using a car. In fact, the average car's carbon footprint is ten times larger than a bicycle (Palmer, 2011).

Even though regular cycling is environmentally friendly, it is not necessarily the main reason why people bike. Some people bike as a means of daily exercise. Other people bike to save money and not pay the fees associated with owning and driving a car, like gas, auto repairs, and even parking passes. The cost of purchasing and maintaining a bicycle is significantly less than purchasing and maintaining a motorized vehicle. Some people commute by bike because it is more efficient and convenient than driving. These factors are all possible reasons for why people would choose to bike; sustainability, however, might just be an added benefit of an already-established behavior.

I propose to study the relationship between individuals' biking behavior and their environmental sustainability behaviors. There is scant literature on the relationship between biking and sustainability practices, however, there has been substantial research done on factors that motivate people toward sustainable behavior. I believe this is important to study this

relationship because we could potentially use the findings to further understand the motivations for not only bicycling behaviors, but also pro-environmental behaviors in general. If people realize that their bicycling behaviors are having a reduced impact on the environment, they may feel empowered to adopt other pro-environmental behaviors. If bicycling is predictive of other sustainable behaviors, then individuals, businesses, and local governments could use that information to promote bicycle commuting in an effort to build a more sustainable community. I hypothesize that individuals who bike will have a lower ecological footprint score, demonstrating a lower impact on the environment; conversely, those who do not bicycle will have higher scores on the ecological footprint.

Literature Review

Bicycling and Exercise

Regularly bicycling and exercising outdoors can have positive effects on one's physical and mental wellbeing. Research has shown that exposure to nature and physical exercise can have beneficial effects on one's mental and physical health (Pretty, Peacock, Sellens, & Griffin, 2005). "Green exercise" is any kind of physical exertion that takes place while surrounded by a natural environment (e.g., biking in forests, running along the beach, etc.). In one study, Pretty, Peacock, Sellens and Griffin (2005) had participants run on a treadmill while watching various rural and urban scenes to simulate exercising in natural and unnatural environments. They found that those exercising while viewing pleasant rural (natural environment) scenes produced a significantly greater positive effect on self-esteem than those who didn't view any scenes while exercising. Another study by Thompson Coon, Boddy, Stein, Whear, Barton and Depledge (2011), researched the physical and mental health outcomes of exercising in natural environments. They had participants' record trials in which they would exercise indoors

(walking or running) and in which they would do the same activity at a similar physical level outdoors. They found that exercising outdoors was associated with greater feelings of revitalization, decreased tension and depression, and increased energy in the participants. Together, these studies argue that exercising outdoors (such as biking along a trail) promotes increased health, self-esteem, and mood.

In 2010, Gatersleben and Haddad surveyed 244 cyclists and non-cyclists about their perceptions regarding the typical bicyclist and how those perceptions affect their willingness to bicycle. From their data, they classified bicyclists into one of three different stereotypes: responsible (cycle safely), lifestyle (cycle for enjoyment), and commuter (cycle for transportation). They found that those who had cycled within the past two months were more likely to perceive the typical cyclists as being a “responsible cyclist” and “commuter cyclist” than non-cyclists. They also found that those who had not ridden a bicycle in the last year were not likely to perceive cyclists as “commuter cyclists” at all and less likely to perceive cyclists as “responsible cyclists”. These findings indicate that people who cycle more often have a more positive perception of cyclists and help build a more positive cycling community (Gatersleben & Haddad, 2010).

Environmental Attitudes and Behaviors

Currently, there is little research about whether bicycling is correlated with views on sustainability. Two articles by Horton (2006a, 2006b) look at how the environment plays a role in bicycling and environmental citizenship. Environmental citizenship is when green lifestyles emerge in a culture, including awareness, responsibilities, and everyday practices. Horton (2006a) argued that bicycling has been a part of several critical social movements, one of them being environmental. For example, the use of bicycles has provided a form of transportation that

does not cause the amount of damage that cars do to our society and environment. But, if a large enough percentage of the population bikes, then it may become a strong social norm, which is likely to encourage or motivate others to join the movement. Horton (2006b) suggests that people who are already environmentalists are more likely to ride bicycles, but that not all people who ride bicycles are environmentalists. This is an important distinction to make because it shows that there are different motivations for bicycling, and lends to the thesis of the current proposal.

A survey by Moritz (1997) recorded the responses from 2,300 North American and Canadian participants about their bicycling habits. Moritz asked them a wide range of questions about people's commuting habits, including, the facilities they use, their safety and accidents, and employer compensation or incentives to motivate bicycle commuting. When asked what motivated their bicycle commuting, participants gave both positive and negative motivations. For example, 95% of participants indicated that they biked to work for health and fitness, and 81.6% said they biked out of concern for the environment. These are positive motivations because individuals gain from the activity. Participants also noted "negative" motivations, or, in other words, motivation through avoidance of less desirable experiences, such as traffic congestion (51.7%), the cost of gasoline (45.6%), and car parking cost and availability (34%; Moritz, 1997). This study shows that there are a number of motivations, including concern for the environment.

Karl Ulrich (2006) discusses how bicycling instead of driving is promoted as a means of reducing environmental impacts. He argues that the health benefits and life longevity effects of bicycling are likely to counterbalance the environmental benefits of bicycling; specifically, a longer life correlates to a higher lifetime use of Earth's resources. Although this creates an interesting and important paradox, it is possible that bicycling increases environmental concern

and thus may also increase the likelihood that cyclists engage in other pro-environmental behavior, lending to, rather than detracting from, sustainability (Ulrich, 2006).

There have been a number of studies that have attempted to measure the relationship between environmental attitudes and pro-environmental behaviors. For example, Scott and Willits (1994) investigated the relationship between Pennsylvanians' attitude toward the environment (measured by the New Environmental Paradigm (NEP) scale) and their pro-environmental behaviors. The NEP scale is widely used to measure environmental attitudes and the ways in which people relate with their environment (Dunlap & Van Liere, 1978). Contrary to what most might expect, Scott and Willits (1994) found that individuals' scores on the NEP were not strongly correlated with pro-environmental behavior. Interestingly, the strongest predictors of pro-environmental behavior, however, were factors such as gender (e.g., women were more likely to engage in pro-environmental behavior), political ideology (e.g., people with liberal political ideologies were more likely to be concerned with the environment), education (e.g., more highly educated people were more likely to be concerned about environmental health), and age (e.g., younger people were more likely to take part in environmental practices) (Scott & Willits, 1994). This study suggests that a number of factors, may that correlate with individuals' pro-environmental concern.

Materials and Methods

Participants

Participants were recruited through three primary means: the general Lincoln community, the employees that work at UN-L's Outdoor Adventures program, and individuals who support Cycle Works, a local bike shop in Lincoln, Nebraska. Participants were contacted through social media outlets (i.e., Facebook) and through email. There was no eligibility criterion for

participation (e.g., no restrictions on age, ethnicity, gender, or amount of bicycling) in order to better represent the greater Lincoln, NE.

Design, Procedure and Measures

Participants completed the study online, using Qualtrics Survey Software© in March 2013. The survey took about 15 minutes to complete; respondents were first asked about their environmental habits (e.g., What portion of the following do you recycle?), then about their bicycling habits (e.g., How often do you ride a bicycle?), and their motivations for bicycling, including an assessment of their feelings related to their bicycling experience. Additionally, all participants completed an “ecological footprint” measure to determine their pro-environmental behaviors. Typical “ecological footprint” tools¹ calculate one’s use of the Earth’s resources, based on the area of land and ocean required to support an individual’s consumption of food, good, services, housing, and energy. Lower scores on an ecological footprint scale indicate more pro-environmental (more sustainable) behavior, whereas higher scores indicate less pro-environmental (less sustainable) behavior. Participants’ responses to the measures and questions were analyzed using IBM SPSS Statistics 21.0 ©, a statistical computing software commonly used in the social sciences.

Participants were then asked specifically about their biking behaviors. Specifically, they were asked: How often do you ride a bicycle? If you never do; why do you not engage in bicycling? If you do ride a bicycle: why do you regularly ride? What are some other factors that motivate you to ride your bicycle? What type of biking matches your riding most? What are the main reasons why you bicycle? What type of environment most closely matches your regular bicycling routes? How do you feel immediately after a bike ride? What is the most important thing a city could do to encourage you to bicycle more? The participants were provided with

¹ Available online from: <http://www.deq.state.ok.us/mainlinks/uls/PersonalEcoFootprintCalculatoradult.pdf>

response options for all the questions and some questions had space for them to write other responses.

Results

There were 169 participants that fully completed the online survey. Out of those 169 participants, 63 (37.3%) responded that they bicycle almost everyday, 56 (33.1%) responded that they bicycle a few times per week, 25 (14.8%) responded that they bicycle 1-4 times per month, 15 (8.9%) responded that they bicycle a few times per year, 8 (4.7%) responded that they have not rode a bicycle in the last two years, and 2 (1.2%) responded that they have never rode a bicycle.

The relationship between bicycling behavior (as measured by the question, “How often do you ride a bicycle?”) and pro-environmental behaviors (as measured by the ecological footprint scale) was investigated using Pearson product-moment correlation coefficient. There was no relationship between the two variables ($r = 0.04$, $n = 170$, $p > 0.05$), indicating that bicycling behavior is not predictive of sustainable behaviors.

We next evaluated several questions about their environmental practices. The questions asked how much they drive their car, measures they take to save energy in their home, questions about their diet and food purchasing habits, and their recycling habits. Each item was given a point value based on how sustainable they were². The points were added up and each participant was given an “ecological footprint” score. The minimum ecological footprint score was 170 and the maximum score was 1620 ($m = 764.62$, $sd = 294.19$). The lower the ecological footprint score, the more sustainable practices participants exhibited and vice versa for higher scores.

A one-way between-groups analysis of variance was conducted to explore the impact of bicycling behaviors on one’s overall sustainable behavior, as measured by the ecological

² Available online from: <http://www.deq.state.ok.us/mainlinks/uls/PersonalEcoFootprintCalculatoradult.pdf>

footprint score. Participants were divided into groups according to their self-identified bicycling behaviors (e.g., almost every day, a few times per week, 1-4 times per month, a few times per year, not within the past two years, or never). There was no statistically significant difference between the groups in the omnibus comparison ($F(5, 163) = 0.28, p = 0.93$). Figure 1 and Table 1 depict the differences in mean values for the varying levels of bicycling. Participants were also recoded into three groups according to how much they bicycle to determine if regular cyclists were more sustainable (as measured by the ecological footprint score) than those who rarely or never bicycle (i.e., Almost everyday or a few times per week are “regular bikers”; 1-4 times per month or year are “recreational bikers”; have not rode in past two years or ever are “non-bikers”). A one-way between-groups analysis of variance was conducted to explore the relationship among regular bikers, recreational bikers, and non-bikers, on their sustainability practices (See Figure 2). Again, no statistically significant difference between the groups was identified ($F(2, 166) = 0.043, p = 0.96$).

Table 1

Participants' Ecological Footprint Score by Bicycling Frequency

	<i>n</i>	Mean	Standard Deviation
Almost every day	63	787.30	349.93
a few times per week	56	731.25	242.42
1-4 times per month	25	752.80	282.05
A few times per year	15	799.33	296.66
I have not rode a bicycle in the last two years	8	781.25	247.93
I have never rode a bicycle	2	805.00	148.49

Figure 1

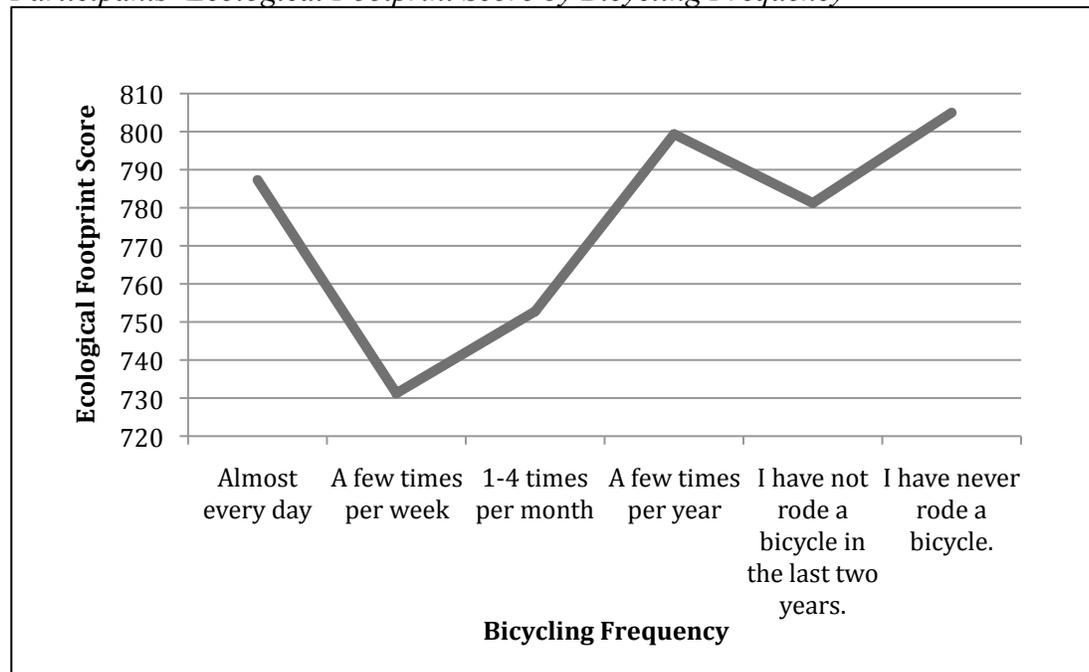
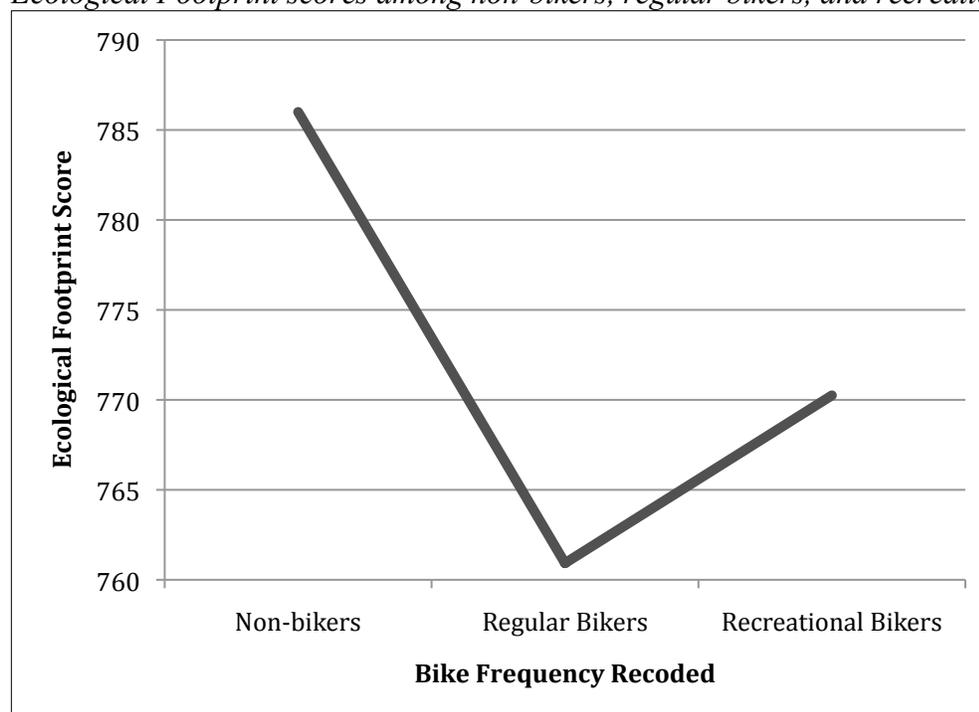
Participants' Ecological Footprint Score by Bicycling Frequency

Figure 2

Ecological Footprint scores among non-bikers, regular bikers, and recreational bikers

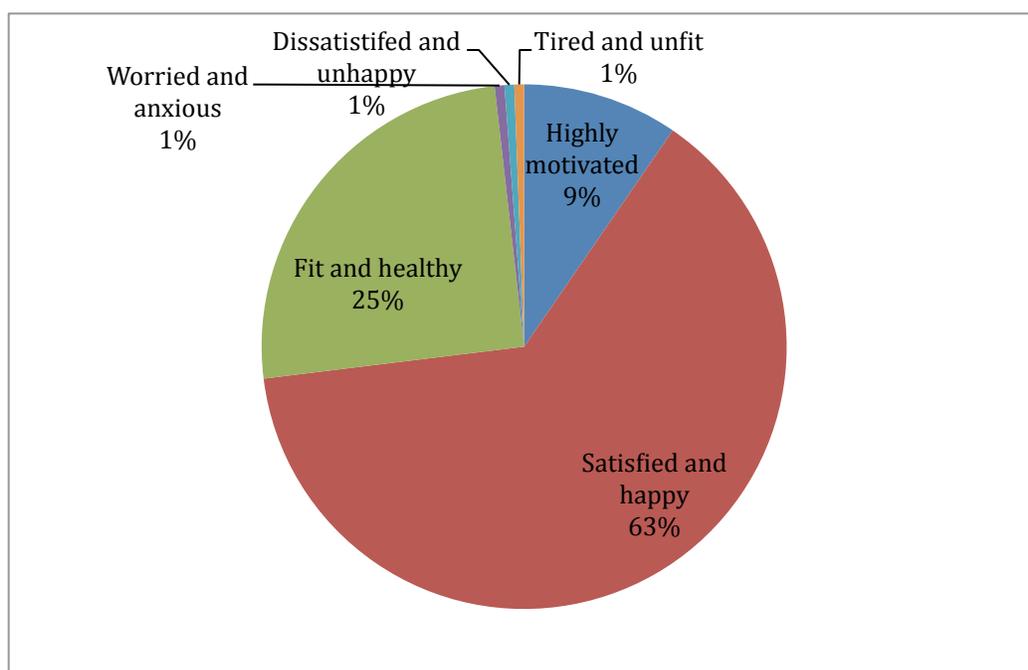
Regarding the kinds of cycling, a majority of cyclists ($n = 129$; 72.1%) responded that commuting matches their riding style the most, 31% responded mountain biking, 46.4% responded road biking, 19.0% responded touring, and 1.1% responded said BMX or trials. Most participants responded that they ride through neighborhoods ($n = 123$; 68.7%), downtown streets (48.6%), and along city trails (76.0%).

The participants who bicycle responded that they bicycle for enjoyment (85.5%), exercise (84.9%), improved health (79.3%), to save money (62.6%), to reduce impact on the environment (56.4%), convenience (46.4%), and other reasons (7.8%). Other reasons that people cited were “I hate having to find a parking space”, “to be out in nature”, “I don’t own a car”, and “It’s fun!”

Most cyclists responded that they feel “satisfied and happy” (63.5%) or “fit and healthy” (25.1%) immediately after a bike ride (See Figure 3).

Figure 3

Respondents’ Self-Reported Feelings after Bicycle Riding

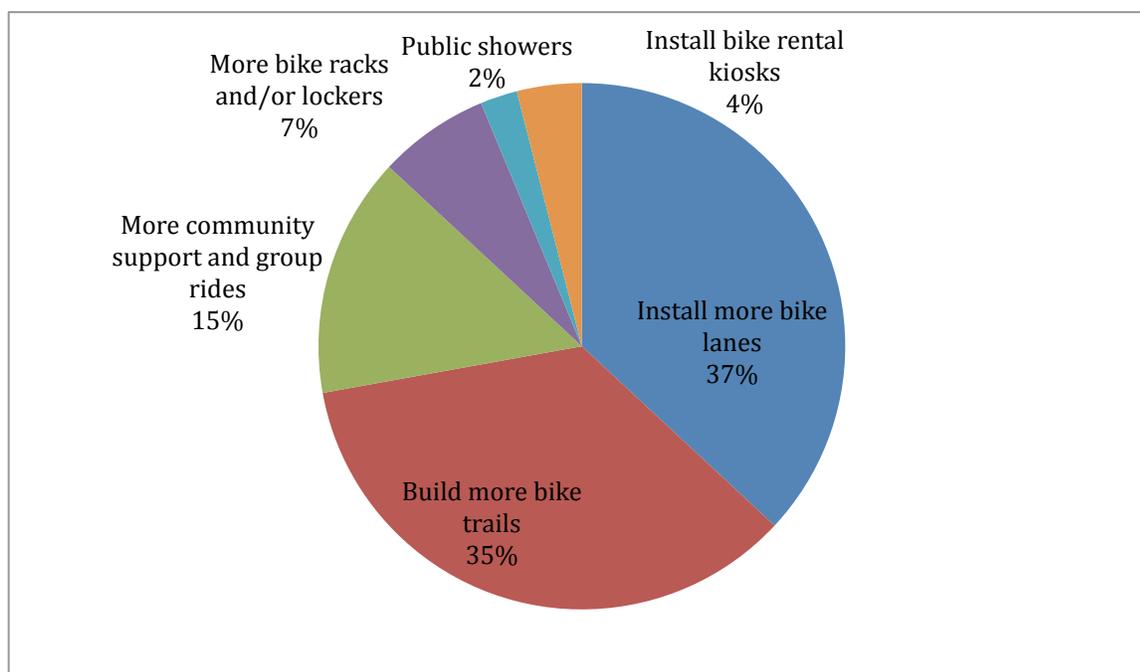


The majority (n = 10, 70%) of non-cyclists responded that they don't engage in bicycling because it is too far of a commute. Other reasons identified include, "I do not feel safe riding a bicycle (20%), and "There is not enough support from the community" (10%).

The cyclists and non-cyclists both responded that installing more bike lanes (36.9%) and building more bike trails (35.2%) would encourage them to cycle more (See Figure 4). Other response options included, "More community support and group rides" (n = 26, 14.8%), "More bike racks and/or lockers" (n = 12, 6.8%), "Public showers" (n = 4, 2.3%), and "Install bike rental kiosks" (n = 7, 4.0%; see Figure 4). Participants were asked to choose the "most important" thing a city could do to encourage them to bicycle more; each participant was allowed to choose only one response option.

Figure 4

Respondents' identification of the most important community support to encourage more bicycling



Discussion

The findings failed to support the research hypothesis that those who cycle are more sustainable than those who do not. While the means are in the projected direction, there were no significant differences in sustainability practices for those who regularly bicycle and those who rarely bicycle. There is a slight decrease in ecological footprint scores in those who regularly bicycle; however, it is not close to being a statistically significant difference in the ecological footprint scores.

Although the null findings may be discouraging, they still aid our understanding of individuals' sustainability efforts. These findings further demonstrate that there are a number of behaviors individuals do to promote environmental sustainability besides bicycling. Bicycling is acknowledged as being more environmentally friendly than driving, but, as this study shows, being environmentally friendly is not a primary motivator for biking. Rather, personal enjoyment, exercise and improved health are the main reasons that people gave for bicycling. This analysis has indicated that those who bicycle are not necessarily more inclined to recycle, buy local food, or make their homes more energy efficient than people who do not bicycle. Most people are bicycling for personal reasons (e.g., "It's fun!"); sustainability is merely an additional benefit.

This survey also gathered data about why people bicycle and how it makes them feel. The findings are consistent with previous research on green exercise, demonstrating that people cycle because it helps to improve their mental and physical health.

Summary & Conclusions

At a time when it's imperative to consider alternative options, bicycling for transportation is one way that individuals can reduce their carbon footprint on the Earth. This research was

conducted to see whether bicycling behavior predicted greater sustainability practices. The studies results indicated that there were no statistically significant differences in environmental practices by those who bicycle and those who don't. It was also found that people mainly bicycle for personal benefits they get such as exercise and enjoyment.

The survey findings also help to inform the areas to focus on for the city of Lincoln to encourage greater participation in cycling throughout the community. Responses indicated that installing more bike trails and lanes, and having more community support rides would increase the likelihood of individuals bicycling. These are the main areas that organizations such Lincoln Parks and Recreation and local government officials could focus on when trying to increase bicycling ridership in the community.

Bicycling in Lincoln is a very important part of the community and there is still room for improvements to be made. While focusing on increasing bicycling will not lead to an increase in other sustainable practices in the community, increasing bicycling by itself will make the community more sustainable. The findings showed that creating more bicycle trails and having more group rides and community events could increase the amount of bicycling in Lincoln. The findings are similar to the research previously discussed. Previous research has suggested that cycling is part of a larger movement and one aspect of that is environmental, but that not all people who ride bicycles are necessarily environmentalists (Horton, 2006b).

The current sample for this study included a disproportionate number of individuals would be considered "heavy bike" users. Less than ten percent of the studies population was not regular cyclists, so future research should focus on specifically targeting individuals who do not bicycle. Also, by extending this research to multiple cities, we might also identify characteristics that make Lincoln, NE (a very bike-friendly community) different. Reasons for or against

cycling may vary by city, depending on a number of factors—some outside the scope of the present research. While bicycling is not necessarily predictive of overall sustainable behavior, it is, however, a means to reducing one's carbon footprint, which promotes sustainability.

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