

The Spread of Behavior: When, How, and For Whom Do Proenvironmental Behaviors Spread to Other People and Other Behaviors?

A DISSERTATION
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

Alexander Maki

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Mark Snyder, Alexander Rothman

June 2015

© Alexander Maki 2015

Acknowledgements

My sincerest gratitude goes out to all of those who have supported me professionally up until this moment, including my research assistants, graduate school colleagues, and members of the psychology faculty and staff at the University of Minnesota. I would also like to thank the members of my committee, Geoffrey Maruyama, Marti Hope Gonzales, Mark Snyder, and Alex Rothman, for their advice and words of encouragement throughout the entire dissertation process. Mark and Alex, thank you both so much for challenging me, supplying me with constant training, providing me with an incredible amount of feedback through the years, and supporting me during the entirety of my graduate education.

A special thank you is reserved for my mother Peggy and father Roger, my brother Aaron and sister-in-law Lynda, my sister April and brother-in-law Nick, all of my incredible friends, and Kristin, the one who gives me the strength to keep trying to make a difference. This accomplishment belongs to all of you just as much as it belongs to me.

Dedication

My dissertation is dedicated to my nieces, Ella and Viviana, and my nephew, Colin. I love you all more than you could ever know.

Abstract

To address many environmental problems, large groups of people must engage in a range of relevant behaviors. Toward this goal, three studies examined when, how, and for whom the spread of proenvironmental behavior occurs both between individuals, from person to person, and also within the individual, from one behavior to other behaviors. Study 1 used a survey design to demonstrate that people use modeling, persuasion efforts, and conversation to try to spread their proenvironmental behavior to others. Furthermore, people reported engaging in a range of proenvironmental behaviors because of their positive environmental attitudes. Building upon these results, experiments in Studies 2 and 3 revealed that interventions that focus on a single behavior in a specific context (i.e., modeling and planning interventions) successfully increased behavioral intentions (Study 2) and engagement in a target behavior (Study 3). However, a persuasive message intervention that focused on more general attitudes increased behavioral intentions and behaviors related to the spread of behavior between individuals (i.e., people were more likely to try to influence others) and within individuals (i.e., people were more likely to engage in related behaviors). By linking the target behavior to related behaviors and the broader social context, persuasive messages have the potential to induce the spread of proenvironmental behavior both between and within individuals. In addition, people with positive environmental attitudes were more likely to engage in a range of proenvironmental behaviors, and people high in moral exporting were more likely to try to spread their proenvironmental behavior to others. Thus, both experimental and individual difference approaches were linked to the spread of proenvironmental behavior.

Table of Contents

Acknowledgements.....	i
Dedication.....	ii
Abstract.....	iii
Table of Contents.....	iv
List of Tables.....	v
List of Figures.....	vii
Introduction.....	1
Study 1.....	28
Study 2.....	40
Study 3.....	60
General Discussion.....	91
Tables.....	113
Figures.....	139
References.....	146
Appendices.....	163

List of Tables

Table 1 The independent variables, dependent variables, and predictions relevant to each hypothesis.....	113
Table 2 Percentage of participants engaged in spread/consistency efforts in Study 1...	116
Table 3 Coded open-ended responses for where people try to influence the proenvironmental behaviors of others in Study 1.....	117
Table 4 Coded open-ended responses for when people try to influence the proenvironmental behaviors of others in Study 1.....	118
Table 5 Coded open-ended responses for how people try to influence the proenvironmental behaviors of others in Study 1.....	119
Table 6 Coded open-ended responses for why people try to influence the proenvironmental behaviors of others in Study 1.....	120
Table 7 Coded open-ended responses for why people consistently engage in different proenvironmental behaviors in Study 1.....	121
Table 8 Coded open-ended responses for why people do not consistently engage in different proenvironmental behaviors in Study 1.....	122
Table 9 Past behavioral efforts to influence the proenvironmental behavior of others in Study 1.....	123
Table 10 Future intentions to influence the proenvironmental behavior of others in Study 1.....	124
Table 11 Prototypicality ratings for each proenvironmental behavior in Study 1.....	125
Table 12 Correlations between measures assessed during the online survey in Study 2.....	126

Table 13 Correlations between measures assessed during the in-person survey in Study 2.....	127
Table 14 Post-intervention cognitions relevant to paper recycling at home by condition in Study 2.....	128
Table 15 Behavioral intentions over time by experimental condition in Study 2.....	129
Table 16 Behavioral intentions over time by experimental condition in Study 2.....	130
Table 17 Total number of surveys participants completed in Study 3.....	131
Table 18 Correlations between measures assessed during the first online survey in Study 3.....	132
Table 19 Correlations between measures assessed during the in-person survey in Study 3.....	133
Table 20 Correlations between measures assessed during the final online survey in Study 3.....	134
Table 21 Post-intervention cognitions relevant to paper recycling at home by condition during the in-person survey in Study 3.....	135
Table 22 Post-intervention cognitions relevant to paper recycling at home by condition during the final online survey in Study 3.....	136
Table 23 Behavioral intentions over time by experimental conditions in Study 3.....	137
Table 24 Behavioral intentions over time by experimental conditions in Study 3.....	138

List of Figures

Figure 1 Proposed model of how behaviors spread between individuals.....	139
Figure 2 Proposed model of how behaviors spread with an individual from a target behavior to a non-target behavior.....	140
Figure 3 Daily reporting of recycling paper at home by condition.....	141
Figure 4 Daily reporting of behavior high in prototypicality by condition.....	142
Figure 5 Daily reporting of behavior low in prototypicality by condition.....	143
Figure 6 Daily reporting of efforts to spread one's behavior to others by condition.....	144
Figure 7 Proposed model of the spread of behavior both between and within individuals.....	145

The Spread of Behavior: When, How, and for Whom Do Proenvironmental Behaviors

Spread to Other People and Other Behaviors?

Many of today's pressing social problems are brought about by large groups of people each making individual decisions that collectively lead to great harm. In particular, environmental problems such as climate change and water pollution stem from such social dilemmas, and to properly address these problems requires that these large groups of people engage in a range of positive, proenvironmental behaviors (Gifford, 2014; Kazdin, 2009; Swim et al., 2009). For example, addressing a problem as complex as climate change requires that people across the country and the world change a number of behaviors that affect carbon emissions, such as replacing inefficient light bulbs with more efficient lights, more consistently recycling all possible products, and choosing more sustainable modes of transportation. Efforts to understand the spread of behavior are fundamentally concerned with understanding and influencing when people spread their behavior to others, and also when an individual engages in a range of related behaviors.

This research examines when, how, and for whom the spread of proenvironmental behaviors to other individuals occurs, and also when, how, and for whom it is likely that people will engage in a range of proenvironmental behaviors. Furthermore, the current work investigates whether it is possible to *influence* the spread of proenvironmental behaviors, both from an initial person to other individuals, and from one target behavior to other related proenvironmental behaviors. This research builds upon what we currently

know about the spread of behavior to provide both theoretical and practical guidance towards the understanding and influencing of the spread of proenvironmental behaviors.

The Spread of Behavior

Researchers interested in solving pressing social problems, including environmental problems such as climate change, have long pursued the factors that predict and influence human behavior. Toward this goal, social scientists, and in particular social psychologists, have tended to target a *single* behavior performed by a *single* individual with their efforts. For example, researchers have paid individuals monetary incentives to increase the frequency of their bus riding (e.g., Bamberg, 2006), but have not attempted to influence families or entire communities to more frequently take the bus. Additionally, researchers have rarely tried to target clusters of related behaviors at one time, such as influencing individuals to take the bus *and* carpool when riding the bus is not an option. Targeting a single individual to change a single behavior has been a fruitful approach to changing behavior, but it is inherently limited in its ability to solve social dilemmas, as these efforts fail to capitalize on how the act of influencing an individual to engage in a single behavior could have downstream effects on the behavior of other individuals and could influence the individual's other, related behaviors.

The questions of when, how, and for whom behavior spreads, including whether it spreads to other people and whether it spreads within the individual from one behavior to other related behaviors, is an important set of questions relevant to understanding and addressing complex social issues. These questions are of theoretical importance, as most

theories of behavior change fail to leverage how behavior might spread, and they are also of practical value – if we wish to adequately solve current social problems, we need an improved ability to influence the spread of behavior.

Behaviors have the potential to spread in at least two distinct ways: (1) behavior can spread from an initial person first engaging in the behavior, to other people in a social network or physical space, such as the individual who begins recycling at home and influences roommates to also recycle, and (2) behavior can spread within an individual, such as the person who recycles paper and later comes to also recycle aluminum cans. Research on the spread of behavior between people has often considered how health or technology-related behaviors and outcomes spread through a social network over time (e.g., Christakis & Fowler, 2007; Rodgers, 2013). However, most of this research has tended to consider whether behavior spreads, and has not focused on mechanisms through which behavior might spread; this area of work would greatly benefit from new models, theories, and data that speak to the processes of how behaviors spread between individuals (Smith & Christakis, 2008). Research on the spread of behavior within individuals has received less attention to date, but it is also a key to potentially improving our ability to understand and influence when, how, and which individuals consistently engage in different types of related behaviors (Thøgersen & Ölander, 2003). Moving forward, both areas of research would stand to benefit from a greater amount of experimental work to strengthen claims about the spread of behavior, allowing researchers to demonstrate the processes that contribute to the spread of behavior, and also provide evidence of when the spread of behavior is more or less likely.

By focusing on the environmental domain, I explored quantitatively and qualitatively the factors that contribute to the spread of proenvironmental behaviors both between and within individuals. Additionally, by examining processes that contribute to the spread of behavior, I hope to determine how theoretically relevant interventions in the proenvironmental domain affect the spread of behavior between and within individuals. Finally, I also determine factors that make spread more or less likely. This is important research for the field, as it helps us better understand the unexpected or “collateral effects” (De Young, 1993; Smith & Christakis, 2008) of behavior change efforts, including when, how, and for whom behaviors spread between and within individuals.

The Spread of Behavior Between Individuals

The spread of behavior between people has only occasionally received attention in the psychological literature. Early work on the spread of behavior between individuals asked such questions as whether adoption of a new pharmaceutical drug spreads through a network of doctors (Burt, 1987), whether word-of-mouth referrals influence community members to take piano lessons (Brown & Reingen, 1987), and how family members influence one another’s home efficiency improvements (Costanzo, Archer, Aronson, & Pettigrew, 1986; Darley & Beniger, 1981). Much of the early research on this topic relied on observing patterns in correlational data over time to evaluate whether new technologies or services spread across a social network of individuals (Rodgers, 2013). Only on occasion did this type of work consider when these behaviors were more or less likely to spread, as well as how this spreading of behavior was actually occurring. Burt (1987), for example, found some preliminary evidence for the premise that the spread of

new drugs occurred via doctors talking to one another about treatment options.

Meanwhile, Brown and Reingen (1987) also focused on whether the spread of behavior occurs, but also found some, albeit inconsistent, support for the notion that the strength of social ties can affect whether piano lesson recommendations spread to members of one's social network. Overall though, older work in this area has traditionally evaluated whether behavior spreads, and has tended to spend less empirical attention on examining when and how these behaviors spread.

More recent research on the diffusion of innovations and technology has considered the spread of proenvironmental behaviors, including the spread of solar panel purchasing among neighbors (Noonan, Hsieh, & Matisoff, 2013; Zhang & Vorobeychik, 2015). Since much of the work in the environmental domain has tended to consider why one person does or does not adopt a new technology (e.g., Brown, 1984; Darley, 1977/78; Zaltman & Duncan, 1977), this literature has tended to ignore the social and interpersonal dynamics that lead to the spread of behavior. Indeed, a richer literature on the spread of behavior between individuals would need to address the following key questions: (1) whether it is possible to influence the spread of behavior, (2) how, exactly, behavior spreads between people, and (3) an understanding of when and for whom behavior spreads. Fortunately, certain strands of research in the wider psychological and sociological literatures have, over time, begun to explore these additional dimensions. These lines of research have tended to come from three areas: 1) social networks and the spread of health behaviors and health outcomes, 2) interpersonal persuasion, and 3) the effect of normative influence on social behaviors.

Similar to research on diffusion of innovation, more recent social network analyses have examined the spread of health behaviors and health outcomes using a correlational approach. For example, Christakis and Fowler (e.g., 2007; 2013) determined that health outcomes and behaviors, such as obesity and smoking quit attempts, can spread through a person's social network over time. However, this research has extended work on the spread of behavior between individuals by finding some evidence of *when* the spread of behavior occurs, such as the spreading of obesity outcomes being more likely when two people are close friends, as opposed to acquaintances, or same-sex friends, as opposed to opposite-sex friends, such that these types of relationships facilitate the spreading of obesity between people (Smith & Christakis, 2008).

Given the typical research designs used in this area, researchers have had a limited ability to explore the *processes* through which one person influences another in a social network. However, one experimental study on the spread of behavior across social networks found that voting behavior seems to spread across social networks on Facebook, primarily via the process of getting people to show online, public displays of voting behavior that tends to influence others to also go vote on Election Day (Bond et al., 2012), providing evidence of both experimental effects and process. However, this type of work has only recently begun, and scholars have been calling for more experimental work in the area to test how these processes unfold (e.g., Smith & Christakis, 2008), providing more evidence of the experimental influencing of the spread of behavior between individuals in social networks. In the environmental context, recent research on social networks has begun to consider how people might try to influence

others in their social circles (Southwell & Murphy, 2014; Southwell, Murphy, DeWaters, LeBaron, & Willoughby, 2014), but this work is still limited, and has not considered experimental approaches.

Experimental tests of the idea that behavior can spread between individuals, and evaluation of the processes through which spreading can occur, mostly derive from the interpersonal persuasion and normative influence traditions in psychology. Research has examined, for example, whether family members can influence other family members' organ donation decisions (Hyde & White, 2013), the impact of eating norms on others' eating behaviors (Herman, Roth, & Polivy, 2003), and the effect of communicated normative information on hotel energy conservation (Goldstein, Cialdini, & Griskevicius, 2008). Much of this work has generally examined whether it is possible to *influence*, not just measure, the spread of behavior. For example, experimental work has demonstrated that placing littered handbills by someone's car makes it more likely, as compared to an environment without littered handbills, that people will litter a handbill of their own that was placed on the windshield of their car (Cialdini, Reno, & Kallgren, 1990).

However, this work has not tended to focus on when, for whom, and how this spreading occurs. When researchers have considered how the spread of behavior between individuals occurs in these paradigms, the processes proposed and examined have included modeling effects (demonstrating the behavior to others; e.g., Bandura, Ross, & Ross, 1963), mimicry effects (often implicating mirror neurons; e.g., Bono & Ilies, 2006), normative information (e.g., Cialdini, 2003), persuasion attempts by a person trying to influence others (trying to convince someone to adopt a new behavior; Aronson &

Gonzales, 1990; Burn, 1991; Peterson, Smith, Tannebaum, & Shaw, 2009), or bringing up the behavior in conversation (Rodgers & Rowe, 1993). Though research has considered these processes, and conducted experiments that implicate these processes, rarely have they been directly measured, leaving ambiguity as to the exact processes. Work in these areas has taught us that behaviors can spread between individuals, that it might be possible for experimental interventions to influence other, non-targeted individuals to engage in a behavior, that behaviors could possibly spread via a number of different processes (including modeling and normative influences, persuasion attempts, and conversation), and that the spread of behavior between individuals can be facilitated by a number of factors, including the type of relationship the individuals share.

This lack of knowledge exists to an even greater extent when it comes to the spread of proenvironmental behaviors between individuals given that we know little about whether these types of behaviors can spread, and nothing about whether it is possible to induce the spread of proenvironmental behaviors. It would be valuable to conduct further research on whether the interpersonal spread of proenvironmental behavior is possible, and in particular on whether it is possible to *induce* the spread of proenvironmental behaviors among individuals, *when* and *for whom* the spread of proenvironmental behavior occurs, and the *processes* through which the spread of proenvironmental behavior occurs between individuals.

Inspired by past research on the potential processes that contribute to the spread of behavior between individuals (Bandura et al., 1963; Burn, 1991; Cialdini, 2003; Peterson et al., 2009; Rodgers & Rowe, 1993), I chose to focus on three potential

mediators of the spread of proenvironmental behaviors between individuals (see Figure 1): (1) modeling, (2) persuasion (convincing someone to change their behavior), and (3) conversation (bringing up the behavior when talking to others). I chose these three processes because they are all social behaviors that can be intentionally enacted, and they capture actions that range from not at all overt (modeling) to overt and direct (persuasion), which is important given the fact that people could vary in how comfortable they feel engaging in overt efforts to influence others.

First, individuals who model their behaviors in front of others should be more likely to spread their behavior to other people (e.g., Bandura et al., 1963). If a person only engages in a given behavior in private (e.g., when no other person is around to witness the behavior or evidence of the behavior, such as the accumulation or “residue” of piles of recycling; Gosling, Ko, Mannarelli, & Morris, 2002), it is less likely to directly influence the behavior of other people. Second, those who attempt to persuade others of the merits of their own behavior should be more likely to spread their behavior to other people (Aronson & Gonzales, 1990; Burn, 1991; Peterson et al., 2009). Third, those who bring the topic of the behavior up to others in conversation should also be more likely to spread their proenvironmental behavior to others (Rodgers & Rowe, 1993). Thus, behavior could spread to other people through mechanisms that include a person engaging in the behavior in front of others (modeling), through persuasion efforts, or by bringing up the behavior in conversation.

Influencing the processes that contribute to the spread of behavior between individuals. Not only should psychologists be concerned about understanding the

processes that contribute to the spread of behavior between people, but in an applied domain such as environmental behavior, they should also focus on trying to influence this spread. With these proposed mechanisms of modeling, persuasion, and conversation that might lead to the spread of proenvironmental behaviors between individuals, different interventions in the proenvironmental behavior area might have a stronger or weaker influence on these proposed processes. Specifically, three popular and effective interventions in the area (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Osbaldiston & Schott, 2012; Steg & Vlek, 2009)—persuasive messages, modeling interventions, and planning activities—should have varying degrees of success at influencing the proposed processes by which the spread of behavior occurs between individuals.

Evidence suggests that each of these three interventions can influence a single targeted behavior (Osbaldiston & Schott, 2012), and that they also affect cognitions relevant to a target behavior, such as attitudes, behavioral beliefs, and knowledge (persuasive messages; Derzon & Lipsey, 2002; Witte & Allen, 2000), self-efficacy (modeling interventions; Bandura et al., 1963; Schunk & Hanson, 1985), and plans (planning activities; Luszczynska, 2006; Mistry, Sweet, Rhodes, & Latimer-Cheung, 2015). However, these interventions might also vary in the extent to which they influence people's efforts to spread their behavior to others. Whereas persuasive messages can be crafted to convince an individual why they have to change their behavior and why the behavior of other people matters, modeling and planning activities influence individuals to simply adopt a new behavior by focusing on either confidence in one's ability to change a behavior (modeling interventions), or on developing plans to engage in the

behavior (planning activities). Thus, persuasive messages might be more likely to provide the individual with a way to think about the target behavior more generally, including how the behavior relates to other issues and whether other people also need to engage in the behavior. After receiving a persuasive message, as compared to modeling interventions and planning activities, people should be more likely to try to spread their behavior to others by modeling their behavior to others, persuading others to change their behavior, or the individual bringing up the behavior in conversation.

Alternatively, modeling interventions and planning activities tend to be less concerned about making arguments for why individuals should change their behavior, and focus less on the context surrounding the behavior, instead asking people to reflect on just the specific action that they need to change, and changing only cognitions relevant to the specific behavior. With explicit attention on only the target behavior, evidence suggests that modeling interventions and planning activities indeed tend to be more effective at changing a target behavior in the proenvironmental domain as compared to persuasive messages (Osbaldiston & Schott, 2012). However, these types of interventions should be less effective at influencing individuals to try to spread their behavior to others, since they only focus on the specifics of one behavior, removed from the context of why that behavior is important and why other people also need to engage in the behavior. Overall, persuasive messages, modeling interventions, and planning activities should variably affect recipients' efforts to spread their behavior to others via the processes of modeling, persuasion, and conversation. Explicit hypotheses can be found below, but all of the hypotheses can also be found in Table 1.

Hypothesis 1: Persuasive messages will have a greater influence on attitudes, behavioral beliefs, and knowledge, as compared to modeling interventions, planning activities, and a no intervention condition. It is not expected that modeling interventions and planning conditions will significantly increase these outcomes as compared to a no intervention condition.

Hypothesis 2: Modeling interventions will have a greater influence on self-efficacy, as compared to persuasive messages, planning activities, and a no intervention condition. It is not expected that persuasive messages and planning conditions will significantly increase self-efficacy as compared to a no intervention condition.

Hypothesis 3: Planning activities will have a greater influence on the development of plans, as compared to persuasive messages, modeling interventions, and a no intervention condition. It is not expected that persuasive messages and modeling interventions will significantly increase plans as compared to a no intervention condition.

Hypothesis 4: Modeling interventions and planning activities will have a greater influence on a target behavior, or intentions to engage in a target behavior, as compared to persuasive messages and a control condition.

Hypothesis 5: Persuasive messages will have a greater influence on a target behavior, or intentions to engage in a target behavior, as compared to a no intervention condition.

Hypothesis 6: Persuasive messages will have a greater influence on efforts to spread one's behavior to others, and intentions to spread one's behavior to others, as compared to modeling interventions, planning activities, and a no intervention condition.

It is not expected that modeling interventions and planning conditions will vary from a no intervention condition.

The Spread of Behavior Within an Individual

Social scientists considering the spread of behavior have paid less attention to whether behaviors spread *within* individuals, such as the spreading of behavior from a target behavior to other, relevant behaviors. This spread of behavior within the individual deserves further consideration within the wider field of social psychology, and, specifically, as it relates to the domain of proenvironmental behavior. Some examples of this type of work exist, examining the spread of behavior within an individual in domains such as health behavior (e.g., Foster, Giles-Corti, & Knuiiman, 2011), antisocial behavior (e.g., Keizer, Lindenberg, & Steg, 2008), political behavior (e.g., McCann, Partin, Rapoport, & Stone, 1996) and prosocial behavior (e.g., Vohs, Redden, & Rahinel, 2013). For example, Mata et al. (2009) found that people who increased their physical activity were also more likely to eat healthier further in the future. Personality researchers have also examined the consistency of people's behaviors, as well as the predictors of this consistency (e.g., Snyder & Ickes, 1985) and the extent to which personality traits themselves are consistent across behaviors ("traitedness"; Baumeister & Tice, 1988). This personality approach to the consistency of behavior suggests that there are ways to find consistency in people's behavior across types of behaviors; however, this approach has focused less on the actual spreading of behavior within the person across behaviors over time.

Other correlational work on behavioral consistency has actually come from the proenvironmental area, such as work by Thøgersen and colleagues (e.g., Thøgersen & Crompton, 2009), who have examined the correlations between certain proenvironmental behaviors. Thøgersen and Ölander (2006) found that types of recycling behaviors (e.g., recycling paper and glass and recycling hazardous materials) strongly correlated with one another, and similar trends were found within types of green consumption behaviors (purchasing different types of organic foods) and within types of public transportation behaviors (i.e., taking the bus to and from work; taking the bus to and from shopping). However, this research has rarely explored these questions using experimental methods, has rarely examined when spreading is more or less likely, and has largely ignored the processes through which individuals come to consistently engage in different proenvironmental behaviors. Thøgersen (1999), however, did search for some potential mediators in the proenvironmental area, finding that making general environmental attitudes salient is one plausible mechanism. Indeed, work on the spread of behavior within the individual has tended to neglect important topics also rarely explored in the research on the spread of behavior between individuals, including: (1) whether it is possible to influence the spread of behavior, (2) how behavior spreads within the individual, and (3) an understanding of when and for whom behavior spreads.

Relevant experimental work on the spread of behavior within the individual does exist in certain areas of psychology. Consideration of whether getting an individual to engage in one behavior leads them to engage in related behaviors has primarily come from two areas of work: 1) research on the foot-in-the-door effect, and 2) health behavior

change interventions. Research on the foot-in-the-door effect (Freedman & Fraser, 1966) examines whether it is possible to influence people to adopt two related behaviors, stemming first from a request for a minimal, initial behavior, and later from a request for a second, more effortful behavior. This work has tended to be experimental, and meta-analyses have found that when prompted by a requester, within an individual the spread of behavior can occur from one smaller behavior to a second, larger behavior (Beaman, Cole, Preston, Klentz, & Steblay, 1983; Burger, 1999). Although investigators have proposed a number of mechanisms that might explain why one behavior spreads to a second behavior, such as perceptions of social norms, consistency concerns, and changes in identity or attitudes, little experimental work has tested whether these processes explain the spread of behavior within individuals.

Multiple health behavior change interventions have also explored whether getting an individual to perform a target behavior leads that individual to engage in other, related behaviors (e.g., Dutton, Napolitano, Whiteley, & Marcus, 2008; King et al., 2013; Prochaska, Velicer, Nigg, & Prochaska, 2008). Though most of this research has tried to influence individuals to engage in more than one related health behavior immediately at the onset of the intervention, some of this research has indeed found that interventions asking people to engage in one health behavior (e.g., physical activity) can influence the same person to engage in other health behaviors (e.g., dieting), even if only one behavior is the focus of the intervention (Dutton et al., 2008). Given this past research on the spread of behavior within individuals from a target behavior to other, related behaviors,

there is currently at least some support across domains for the notion that the spread of behavior within the individual can occur.

In the environmental area, research has begun to consider how experimental work might inform our knowledge of the spread of behavior within an individual (Truelove, Carrico, Weber, Raimi, Vandenberg, 2014). For example, researchers found that use of financial incentives and verbal praise did lead to the spread of behavior from purchasing green products to other proenvironmental behaviors such as recycling, conserving energy, and choosing sustainable modes of transportation (Lanzini & Thøgersen, 2014).

Alternatively, there is also evidence that environmental information, but not financial information, concerning car-sharing can lead to increased recycling behavior (Evans et al., 2013); however, Longoni, Gollwitzer, and Oettingen (2014) also found that giving people positive feedback on green purchasing can lead to less subsequent recycling behavior. These efforts have been informative and even experimental, yet somewhat atheoretical, and lacking in exploration of the *processes* through which behaviors might spread to other behaviors, as well as the factors that make the spread of behavior within individuals more or less likely.

Given past research and theorizing on why people consistently engage in related behaviors (e.g., Dolan & Galizzi, 2015; Littleford, Ryley, & Firth, 2014), possible mechanisms for the spread of behavior within people include (1) making people aware of their general attitudes relevant to a set of behaviors, such as general attitudes toward proenvironmental behaviors (Thøgersen, 1999), (2) making people aware of their inconsistencies in how frequently they engage in different behaviors, as well as

importance of the behaviors (“consistency concerns,” such as seen in hypocrisy manipulations in research such as conducted by Dickerson, Thibodeau, Aronson, and Miller, 1992), and (3) changes in self-concept or identity, following from self-perception theory (Bem, 1967; DeJong, 1979) and research on green identity (Whitmarsh & O’Neill, 2010). These three proposed processes potentially explain how engaging in a target behavior leads an individual to engage in other, related behaviors. I chose to focus on one of these possible mechanisms, change in general attitudes (see Figure 2), which has some correlational support in the proenvironmental behavior change area (Thøgersen, 1999). If people come to see a given environmental behavior (e.g., recycling a specific material, such as paper) as relating to other behaviors (e.g., recycling other products, such as plastic, glass, and aluminum), or even that it relates to more general environmental issues (e.g., reducing carbon emissions linked to climate change), this could cause people to expand the types of behavior they deem worthy of enactment.

Influencing the processes that contribute to the spread of behavior within individuals. Just as common interventions in the proenvironmental behavior change area may affect the proposed processes of how the spread of proenvironmental behaviors occurs between people, these interventions may also distinctly influence the proposed processes of the spread of proenvironmental behavior within individuals. Indeed, persuasive messages could have a larger effect on beliefs about a target behavior and how it relates to other environmental issues, as compared to modeling interventions or planning activities. These persuasive messages should also make people more aware of their own general attitudes about proenvironmental behaviors, and will thus be more

likely to lead to the spread of behavior within the individual from the target behavior to other, related proenvironmental behaviors. Modeling interventions and planning activities, with their focus on one specific behavior and cognitions directly linked to only this behavior (i.e., self-efficacy and plans), should have less of an effect on general proenvironmental attitudes and beliefs, and should thus be less likely to lead to the spread of behavior within the individual.

The question of *which* behaviors a target behavior should spread to is of great importance to the field, as it seems unlikely that efforts to change one proenvironmental behavior should lead to the within-person spread of behavior to all other forms of proenvironmental behavior. There are numerous potential variables that could make the spread to another behavior more or less likely, but one particularly relevant moderator would be the prototypicality of the other proenvironmental behaviors. Prototypicality has typically been explored in the cognitive psychology area (Buss & Craik, 1980) and is useful for examining how different types of objects in a shared category are representative of that category (e.g., automobiles are a highly prototypical form of transportation and using a canoe is considered to be a much less prototypical form of transportation; Rosch, 1975). Though rarely applied to issues of the spread of behavior, prototypicality is one possible way to guide predictions about when the spread of behavior within the individual should occur. Just as when people are asked to think of examples of forms of transportation they should be more likely to list a form such as an automobile and less likely to list a form such as using a canoe, efforts to influence a person's target proenvironmental behavior should be more likely to lead to the spread of

behavior to highly prototypical behaviors, and less likely to lead to the spread of behavior to behaviors low in prototypicality. Individuals should be more likely to view behaviors high in prototypicality as being a clearer example of the category of “environmental behaviors,” and thus behaviors of relevance to a target proenvironmental behavior.

Researchers have speculated on which environmental behaviors might be highest or lowest in perceived prototypicality, putting forth recycling behaviors as the most likely candidate to be the behavior perceived as highest in prototypicality (Olli, Grendstad, & Wollebaek, 2001), but to date no empirical data have been gathered on the topic. Recently, environmental researchers interested in the spread of behavior within the individual have called for work on how the spread of behavior within the individual might be affected by how prototypical the non-target behaviors are, but no work to date has considered how experimental interventions might influence non-target behaviors that are high or low in prototypicality (Evans et al., 2013).

Hypothesis 7: Persuasive messages, as compared to modeling interventions, planning activities, and a no intervention condition, will increase rates of within-person spread of behavior from a target behavior to behaviors high in prototypicality, as well as increased intentions to engage in behaviors high in prototypicality.

Hypothesis 8: None of the intervention approaches (i.e., persuasive messages, modeling interventions, or planning activities), as compared to a no intervention condition, will increase rates of within-person spread of behavior from a target behavior to behaviors low in prototypicality or increase in intentions to engage in behaviors low in prototypicality.

Individual Differences that May Inhibit or Facilitate the Spread of Behavior

In addition to considering whether the spread of behavior occurs between and within individuals and *how* behaviors might spread, the questions of when and for whom spreading occurs are also fundamentally important. One way to approach the potential moderators of the spread of behavior is to examine how individual differences might play a role in the spreading of behavior between and within individuals.

Starting with the spread of behavior *between* individuals, what types of individuals might be more likely to engage in the behaviors that facilitate the spread of proenvironmental behavior? People who hold moral beliefs about the value of environmental issues might be more likely to try to spread their behaviors to others, and in particular individuals high in “moral exporting” (the willingness to try to get others to adopt your morals; Peterson, et al., 2009) might be more likely to attempt to model their behavior, try to persuade others to adopt a behavior, and also bring up the behavior in conversation. Indeed, people high in moral exporting tend to have stronger behavioral convictions in a given domain (such as moral behaviors), and are more willing to promote their values and behaviors to others (Peterson et al., 2009). In addition to the hypothesis that people high in moral exporting should be more likely to try to spread their environmental behavior to others, the three interventions of persuasive messages, modeling interventions, and planning activities should be more effective at getting people high in moral exporting to try to spread their behaviors to others, as compared to the control condition.

A second individual difference relevant to the spread of behavior between people is the extent to which an individual is extraverted and positively oriented toward engaging with other people (Costa & McCrae, 1980). Extraverts feel more comfortable interacting and conversing with others (e.g., Rice & Markey, 2009); indeed, some evidence suggests that extraverts are even more effective at persuading others (e.g., Carment, Miles, & Cervin, 1965; Oreg & Sverdlik, 2014), and are more likely to try to influence others and to use a wider range of persuasion strategies (Caldwell & Burger, 1997). If an extraverted person has recently adopted a new behavior or experienced an intervention that influences them to change an existing behavior, that person should be more likely to model that behavior to others, more willing to try to persuade others, and also more likely to bring up the behavior in conversation. In addition to the hypothesis that people high in extraversion should be more likely to try to spread their environmental behavior to others, the three interventions of persuasive messages, modeling interventions, and planning activities should be more effective at getting people high in extraversion to try to spread their behaviors to others, as compared to the control condition.

A third individual difference possibly useful for predicting who should be more likely to try to spread their proenvironmental behavior to others would be those who have positive environmental attitudes (e.g., Milfont & Duckitt, 2010). Similar to those high in moral exporting, individuals with positive environmental attitudes should also be more willing to promote their proenvironmental behaviors. Thus, people with positive environmental attitudes should be more likely to try to spread their behavior to others via

modeling, persuasion, and conversation efforts. However, whereas moral exporting (as well as extraversion) is potentially more relevant to the spread of behavior between individuals, environmental attitudes should also be relevant to the spread of behaviors *within* individuals. Thus, individuals with more positive proenvironmental attitudes might be more likely to not only engage in a target proenvironmental behavior, but they should also be more likely to engage in a range of behaviors of relevance to the target behavior. In addition, the three interventions of persuasive messages, modeling interventions, and planning activities should be more effective at getting people with positive environmental attitudes to engage in behaviors relevant to the spread of proenvironmental behavior between and within individuals (and, in particular, those proenvironmental behaviors high in prototypicality).

One individual difference measure more relevant to the spread of behavior within the individual would be preference for consistency (Cialdini, Trost, & Newsom, 1995; similar to self-reported consistency investigated by Bem and Allen, 1974). Preference for consistency captures the extent to which people strive to be consistent, want to appear consistent, and want others to be consistent. People high in preference for consistency strive to be consistent in these various ways, and this is particularly true when presented with new information within a specific domain that implicates other domain-specific attitudes or beliefs (Cialdini et al., 1995). Recent research has found that people high in preference for consistency are also more likely to feel the need to act prosocially when there is pressure to act in a prosocial manner (Gebauer, Riketta, Broemer, & Maio, 2008). Because a wider set of proenvironmental behaviors might be primed by proenvironmental

interventions, individuals high in preference for consistency should be more likely to appreciate the importance of a range of proenvironmental behaviors and how they implicate consistency, and thus should be more likely to spread their target behavior to other, related types of behaviors.

It is also possible, though less explored in the literature, that people high in preference for consistency might also desire a consistent social network, such that people high in preference for consistency might desire that others should also engage in the behaviors that they value, to maintain a “consistent” social network. I leave this possibility open and something worth exploring in the current research; however, I do expect that individuals high in preference for consistency will be more likely to experience the spread of behavior within the individual (particularly to those proenvironmental behaviors high in prototypicality). Thus, the three interventions of persuasive messages, modeling interventions, and planning activities should be more effective at getting people high in preference for consistency to engage in behaviors relevant to the spread of proenvironmental behavior within individuals (and, in particular, those proenvironmental behaviors high in prototypicality), and possibly between individuals. This will *only* be true for individuals who receive one of the interventions, as people high in preference for consistency might not intrinsically care about environmental issues, and instead they might need to be initially influenced by an intervention.

Finally, the individual difference measure of self-monitoring should also be relevant to the spread of behavior within the person in certain *settings*. People who are

high in self-monitoring (Snyder, 1974) tend to rely upon cues from other people when deciding the proper way to act in a social context, as compared to people low in self-monitoring, who instead rely upon their own values and beliefs when deciding how to act in a social situation. Thus, people low in self-monitoring can be expected to be more consistent in their behavior across settings, as they are less concerned about, and influenced by, the behaviors and beliefs of other people. One type of setting distinction that is relevant to both proenvironmental behavior and self-monitoring is the distinction between public and private settings (Goffman, 1959; Leary & Kowalski, 1990). Many proenvironmental behaviors are engaged in across different settings, some settings being more private (e.g., one's own home) and some settings being more public (e.g., school or work), suggesting that these behaviors can vary in the extent to which they can be publically observed and influenced (Kenrick & Stringfield, 1980; Littleford et al., 2014).

Whereas people low in self-monitoring might be more likely to consistently engage in proenvironmental behaviors regardless of setting, people high in self-monitoring may show less consistency. For example, in private settings the behavior of high self-monitors might be driven by personal values, but in a public setting, such as at school, social pressures may drive their behavior more. Given this possibility, it is worth exploring whether the three interventions of persuasive messages, modeling interventions, and planning activities are more effective at getting people high in self-monitoring to engage in public, but not private, behaviors. Just as with people higher in preference for consistency, people high in self-monitoring might not intrinsically care

about the environment, and instead they might need to be initially influenced by an intervention.

Overall, people high in moral exporting and extraversion should be more likely to try to spread their behavior to others, people with positive environmental attitudes should be more likely to *both* try to spread their behavior to others and engage in behaviors relevant to a target behavior, people high in preference for consistency should be more likely to engage in behaviors relevant to a target behavior (and possibly intend to spread their behavior to others), and people high in self-monitoring should be more likely to only spread their behavior from a target behavior to those behaviors engaged in publicly.

Hypothesis 9: People higher in moral exporting, as compared to those who are lower, will report higher rates of efforts, and higher intentions, to spread their behavior to other individuals.

Hypothesis 10: People higher in moral exporting, as compared to those who are lower, and who also receive one of the interventions, will report higher rates of efforts, and higher intentions, to spread their behavior to other individuals.

Hypothesis 11: People higher in extraversion, as compared to those who are lower, will report higher rates of efforts, and higher intentions, to spread their behavior to other individuals.

Hypothesis 12: People higher in extraversion, as compared to those who are lower, and who also experience one of the interventions, will report higher rates of efforts, and higher intentions, to spread their behavior to other individuals.

Hypothesis 13: Individuals with more positive proenvironmental attitudes, as compared to those with less positive attitudes, will report higher rates of efforts, and higher intentions, to spread their behavior to other individuals, and will be more likely to engage, or intend to engage, in a range of proenvironmental behaviors.

Hypothesis 14: Individuals with more positive proenvironmental attitudes, as compared to those with less positive attitudes, and who also experience one of the interventions, will report higher rates of efforts, and higher intentions, to spread their behavior to other individuals, and will be more likely to engage, and intend to engage, in behaviors high, but not low, in prototypicality.

Hypothesis 15: People higher in preference for consistency, as compared to those who are lower, and who also experience one of the interventions, will be more likely to engage, or intend to engage, in behaviors high, but not low, in prototypicality, and will possibly report higher rates of efforts, or higher intentions, to spread their behavior to other individuals.

Hypothesis 16: People higher in self-monitoring, as compared to those who are lower, and who also experience one of the interventions, will be more likely to engage, and intend to engage, in behaviors that are public, but not private.

Present Research

In order to determine whether proenvironmental behavior spreads between and within individuals, and also how, when, and for whom it spreads, I conducted three studies. In Study 1, I quantitatively and qualitatively examined the ways in which individuals think about the spread of behavior between and within individuals, and I also

aim to provide richer information regarding when behavior should spread within individuals (e.g., perceived prototypicality of proenvironmental behaviors). Results from Study 1 directly informed and guided aspects of Studies 2 and 3, including confirmation of the processes through which the spread of proenvironmental behavior occurs between individuals (i.e., modeling, persuasion attempts, and conversation), the processes that contribute to the spread of behavior within individuals (i.e., the activation of more general environmental attitudes), and the extent to which proenvironmental behaviors are high or low in prototypicality (guiding predictions about the types of behavior the spread of behavior within the individual should and should not lead to).

Moving into the experimental context, Studies 2 and 3 both tested versions of all 16 hypotheses. Whereas Study 2 tested whether intentions to engage in behaviors relevant to the spread of behavior between and within individuals are influenced by the proposed interventions (i.e., a persuasive message, a modeling intervention, and a planning activity), Study 3 examined these effects on behavior over time. Both Studies 2 and 3 also considered how the interventions affected cognitions relevant to the spread of behavior (e.g., attitudes, beliefs, knowledge, self-efficacy, and planning), as well as key predictors and moderators of actions relevant to the spread of behavior (i.e., moral exporting, extraversion, environmental attitudes, preference for consistency, and self-monitoring). Across all three studies self-reported behavior is the focus, instead of objective behavior, given the difficulty of collecting objective behavioral data. This point is further explored during the discussion of limitations near the end of the document.

It was necessary to target one specific behavior in these studies, and I chose to target the behavior of recycling paper, and specifically in the context of one's home, for a number of reasons. First, prior research (Maki & Rothman, in preparation) indicates that people engage in only moderate amounts of paper recycling, and this is particularly true in the home. The Environmental Protection Agency estimates that 20% of trash in the United States consists of recyclable paper (Environmental Protection Agency, 2014); meaning that there should be room for improving rates of paper recycling at home. Additionally, paper recycling is a behavior that is of particular relevance to other types of proenvironmental behaviors (e.g., other types of recycling behaviors and recycling paper in other settings), and is not as overtly relevant to other proenvironmental behaviors (e.g., taking public transportation). This made it a good candidate for examining how paper recycling at home might spread between people and spread to other proenvironmental behaviors.

Study 1: How Do People Think About the Spread of Proenvironmental Behaviors?

Design

Study 1 is designed to provide in-depth detail on how people think about the spread of behavior. Study 1 used an online survey to examine people's perceptions, using open-ended questions focusing on behavioral consistency and the spread of their behavior, as well as questions concerning how often they attempt to influence the behavior of others, and how prototypical they perceive a range of proenvironmental behaviors to be.

Participants

Participants were 104 undergraduates (80 women, 24 men; mean age = 21.64, *SD* = 5.38) at a large public University in the Midwestern United States receiving partial course credit for study involvement. The majority identified as White (66%), though some identified as African American (5%), Asian (29%), Latino (2%), Native American (2%), or other (3%).

Procedure

Participants were recruited for a study on consumer behaviors. After consenting to participate in the study, participants were randomly assigned to the order in which they completed each of the following two blocks of questions: (1) their beliefs regarding the prototypicality of a range of commonly examined proenvironmental behaviors across a range of relevant settings (i.e., recycling paper, recycling plastic, glass, and aluminum, conserving water, conserving energy, using public transportation, buying organic foods, and using reusable bags) and their responses to open-ended questions concerning consistency and spread of behavior, or (2) their past behavior aimed at spreading their proenvironmental behavior and intentions to engage in efforts to spread their behavior to others. Participants in both conditions last responded to demographic measures and then were debriefed.

Measures¹

Prototypicality ratings of environmental behaviors. Participants reported the extent to which each type of proenvironmental behavior in each setting is prototypical of the more general category of proenvironmental behaviors. After participants read a description and example of the concept of prototypicality, as done previously by Buss and Craik (1980), participants reported their rating of prototypicality of each behavior in each setting with a Likert-type scale that ranges from 1 (“very poor fit”) to 7 (“very good fit”).

Open-ended questions. Participant responded to open-ended questions regarding the spread of behavior in order to both confirm the proposed processes through which they try to spread their behavior to others (i.e., modeling, persuasion, and conversation), and to provide a richer sense of when the spread of behavior occurs both within and between individuals. The six open-ended questions² were: (1) Where do you try to influence the proenvironmental behaviors of others? (2) When do you try to influence the proenvironmental behaviors of others? (3) How do you try to influence the

¹ Other measures/items were also administered in this study but were not analyzed as they served a backup role in case another measure did not work (e.g., measures of similarity between pairs of behaviors would have been used if the prototypicality results were not informative) or were collected just in case future manuscript reviewers want to see them/they might be considered in analyses down the road (e.g., past proenvironmental behavior and future intentions, past paper recycling behavior of others, and future expectations of others’ paper recycling behavior, various demographic questions, including citizenship status, employment status, family income, marital status, past and current residence information, time spent in college, and political ideology). See Appendix 1 for all measures used across all three studies.

² In addition, two other questions were asked but are not considered here: (7) Why do you consistently engage in the same proenvironmental behaviors across settings? (8) Why do you not consistently engage in the same proenvironmental behavior across settings?

proenvironmental behaviors of others? (4) Why do you try to influence the proenvironmental behavior of others? (5) Why do you consistently engage in different types of proenvironmental behaviors? (6) Why do you not consistently engage in different types of proenvironmental behaviors?

Responses to the open-ended questions were reviewed to create an exhaustive coding scheme for the types of responses for each question. A research assistant and I then separately coded all of the responses to each question with the coding scheme. Codes were compared and generally had a high level of agreement ($kappa = .86$). Disagreements were resolved through discussion.

Past efforts to spread one's environmental behavior to others. Participants reported their past efforts to spread their paper recycling to others, including the extent to which they modeled paper recycling to others, they tried to persuade other people to recycle paper, and they brought up paper recycling around other people, using a Likert-type scale that ranged from 0 ("never") to 6 ("always"; e.g., "During the past two weeks, I recycled paper in places where other people saw that I recycled paper"). The three behaviors were correlated, $r = .42$ between modeling and persuasion, $r = .46$ between modeling and conversation, and $r = .84$ between persuasion and conversation; when combined they had an overall alpha of .80.

Intention to spread one's environmental behavior to others. Participants reported their intentions to spread their behaviors to others through modeling, persuasion, and conversation efforts (e.g., "During the next two weeks, I expect to recycle paper in places where other people will see or know that I recycled paper") using a Likert-type

scale that ranged from 0 (“never”) to 6 (“always”). The items were all correlated, $r = .48$ between modeling and persuasion, $r = .47$ between modeling and conversation, and $r = .83$ between persuasion and conversation. When combined, they had an overall alpha of .82.

Demographics. Participants reported their age, gender, and ethnicity.

Results

I first report the findings from the open-ended questions, which provide a richer context of how people think about the spread of behavior between and within individuals. Next, I report results on the processes that contribute to the spread of behaviors between individuals. Finally, I report the results of participants’ perceptions of the prototypicality of various proenvironmental behaviors; all of these results informed data collection and analysis in Studies 2 and 3.

How Do People Think About the Spread of Behavior Between Individuals?

Participants’ responses to questions concerning the spread of proenvironmental behavior between individuals provide evidence of the processes through which the spread of behavior might occur, both supplying validation for my proposed processes (i.e., modeling, persuasion, and conversation), as well as enriching current understandings of this phenomenon. Overall, 49% of participants reported trying to influence the proenvironmental behaviors of others in some way (see Table 2). Responses to the open-ended questions were categorized according to the most common types of responses to each question. When considering *where* people try to influence the proenvironmental behaviors of others (highlighted in Table 3), participants reported trying to influence the

proenvironmental behaviors of others most commonly at home (53%), followed by at school (27%), in public areas (18%), in friends' homes (16%), at work (13%), and when they saw someone perform the wrong environmental behavior (11%; other places reported less than 10% of the time can be seen in Table 3). Overall, there was a wide range of settings in which people tried to influence the environmental behavior of others.

There was also a range of *times* at which people tried to influence others (see Table 4). Though participants were most likely to list an idiosyncratic time not listed by others (26%), participants also reported trying to influence others at all times (23%), when they see the wrong environmental behaviors (23%), when at home (11%), when at school (11%), at night (11%), and when at social gatherings (11%; other times reported less than 10% of the time can be seen in Table 4). Though some participants reported specific times, or lack thereof, when they try to influence others, some participants simply reported places they try to influence others. Considering *how* they try to influence the environmental behavior of others, the most common responses were by asking or telling other people (38%, similar to persuasion efforts), mentioning or reminding them (19%, similar to conversation efforts), leading by example (17%, similar to modeling efforts), encouraging them (15%), and explaining the benefits of the behavior or costs associated with not engaging in the behavior (15%; other methods reported less than 10% can be seen in Table 5).

When asked *why* they try to influence others' environmental behaviors, the most common reasons reported (see Table 6) were trying to address issues pertaining to environmental health (52%), assorted idiosyncratic reasons (22%), to protect limited

resources (17%), because every action has an effect (11%), and because it is easy to do (11%; other reasons reported less than 10% can be seen in Table 6). These results provide a richer understanding of how people think about the spread of proenvironmental behaviors between individuals, and provide support for the processes through which they try to do so, including descriptions of actions quite similar to modeling, persuasion, and conversation efforts, and reasons why they try to influence others, including concern about general environmental issues and outcomes.

How Do People Think About the Spread of Behavior Within Individuals?

In addition, 83% of participants reported trying to consistently engage in different types of proenvironmental behaviors (see Table 2). When participants who reported consistently engaging in different types of behaviors were asked why they consistently engaged in different types of proenvironmental behaviors (see Table 7), the most commonly reported reasons were to ensure environmental health (45%), to save money (14%), assorted idiosyncratic reasons (13%), to protect limited resources (12%), and because it is easy to do (11%; other reasons reported less than 10% of the time can be seen in Table 7). When participants who reported not trying to consistently engage in different proenvironmental behaviors were asked why they did not try to do so (see Table 8), the most common responses were that it was inconvenient (25%), they were too lazy (13%), that it wasn't always possible (13%), that they did not have enough time (13%), that it was not worth the effort (13%), or for other idiosyncratic reasons (13%; other reasons reported less than 10% of the time can be seen in Table 8). Overall, many of the responses to the open-ended questions implicate the belief that more general

environmental concerns spur people on to engage in a range of proenvironmental behaviors consistently, lending some support for the proposed process of how behavior spreads within the individual.

How frequently did participants report engaging in behaviors relevant to the spread of behavior between individuals, and how strong are their future intentions to spread their behavior?

Turning to the target behavior of recycling paper at home, little is known about how frequently people try to influence the paper recycling behavior of others. As Table 9 indicates, people were most likely to have tried to model paper recycling behavior to others in the past ($M = 3.28$, $SD = 1.60$), followed by attempting to persuade others to engage in the behavior ($M = 1.36$, $SD = 1.78$), and then by bringing up the behavior in conversation ($M = 1.02$, $SD = 1.59$). Looking forward, participants' intentions to engage in behaviors to spread paper recycling largely reflected their past behavior (see Table 10) – modeling was the most likely ($M = 3.33$, $SD = 1.54$), followed by persuasion ($M = 1.44$, $SD = 1.69$), and conversation ($M = 1.24$, $SD = 1.57$).

What Were the Proenvironmental Behaviors Highest and Lowest in Prototypicality?

To provide a sense of when the spread of behavior within the individual should be more or less likely to occur (spreading to behaviors high, not low, in prototypicality is expected in Studies 2 and 3), people reported their perceptions of the behaviors. As Table 11 indicates, people viewed the various proenvironmental behaviors as better or worse examples of the category of environmental behavior. The various recycling behaviors

(i.e., recycling paper and recycling plastic, glass, and aluminum in the each setting) tended to be the behaviors highest in prototypicality. Conservation behaviors tended to be perceived as the next most prototypical set of behaviors. Overall, the top three behaviors in prototypicality were recycling plastic, glass, and aluminum at school, recycling paper at school, and recycling plastic, glass, and aluminum at home.

After most of the recycling and conservation behaviors, taking public transportation from home to school was the most prototypical behavior, being ranked tenth out of twenty behaviors. The seven behaviors considered least prototypical all involved taking public transportation, using reusable bags at the store, or buying organic food. Overall, the bottom three behaviors in prototypicality were using reusable bags when shopping at department stores, buying organic fruits and vegetables at the grocery store, and buying organic foods other than fruits and vegetables.

Study 1 Discussion

Results from Study 1 provide some important insights into the spread of proenvironmental behavior and demonstrate that there were some clear patterns in how people think about the spread and consistency of proenvironmental behaviors, including where, how, and why they try to influence others' behaviors, and why they are consistent in the types of behaviors they engage in. First focusing on the spread of behavior between individuals, I expected to find support for the notions that people try to influence the environmental behavior of others, and they try to do so through modeling, persuasion, and conversation efforts. Results revealed that people tried to influence the proenvironmental behaviors of others at home, at school, or simply when they saw the

wrong environmental behavior. They tended to try to do this by asking them to change their behavior, reminding them of appropriate behavior, or by leading by example, largely reflecting the proposed processes of persuasion, conversation, and modeling. Additionally, people usually tried to influence others to help address environmental issues, including preserving limited natural resources, similar to the reasons they gave for being consistent in the types of behaviors in which they engaged. In addition, questions directly assessing the three proposed processes of efforts to spread one's behavior to others provided evidence that there is variability in the extent to which people tried to influence the paper recycling behavior of others in the past, and their intentions to do so in the future, with modeling being the most popular approach, following by persuasion efforts, and finally use of conversation.

I also sought evidence for why people consistently engage in a range of proenvironmental behaviors, expecting that general environmental attitudes would underlie why people reported being consistent in their behaviors. Indeed, responses to the open-ended questions suggested that though people cited numerous reasons for being consistent, most of those reasons related to general environmental attitudes or the value of engaging in a range of behaviors, not just one. The trends in these responses provide some evidence of the proposed mechanism through which the spread of behavior within individuals occurs, which would be a more general concern or awareness of how a range of behaviors link to a given environmental issue.

Third, there are distinctions in how prototypical people perceive common proenvironmental behaviors. People perceive various recycling behaviors to be the most

prototypical behaviors; this was followed by conservation behaviors, and finally taking public transportation, using reusable bags at the store, and buying organic food. Ratings of how prototypical various proenvironmental behaviors are perceived to be will guide decisions about how to test, in Studies 2 and 3, the hypothesis that persuasive messages, aimed at changing a targeted behavior will influence people to also engage in other behaviors. It is expected that interventions should affect behaviors high, but not low, in prototypicality. The top three behaviors in prototypicality (i.e., recycling plastic, glass, and aluminum at school, recycling paper at school, and recycling plastic, glass, and aluminum at home) were retained for Studies 2 and 3. However, given that Study 3 will examine day-to-day changes in behavior and how infrequent the least prototypical behaviors might be day-to-day, I decided to focus on slightly different behaviors. Instead, I chose the best exemplars from the least prototypical types of behaviors to use as the behaviors low in prototypicality (i.e., taking the bus from home to school, buying organic produce, and using reusable bags at the grocery store), to make sure the day-to-day results had a better chance of being common enough to be reported on most days.

The first study provided evidence that many people do already make occasional efforts to influence others' proenvironmental behaviors, as well as make an effort to consistently engage in different types of behaviors. It also provided some evidence as to the processes that might lead to the spread of behavior between individuals (i.e., modeling, persuasion, and conversation) and within individuals (i.e., more general environmental concerns). Overall, this provides a better understanding of the spread of behavior between and within individuals. However, experimental evidence is needed to

determine the extent to which it is possible to *influence* the spread of behavior, as well as possible mechanisms implicated in the spread of behavior.

Study 2 was designed to determine whether it is possible to experimentally-induce changes in intentions to engage in behaviors relevant to the spread of behavior between and within people. Specifically, I examined whether three intervention approaches, as highlighted in the introduction (i.e., persuasive messages, modeling videos, and planning activities), could be used to induce behaviors relevant to these types of spread. These three approaches allow me to test predictions about what types of interventions should lead to the greatest increase in a target behavior (i.e., modeling interventions and planning activities), and what type of intervention should lead to the greatest increase in efforts to spread one's behavior to others and engage in behaviors high, but not low, in prototypicality.

Finally, Study 2 was designed to explore how certain individual differences (i.e., environmental attitudes, moral exporting, extraversion, preference for consistency, and self-monitoring) are related to intentions to engage in behaviors relevant to the spread of proenvironmental behavior, and also how these individual differences might modify the effect of the interventions on the spread of behavior. I expected that some of these individual differences would be linked to the spread of behavior between individuals (i.e., moral exporting, extraversion, and environmental attitudes) whereas others would be linked to the spread of behavior within individuals (i.e., environmental attitudes, preference for consistency, and self-monitoring).

Study 2: Can We Influence People's Intentions to Spread Their Proenvironmental Behaviors?

Study 2 examines whether it is possible to influence people's intentions to spread their proenvironmental behaviors by again focusing on the target behavior of recycling paper at home, as well as the behaviors determined to be high in prototypicality (i.e., recycling paper at school, recycling plastic, glass, and aluminum at home, and recycling plastic, glass, and aluminum at school) and low in prototypicality (i.e., taking public transportation from home to school, buying organic produce, and using reusable bags at the grocery store), and behaviors related to the spread of proenvironmental behavior between individuals (i.e., modeling, persuasion, and conversation).

Design

Participants were randomly assigned to one of four conditions: (1) reading a persuasive message that explained why people should recycle paper at home, and how recycling paper at home relates to more general environmental issues (2) watching a "how-to" modeling video focusing on tips and techniques to ensure more consistent paper recycling at home, (3) creating a plan (an "implementation intention) on when, where, and how to recycle paper at home, or (4) a control condition in which participants received no experimental manipulation. Afterwards, participants reported their cognitions relevant to paper recycling at home, intentions to spread their behavior to others, as well as proenvironmental behavior intentions.

Participants

The literature (i.e., Osbaldiston & Schott, 2012) suggests an expected effect size of .43 for persuasion interventions to change proenvironmental behavior, an expected effect size of .63 for modeling interventions, and an expected effect size of .64 for planning interventions. Given the differences in expected effect sizes, I used the average expected effect size for (.57) for power analyses. With the help of power analysis (using G*power; Faul, Erdfelder, Lang, & Buchner, 2007) and prior effects sizes in the proenvironmental behavior intervention area (i.e., Osbaldiston & Schott, 2012), and taking into account the fact that the interventions should have a larger impact on intentions as compared to behavior (e.g., Webb & Sheeran, 2006), I targeted 148 undergraduate women and men. An *a priori* power analysis for an F-test with repeated measures (intentions before and after the intervention for a total of two measurement points, and assuming their correlation to be $r = .60$) to compare any two of the conditions revealed that a sample of 148 would be needed to have 75% power.

Participants were 158 undergraduates (104 women, 54 men; mean age = 19.61, $SD = 2.36$) at a large public University in the Midwestern United States. Participants received partial course credit for participation. I increased my target number of participants about approximately 8% to account for possible attrition between the first online survey and the in-person intervention. A majority of participants identified as White (66%), though some identified as African American (5%), Asian (29%), Latino (1%), Native American (2%), or other (2%).

Procedure

Participants were recruited for a study on consumer behaviors. After consenting to participate, participants first completed an online survey that included measures of intentions, moral exporting, extraversion, general environmental attitudes, preference for consistency, self-monitoring, and demographic information. After this participants attended an in-person session at which they were randomly assigned to one of four conditions, all presented on a computer: a persuasive message, a modeling video, a planning activity, or a control condition (intervention materials can be found in Appendix 2).

In the persuasive message condition, participants viewed five pages of information concerning paper recycling at home, outlining the fact that most paper is not recycled, that it is important for people to recycle paper, providing reasons why people should recycle paper, and explaining how paper recycling is one behavior among many that need to be engaged in if humans are to protect the planet. In the modeling video condition, participants watched a short video that addressed how to recycle paper at home, including tips and techniques to make recycling paper at home easier, as well as which paper products can and cannot be recycled in the Minneapolis, Minnesota area.

In the planning condition, participants formed an implementation intention involving recycling paper when at home, following the typical if-then implementation intention format (Sheeran, Webb, & Gollwitzer, 2005). Participants reported the type of home they lived in, the type of rooms in their home where they use paper products, and then the types of paper products they actually use in the rooms of their home. These

selections were automatically filled in on subsequent pages of the survey where participants formed their concrete if-then plans. Using a sentence stem of “If I find myself in my (type of home selected) with any unwanted paper products, then I will recycle my paper products”, participants first reported *where*, exactly, in their home they would recycle paper, then *when* they would recycle paper, and finally *how* they would recycle paper. After forming the where, when, and how, participants then typed their complete plan for recycling paper in their home, once again specifying where, when, and how. Finally, participants in the control condition simply proceeded to complete the remaining study measures.

After the respective experimental manipulations, participants reported their attitudes, behavioral beliefs, knowledge, self-efficacy, and plans in relation to paper recycling at home. After this, participants reported their intentions to spread their paper recycling behavior to others, as well as their intentions to engage in the targeted proenvironmental behavior (recycling paper at home), behaviors high in prototypicality (i.e., recycling paper at school, recycling plastic, glass, and aluminum at home and at school), and behaviors low in prototypicality (i.e., take public transportation from home to school, buy organic fruits and vegetables, and bring a reusable bag to the grocery store). After all of these scales were completed, participants were then debriefed on the computer.

Of the 158 participants, 131 participants completed the in-person survey (17% attrition). Overall, there were 34 participants in the message condition, 34 participants in

the modeling condition, 30 participants in the planning condition, and 33 in the control condition.

Measures³

Online Survey

Measures of future intentions were collected during the online portion of the study as they pertained to recycling paper, recycling plastic, glass, and aluminum, conserving water, conserving energy, taking public transportation, buying organic food, and using reusable bags, in respect to relevant settings used in Study 1.

Intentions to recycle paper at home. Participants reported their intentions, during the next two weeks, to engage in recycling paper at home. Prior literature has tended to focus on one of two time frames when asking participants to report on past recycling behavior (the target behavior): either recycling during the past two weeks or recycling in the past month. In accordance with White and Hyde (2012), I chose to go with two weeks. The two-week time period also matched the follow-up period used in Study 3. Participants indicated their evaluation of statements about expectations to engage in each behavior in each setting (e.g., “During the next two weeks, when I am at home I expect to recycle paper at home”) using a Likert-type scale that ranged from 0 (“never”) to 6 (“always”).

³ Other measures/items were also administered in this study but were not analyzed as they were collected just in case they might be considered in subsequent analyses (e.g., past proenvironmental behavior, various demographic questions, including citizenship status, employment status, family income, marital status, past and current residence information, time spent in college, and political ideology).

Intentions to engage in prototypical environmental behavior. Participants reported their intentions to engage in environmental behaviors that were high and low in prototypicality using a Likert-type scale that ranged from 0 (“never”) to 6 (“always”). Intentions to recycle plastic, glass, and aluminum at school and home, and to recycle paper at school were combined to form a measure of intentions to engage in highly prototypical behavior (Cronbach’s alpha = .80). Intentions to take public transportation from home to school, buy organic produce, and use reusable bags at the store were combined to create a measure of intentions to engage in behaviors low in prototypicality (Cronbach’s alpha = .39). Additionally, the following behaviors were assessed and incorporated to capture additional private and public behaviors: recycling plastic, glass and aluminum in friends’ homes, recycling paper in friends’ homes, taking public transportation from home to work, taking public transportation from home to friends’ homes, buying organic food other than fruits and vegetables, using a reusable bag at the corner store, and using a reusable bag at the department store.

Intention to spread one’s environmental behavior to others. This measure was identical to the measure used in Study 1. The three items were highly correlated, $r = .41$ between modeling and persuasion, $r = .19$ between modeling and conversation, and $r = .71$ between persuasion and conversation. When combined, they had an overall alpha of .71.

Moral exporting. Participants reported their beliefs that people should try to convince others to adopt their preferred environmental morals using an 8-item scale. This scale was adapted from a measure developed by Peterson and colleagues (2009) to focus

on the exporting of environmental values and morals, by including a header that asks participants to focus on this kind of moral exporting, changing some of the wording of the questions, and creating new questions. Participants reported their ratings using a Likert-type scale that ranged from 1 (“Disagree”) to 7 (“Agree”; e.g., “When I meet someone who doesn’t share the environmental values that are important to me, I take the time to explain my views in an effort to convince them that they are worth living by”; Cronbach’s alpha = .87).

Extraversion. Participants reported their level of extraversion by completing the 8-item extraversion subscale of the Big Five Inventory (Benet-Martínez & John, 1998). Participants reported their ratings using a Likert-type scale that ranged from 1 (“disagree strongly”) to 5 (“agree strongly”; e.g., “I see myself as someone who is talkative”; Cronbach’s alpha = .87).

Environmental attitudes. Participants reported their views on general environmental issues using the 24-item Environmental Attitude Inventory (Milfont & Duckitt, 2010). Participants reported their ratings using a Likert-type scale that ranged from -3 (“strongly disagree”) to 3 (“strongly agree”; e.g., “Protecting the environment is more important than protecting people’s jobs”; Cronbach’s alpha = .84).

Preference for consistency. Participants reported their need for general consistency, as well as their desire to engage in consistent behaviors, using the 18-item preference for consistency scale (Cialdini, Trost, & Newsom, 1995). Participants reported their ratings using a Likert-type scale that ranged from 1 (“strongly disagree”) to 9

(“strongly agree”; e.g., “I typically prefer to do things the same way”; Cronbach’s alpha = .90).

Self-monitoring. Participants reported the extent to which they engage in self-monitoring using the Self-Monitoring Scale (Snyder, 1974). This 25-item scale asks participants to rate each item according to whether it is true or false about themselves (e.g., “I find it hard to imitate the behavior of other people”; Cronbach’s alpha = .57).

Demographics. Participants reported their age, gender, and ethnicity.

In-Person Survey

Attitudes. Participants reported their attitudes toward paper recycling at home using two items from Maki and Rothman (in preparation; e.g., “For me, recycling paper at home is”) using a Likert-type scale that ranged from -4 (“very bad”) to +4 (“very good”; $r = .51$).

Behavioral Beliefs. Participants reported their beliefs about how the recycling of paper influences other environmental issues using four items (i.e., “Recycling paper at home is an important part of taking care of the natural environmental”; “Recycling paper at home contributes to energy conservation”; “Recycling paper at home contributes to water conservation”; “Recycling paper at home contributes to gasoline conservation”) using a Likert-type scale that ranged from -4 (“strongly disagree”) to +4 (“strongly agree”; Cronbach’s alpha = .78).

Behavioral Knowledge. Participants reported their knowledge of how the recycling of paper influences other environmental issues using two items (i.e., “Recycling one ton of paper is equivalent to saving ___ trees”; Recycling one ton of paper is

equivalent to conserving ___ barrels of oil”). Participants had four answers to choose from in each question, with only one right answer per question; participants scores were the average of the number of questions they got right to represent the percentage of participants who got both questions right.

Self-efficacy. Participants reported their self-efficacy for paper recycling at home using two items from Maki and Rothman (in preparation; e.g., “I have complete control over recycling paper at home”) using a Likert-type scale that ranged from -4 (“strongly disagree”) to +4 (“strongly agree”; $r = .69$).

Plans. Participants reported their plans for recycling paper at home using items adapted from those used by Rise, Thompson, and Verplanken (2003). Participants reported their agreement with three statements about their plans to engage the behavior at home (i.e., “I have a plan for when to recycle paper at home,” “I have a plan for where to recycle paper at home,” and “I have a plan for how to recycle paper at home”) using a Likert-type scale that ranged from -4 (“strongly disagree”) to +4 (“strongly agree”; Cronbach’s alpha = .79).

Paper recycling at home intentions. This measure was identical to the measure used in the online survey.

Intentions to engage in prototypical environmental behavior. This measure was identical to the measure used in the online survey; highly prototypical behavior had a Cronbach’s alpha = .80, and behaviors low in prototypicality had a Cronbach’s alpha = .40.

Intentions to spread one's environmental behavior to others. This measure was identical to the measure used in Study 1. The measures were highly correlated (modeling and active persuasion $r = .29$, modeling and passive persuasion $r = .26$, active and passive persuasion $r = .72$), and had a combined alpha of .70.

Results

Experimental Effects of the Interventions on Proenvironmental Cognitions and Intentions

Correlations between measures collected during the online survey and measures collected during the in-person survey can be found in Tables 12 and 13, respectively. I set out to examine experimental and individual-difference effects on cognitions and intentions related to engagement in a target behavior (i.e., recycling paper at home), intentions to engage in behavior high and low in prototypicality, and efforts to spread one's behavior to others. I first tested hypotheses pertaining to the experimental conditions (Hypotheses 1-8); for each statistical test, linear regression was used and condition was effects coded as 1 for the relevant experimental condition, and -1 for the relevant control/comparison conditions for each hypothesis. All models that consider experimental effects controlled for relevant baseline measures of intentions/behavior.

Did the interventions increase cognitions relevant to paper recycling behavior? (Hypotheses 1-3) It was expected that the persuasive message would lead to the strongest positive attitudes toward paper recycling at home, most favorable behavioral beliefs about paper recycling at home, and greatest knowledge concerning paper recycling (see Table 14 for the means and standard deviations of the cognitions by

experimental condition). Results revealed that the message condition, as compared to the modeling, planning, and control conditions, did not lead to more positive attitudes ($b = .10$, $CI = -.39-.59$, $p = .70$, $d = .07$), but did lead to more positive beliefs ($b = 1.35$, $CI = .90-1.81$, $p < .001$, $d = 1.03$) and greater knowledge ($b = .38$, $CI = .25-.50$, $p < .001$, $d = 1.06$).

The modeling video was expected to be most effective at increasing self-efficacy related to paper recycling at home. The modeling condition, as compared to the message, planning, and control conditions, did not lead to higher self-efficacy ($b = -.42$, $CI = -1.09-.24$, $p = .21$, $d = -.22$). Finally, it was expected that the planning condition would be most effective at increasing strength of plans to recycle paper at home, and indeed the planning condition was more effective than the other three conditions ($b = .89$, $CI = .25-1.52$, $p = .007$, $d = .49$). The hypotheses were largely confirmed for the message and planning conditions, but not the modeling condition.

Did the interventions increase intentions to recycle paper at home

(Hypotheses 4-5)? It was expected that the modeling and planning interventions would be most effective at increasing intentions to recycle paper at home, followed by the persuasive message, and then the control condition (see Table 15 for the means and standard deviations of intentions to recycle paper at home by experimental condition, both before and after being assigned to condition). Results revealed that the modeling and planning conditions elicited stronger increases in intentions than the control and message conditions ($b = .40$, $CI = .04-.78$, $p = .03$, $d = .40$), although the modeling and planning

conditions did not elicit stronger intentions as compared to just the control condition ($b = .61, CI = -.12-.76, p = .16, d = .31$).

Follow-up analyses revealed that the modeling condition marginally increased participants' intentions to recycle paper at home as compared to the control condition ($b = .36, CI = -.07-.79, p = .10, d = .42$), but this was not the case for the planning condition ($b = .27, CI = -.29-.84, p = .34, d = .26$). Unexpectedly, the message condition was ineffective at increasing intentions as compared to the control condition ($b = -.21, CI = -.70-.28, p = .39, d = -.22$). In sum, the modeling and planning conditions, when combined, were able to increase participants' intentions to recycle paper at home as compared to the message and control conditions, but only the modeling condition increased intentions when compared to the control condition.

Did the interventions increase intentions to engage in behaviors high and low in prototypicality (Hypotheses 6-7)? It was expected that the message intervention would lead to the greatest increase in intentions to engage in behaviors high, but not low, in prototypicality, and that there should not be any difference between the modeling, planning, and control conditions (see Tables 15 and 16 for the means and standard deviations of intentions to engage in behaviors high and low in prototypicality, both before and after being assigned to condition). The hypothesized effect for behaviors high in prototypicality was not observed; the message condition did not increase intentions as compared to the control, modeling, and planning conditions ($b = .07, CI = -.23-.37, p = .46, d = .08$), nor when it was compared to the control condition alone ($b = .17, CI = -.19-.53, p = .34, d = .24$). Furthermore neither did the modeling and planning conditions

increase intentions more than the control condition ($b = .17$, $CI = -.22-.56$, $p = .38$, $d = .23$ and $b = .07$, $CI = -.32-.46$, $p = .72$, $d = .10$, respectively).

The three experimental interventions were not expected to influence intentions to engage in behaviors low in prototypicality. However, the three experimental conditions *did* increase intentions to engage in these behaviors as compared to the control condition ($b = .37$, $CI = .09-.64$, $p = .01$, $d = .48$). A series of pair-wise comparisons revealed that the message condition did not significantly increase intentions as compared to the control condition ($b = .14$, $CI = -.17-.46$, $p = .37$, $d = .23$), but the modeling condition and the planning conditions did each increase intentions as compared to the control condition ($b = .51$, $CI = .17-.84$, $p = .004$, $d = .77$ and $b = .45$, $CI = .12-.79$, $p = .009$, $d = .72$, respectively).

In sum, none of the experimental conditions significantly increased participants' intentions to engage in highly prototypical behaviors. However, the modeling and planning conditions *did* increase participants' intentions to engage in behaviors low in prototypicality as compared to the control condition.

Did the interventions increase intentions to spread one's behavior to others (Hypothesis 8)? It was expected that the message intervention would have the strongest effect on increase in intentions to spread one's paper recycling behavior to others, and that there would be no difference among the modeling, planning, and control conditions (see Table 16 for the means and standard deviations of intentions to spread one's behavior by experimental condition, both before and after being assigned to condition). Results revealed that the message condition did not significantly increase intentions as

compared to the modeling, planning, and control conditions ($b = .05$, $CI = -.32-.43$, $p = .79$, $d = .05$). However, follow-up analyses revealed that taken together the three experimental conditions *did* increase participants' intentions to spread their behaviors to others as compared to the control condition ($b = .37$, $CI = -.002-.74$, $p = .051$, $d = .40$).

Additional follow-up analyses revealed that each of the three experimental conditions had a marginal effect on intentions as compared to the control condition (message condition: $b = .37$, $CI = -.08-.81$, $p = .11$, $d = .42$; modeling condition: $b = .36$, $CI = -.10-.81$, $p = .12$, $d = .40$; planning condition: $b = .42$, $CI = -.05-.89$, $p = .08$, $d = .47$). Overall, all three conditions were marginally able to increase participants' intentions to spread their paper recycling behavior to others as compared to the control condition.

Individual-difference Effects on Proenvironmental Intentions

I next tested hypotheses pertaining to the individual difference measures, including main effects and interactions with the experimental conditions (Hypotheses 9-16); for each statistical test, linear regression was used and condition was again effects coded as 1 for the experimental conditions, and -1 for the control condition for each hypothesis.⁴ Additionally, each individual difference measure was centered around the mean and entered in interactions with the relevant effects-coded experimental condition. All models that did not include the interaction of an individual difference measure and the experimental condition controlled for whether the participant was in an experimental

⁴ Because it was hypothesized that there would only be a general effect of experimental condition versus control condition as a moderator of how the individual difference measures related to the outcomes, interactions between a *specific* condition versus the control condition are not examined in the text.

condition or the control condition. All models that tested for effects of the experimental condition controlled for relevant baseline measures of intentions/behavior.

Were individuals higher in moral exporting more likely to intend to spread their behavior to others (Hypotheses 9-10)? It was expected that individuals higher in moral exporting would be more likely to intend to spread their behaviors to others and would be more responsive to the experimental interventions designed to increase their intentions to spread their paper recycling behavior to others. Baseline data reveal that people higher in moral exporting had stronger intentions to spread their behavior to others ($r = .53, p < .001$). In addition, people higher in moral exporting had stronger intentions to recycle paper at home ($r = .37, p < .001$), and to engage in behaviors high and low in prototypicality ($r = .48, p < .001$ and $r = .38, p < .001$, respectively).

Next, I examined whether people higher in moral exporting were more affected by the experimental conditions, and thus become more likely to increase their intentions to spread their paper recycling behavior to others. Analyses revealed that the interaction between moral exporting and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions ($b = -.04, CI = -.22-.14, p = .65, d = -.09$). Thus, there was support for the hypothesis that moral exporting would be linked to stronger intentions to spread one's paper recycling behavior to others, but no support for the hypothesis that people higher in moral exporting would be more responsive to the experimental interventions.

Were individuals higher in extraversion more likely to intend to spread their behavior to others (Hypotheses 11-12)? It was expected that individuals higher in

extraversion would be more likely to intend to spread their behaviors to others. It was also expected that people higher in extraversion would be more likely to be influenced by the experimental conditions, and thus be more likely to increase their intentions to spread their paper recycling behavior to others. At baseline, people higher in extraversion did not have stronger intentions to spread their behavior to others ($r = .08, p = .35$) nor did they have stronger intentions to recycle paper at home ($r = -.07, p = .37$) or stronger intentions to engage in behavior high or low in prototypicality ($r = -.11, p = .16$ and $r = -.05, p = .55$).

Next, I examined whether people higher in extraversion were more likely to be influenced by the experimental conditions, and thus become more likely to increase their intentions to spread their paper recycling behavior to others. Analyses revealed that the interaction between extraversion and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions ($b = -.03, CI = -.25-.19, p = .78, d = -.14$). Thus, I found no support for my hypotheses regarding extraversion.

Were individuals with more positive environmental attitudes more likely to intend to recycle paper at home, engage in behaviors high and low in prototypicality, and spread their behavior to other (Hypotheses 13-14)? It was expected that individuals holding more positive environmental attitudes would have stronger intentions to recycle paper at home, engage in behaviors high and low in prototypicality, and to intend to spread their behaviors to others. It was also expected that people holding stronger environmental attitudes would be more likely to be influenced by

the experimental conditions, and thus be more likely to increase their intentions to recycle paper at home, engage in behaviors high in prototypicality (but not low in prototypicality), and spread their behavior to others. First considering the link between environmental attitudes and intentions (as seen in Table 16), people with more positive environmental attitudes had stronger intentions to recycle paper at home ($r = .22, p = .007$), intentions to engage in highly prototypical behavior ($r = .27, p = .001$), intentions to engage in behavior low in prototypicality ($r = .26, p = .001$), as well as intentions to spread one's paper recycling behavior to others ($r = .18, p = .03$).

Next, I examined whether people holding stronger environmental attitudes were more likely to be influenced by the experimental conditions, and thus become more likely to increase their intentions to engage in the targeted behavior, engage in behaviors high in prototypicality, and spread their behavior to others. Analyses revealed that the interaction between environmental attitudes and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions to recycle paper at home ($b = .19, CI = -.15-.53, p = .27, d = .20$), engage in behaviors high or low in prototypicality ($b = -.06, CI = -.31-.19, p = .62, d = -.09$ and $b = .00, CI = -.22-.23, p = .99, d = .00$, respectively), or spread one's paper recycling behavior to others ($b = .03, CI = -.28-.34, p = .84, d = .04$). Thus, although there was evidence in support of my hypothesis that people's environmental attitudes would be positively associated with intentions to engage in the four outcomes, there was no support for the hypothesis that people with stronger environmental attitudes would be more responsive to the experimental interventions.

Were individuals higher in preference for consistency more likely to increase intentions to recycle paper at home, engage in behaviors high in prototypicality, and to spread their behaviors to others (Hypothesis 15)? It was expected that people with a stronger preference for consistency would be more likely to be influenced by the experimental conditions, and thus be more likely to increase their intentions to recycle paper at home, engage in behaviors high (but not low) in prototypicality, and spread their behavior to others. Analyses revealed that the interaction between preference for consistency and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions to recycle paper at home ($b = .07$, $CI = -.14-.28$, $p = .51$, $d = .12$), intentions to engage in behaviors high ($b = .08$, $CI = -.08-.23$, $p = .35$, $d = .17$) or low ($b = .04$, $CI = -.10-.18$, $p = .61$, $d = .09$) in prototypicality, or intentions to spread one's paper recycling behavior to others ($b = .05$, $CI = -.14-.24$, $p = .61$, $d = .09$).

Were individuals higher in self-monitoring more likely to increase intentions to engage in public behaviors (Hypothesis 16)? It was expected that people higher in self-monitoring would be more likely to be influenced by the experimental conditions, and thus be more likely to increase their intentions to engage in public, but not private, proenvironmental behaviors. Intentions to engage in public behaviors (i.e., all behaviors taking place at school or friends' homes, plus all public transportation behaviors, buying organic behaviors, and using reusable bag behaviors) and intentions to engage in private behaviors (i.e., the following behaviors at home: recycling paper, recycling plastic, glass, and aluminum, conserving water, and conserving electricity) were each combined to form

a summary measure (public behaviors Cronbach's alpha = .86 (baseline) and .87 (in-person); private behaviors Cronbach's alpha = .67 (baseline) and .68 (in person)).

Analyses revealed that the interaction between self-monitoring and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions to engage in public ($b = -.54$, $CI = -1.45-.36$, $p = .23$, $d = -.22$) or private behaviors ($b = -.13$, $CI = -1.01-.75$, $p = .77$, $d = -.05$).

Study 2 Discussion

Overall, mixed support was found for the hypotheses tested in Study 2. The experimental interventions were largely successful at changing relevant cognitions, as the persuasive message intervention led to the strongest behavioral beliefs and knowledge concerning recycling paper (though not attitudes), and the planning intervention led to the strongest plans to recycle paper at home, but the modeling intervention did not lead to the highest rates of self-efficacy. There was also some evidence that the modeling intervention increased people's intentions to recycle paper at home, though the message and planning interventions did not elicit increases in those intentions. None of the interventions led to increases in people's intentions to engage in highly prototypical behaviors, but, surprisingly, the modeling and planning interventions did increase people's intentions to engage in behaviors low in prototypicality. Finally, all three interventions were able to marginally increase people's intentions to spread their paper recycling behaviors to others as compared to the control condition.

Examination of the effect sizes tells a similar, but more nuanced story concerning the results. Even though effects were sometimes not significant at the $p < .05$ level, the

trends in effect sizes tended to reflect the proposed hypotheses. For example, though none of the intervention effects on intentions to engage in behaviors high in prototypicality were significant, all three interventions had small-to-medium effects on increasing these intentions. Similarly, all three interventions had small-to-medium effects on people's intentions to spread their behavior to others. These trends in the results suggest that perhaps low power limited the ability to find significant effects. Overall, many of the effect sizes were in the range of small-to-medium or medium, providing evidence that these are potentially meaningful effects that deserve attention in both the lab and the field.

Moving on to the individual differences, people higher in moral exporting and with more positive environmental attitudes had stronger intentions to recycle paper at home, to engage in behaviors both high and low in prototypicality, and also to spread their behaviors to others. Contrary to predictions, people higher in extraversion were not more likely to intend to spread their paper recycling behavior to others. None of these individual difference measures interacted with conditions to relate to any of the four outcomes. Finally, little evidence was found for the influence of the experimental conditions on people higher in preference for consistency or self-monitoring, such that these types of individuals in the experimental conditions did not increase their intentions to recycle paper at home, engage in behaviors high or low in prototypicality, or spread their behaviors to others.

However, the question still remains whether these hypotheses might find equal, or perhaps stronger, support when considering behavior, instead of intentions, as the

primary outcome. It is possible that even though these interventions only found some success increasing intentions to engage in these behaviors, perhaps the effects might be different when considering behavior over time, as there might be greater room for growth or greater variability in behavior, as opposed to measures of intentions. I sought to both replicate the current findings in relation to increases in intentions, as well as examine whether these findings hold when considering increases in behavior over time.

Study 3: Can We Influence People to Spread Their Proenvironmental Behaviors? An Examination of Daily Behavior

Study 3 examined whether it is possible to influence people's behaviors relevant to spreading their proenvironmental behaviors by again focusing on the target behavior of recycling paper at home, as well as the behaviors determined to be high in prototypicality (i.e., recycling paper at school, recycling plastic, glass, and aluminum at home, and recycling plastic, glass, and aluminum at school) and low in prototypicality (i.e., taking public transportation from home to school, buying organic produce, and using reusable bags at the grocery store), and behaviors related to the spread of proenvironmental behavior between individuals (i.e., modeling, persuasion, and conversation).

Design

Study 3 kept the same design as Study 2, but added on an additional component of a two-week follow-up period during which participants completed daily surveys measuring behaviors relevant to the spread of behavior. In addition, participants completed an online survey after these daily surveys ended.

Participants

With the help of power analysis (using G*Power; Faul et al., 2007) and prior effect sizes in the proenvironmental behavior intervention area (i.e., Osbaldiston & Schott, 2012), I targeted 150 undergraduate women and men. An *a priori* power analysis for an F-test with repeated measures (assuming fifteen measurement points, the pre-manipulation measure of behavior and the 14 daily measures, and correlations between behavior at any given time points to be $r = .60$) to compare any two of the conditions revealed a sample of 150 participants would be needed to have 86% power.

Participants were 166 undergraduates (116 women, 35 men, 15 did not report gender; mean age = 20.13, $SD = 2.81$) at a large public University in the Midwestern United States. Participants received partial course credit for study involvement. I increased my target number of participants by approximately 10% to account for possible attrition between the first and final online surveys. A majority of participants identified as White (71%), though some identified as African American (6%), Asian (22%), Latino (4%), or other (3%).

Procedure

Participants were recruited for a study of daily behavior. After consenting to participate in the study, participants first completed the initial online survey. Everything through the in-person lab portion of Study 3 was identical to the design of Study 2. At the end of the in-person lab portion, in Study 3 participants signed up for the SurveySignal texting service with the help of the research assistant. After participants confirmed their

phone number via a text sent from SurveySignal, they were then free to leave the lab session.

For the next two weeks, participants received a text link to a daily online survey each evening at 7:00pm. In the survey, participants reported their behaviors (i.e., paper recycling at home, engaging in the high prototypicality behaviors, engaging in the low prototypicality behaviors, and engaging in efforts to spread their behavior to others), all within the past 24 hours. After the two weeks of daily surveys were completed, participants were emailed a link to the final online survey, identical to the in-person lab survey except for the experimental manipulation; afterwards, participants were debriefed on the computer. Participants who completed 13 or 14 of the 14 daily text surveys, as well as the final online survey, were eligible to receive an additional \$10. A final breakdown of the percentage of participants who completed a given number of text surveys can be seen in Table 17.

Of the 157 participants who completed the first survey, 139 participants completed the in-person survey (11% attrition), and an additional nine participants completed the in-person survey but did not complete the initial online survey (148 participants overall were assigned to condition). In total there were 35 participants in the message condition, 37 participants in the modeling condition, 39 participants in the planning condition, and 37 in the control condition. Only one of the 148 participants failed to complete at least one of the daily text surveys; 144 participants completed the final online survey (overall, 135 of the 157 participants completed the measures at all of

the times points; 14% attrition from the first online survey). Participants on average completed 11.80 of the 14 daily text surveys ($SD = 2.15$).

Measures⁵

First Online Survey

Past paper recycling at home. Participants reported the degree to which, during the past two weeks, they engaged in recycling of paper at home using an adapted version of a previously used scale (Maki & Rothman, in preparation). Participants reported their behavior using a Likert-type scale that ranged from 0 (“never”) to 6 (“always”; e.g., “In the past two weeks, I have recycled paper at home”).

Past prototypical environmental behavior. People reported past prototypical proenvironmental behavior using the same Likert-type scale that was used to measure past paper recycling at home. People reported past engagement in the three most prototypical behaviors were combined to form a measure of engagement in high prototypical behavior (i.e., recycle paper at school, recycle plastic, glass, and aluminum at home, and recycle plastic, glass, and aluminum at school; Cronbach’s alpha = .77). In addition, people reported their three of the least prototypical behaviors (i.e., taking the bus from home to school, buying organic fruits and vegetables, and using a reusable bag at the grocery store; Cronbach’s alpha = .33), and these were combined to form a

⁵ Other measures/items were also administered in this study but were not analyzed as they were collected just in case they might be considered in subsequent analyses (e.g., other past and current behaviors, as well as intentions, perceptions of others’ behaviors, various demographic questions, including citizenship status, employment status, family income, marital status, past and current residence information, time spent in college, and political ideology).

measure of engagement in low prototypical behavior. These behaviors were also used to capture the distinction between private and public behaviors.

Past efforts to spread one's environmental behavior to others. This measure was identical to the measure used in Study 1. These three items had high correlations between each other, $r = .38$ between model and persuasion, $r = .34$ between modeling and conversation, and $r = .69$ between persuasion and conversation. The three items had an alpha of .72 when combined.

Intentions to recycle paper at home. This measure was identical to the measure used in Study 2.

Intentions to engage in prototypical environmental behavior. These measures were identical to the measures used in Study 2 (behaviors high in prototypicality: Cronbach's alpha = .88; behaviors low in prototypicality: Cronbach's alpha = .39). These behaviors were also used to capture the distinction between private and public behaviors.

Intention to spread one's environmental behavior to others. These measures were identical to the measures used in Studies 1 and 2. The three items were highly correlated, $r = .47$ between modeling and persuasion, $r = .32$ between modeling and conversation, and $r = .77$ between persuasion and conversation. The three items had an overall alpha of .76.

Moral exporting. This measure was identical to the measure used in Study 2 (Cronbach's alpha = .88).

Extraversion. This measure was identical to the measure used in Study 2 (Cronbach's alpha = .86).

Environmental attitudes. This measure was identical to the measure used in Study 2 (Cronbach's alpha = .85).

Preference for consistency. This measure was identical to the measure used in Study 2 (Cronbach's alpha = .90).

Self-monitoring. This measure was identical to the measure used in Study 2 (Cronbach's alpha = .69).

Demographics. Participants reported their age, gender, and ethnicity.

Measures Administered During the In-Person Survey and the Final Online Survey

Attitudes. This measure was identical to the measure used in Study 2 (in-person survey $r = .43$; final online survey $r = .51$).

Behavioral Beliefs. This measure was identical to the measure used in Study 2 (in-person Cronbach's alpha = .79; final online survey alpha = .79).

Behavioral Knowledge. This measure was identical to the measure used in Study 2.

Self-efficacy. This measure was identical to the measure used in Study 2 (in-person survey $r = .69$; final online survey $r = .65$).

Plans. This measure was identical to the measure used in Study 2 (in-person survey Cronbach's alpha = .81; final online survey = .83).

Intentions to recycle paper at home. This measure was identical to the measure used in Study 2.

Intentions to engage in prototypical environmental behavior. This measure was identical to the measure used in Study 2 (behaviors high in prototypicality: in-person

survey Cronbach's alpha = .86; final online survey = .80; behaviors low in prototypicality: in-person survey Cronbach's alpha = .22; final online survey = .45). These behaviors were also used to capture the distinction between private and public behaviors.

Intentions to spread one's environmental behavior to others. This measure was identical to the measure used in Studies 1 and 2. The measures were, again, highly correlated (in-person survey: modeling and persuasion $r = .55$, modeling and conversation $r = .43$, persuasion and conversation $r = .78$; final online survey: modeling and persuasion $r = .43$, modeling and conversation $r = .38$, persuasion and conversation $r = .85$). They had an overall alpha of .81 for the in-person survey, and an overall alpha of .80 for the final online survey.

Measures Administered During the Daily Survey Following the Intervention

Current paper recycling at home. Participants completed an adapted version of a previously used scale (Maki & Rothman, in preparation) of current types of behavior. Participants reported the degree to which, during the past 24 hours, they engaged in the target behavior of recycling paper at home if they had the chance to do so. Participants reported their behavior using a Likert-type scale that ranged from 0 ("never") to 6 ("always"; e.g., "During the past 24 hours, when I was at home I recycled paper").

Current engagement in prototypical environmental behavior. Participants reported the degree to which, during the past 24 hours, they engaged in the three behaviors high in prototypicality (i.e., recycling paper at school, recycling plastic, glass, and aluminum at home, and recycling plastic, glass, and aluminum at school), and the

three behaviors low in prototypicality (i.e., taking the bus from home to school, buying organic food, and using reusable bags at the grocery store) if they had the chance to do so. Participants reported their behavior using a Likert-type scale that ranged from 0 (“never”) to 6 (“always”; e.g., “During the past 24 hours, when I was at school I recycle paper”). Current engagement in the three most prototypical behaviors were combined to form a measure of engagement in highly prototypical behavior (Cronbach’s alpha = .87). In addition, three of the least prototypical behaviors were combined to form a measure of engagement in behavior low in prototypicality (Cronbach’s alpha = .69). These behaviors were also used to capture the distinction between private and public behaviors.

Current efforts to spread one’s environmental behavior to others. Participants reported their current modeling behavior, their current persuasion efforts, and their current efforts to bring up the target behavior in conversation. Participants reported their behavior using a Likert-type scale that ranged from 0 (“never”) to 6 (“always”; e.g., “During the past 24 hours, I recycled paper in places where other people saw that I recycled paper”). These three items had high correlations between each other, $r = .37$ between model and persuasion, $r = .33$ between modeling and conversation, and $r = .86$ between persuasion and conversation. The three items had a total alpha of .76 when combined.

Results

Experimental Effects of the Interventions on Proenvironmental Cognitions, Intentions, and Behaviors

Correlations between measures collected during the first online survey, measures collected during the in-person survey, and measures captured during the final online survey can be found in Tables 18, 19, and 20, respectively. I set out to examine both experimental and individual-difference effects on cognitions, intentions, and actual behavior, related to the engagement in a target behavior (i.e., recycling paper at home), engagement in behaviors high and low in prototypicality, and efforts to spread one's behavior to others. I first tested hypotheses pertaining to just the experimental conditions (Hypotheses 1-8); for models predicting cognitions or intentions, linear regression was used and condition was effects coded as 1 for the relevant experimental condition, and -1 for the relevant control/comparison conditions for each hypothesis.

For models predicting behavior, I used linear mixed-effects modeling, given its strength over other longitudinal modeling approaches such as repeated-measures ANOVA (i.e., a better ability to deal with missing data; the ability to separate fixed and random effects; the ability to treat time points as meaningfully spread out over time, rather than simply subsequent time points; Seltman, 2014). Initial analyses revealed that models with both fixed and random effects (i.e., intercepts and slopes) tended to lead to overall better model fits, as estimated by comparing Bayesian Information Criterion (BIC; Schwarz, 1978), so both fixed and random effects were retained in all models. Fixed effects refer to overall initial means (intercepts; e.g., overall mean rate of paper

recycling at home during the first time point after the interventions) and overall change over time (slopes; e.g., the extent to which paper recycling at home changed over time). Random effects refer to estimating variability in individuals' initial means (intercepts; e.g., how much people varied in the extent to which they recycled paper at home during the first time point) and estimating variability in individuals' changes over time (slopes; e.g., how much people varied in the extent to which they changed their paper recycling at home over time). In addition, the predictors in each model were entered as both main effects, to predict initial change in means after the intervention, as well as interactions between the predictors and the time variable, to predict change in behavior, or the slope, over time. However, rarely were significant effects found for change in slope over time, so these effects are only reported when significant or marginal; the findings mostly focus on initial change in behavior after the intervention. All models that consider experimental effects controlled for relevant baseline measures of intentions/behavior.

Did the interventions affect cognitions relevant to paper recycling behavior (Hypotheses 1-3)? It was expected that the persuasive message would lead to the strongest positive attitudes toward paper recycling at home, most favorable behavioral beliefs about paper recycling at home, and greatest knowledge concerning paper recycling (see Tables 21 and 22 for the means and standard deviations of the cognitions by experimental condition during the in-person survey and the final online survey, respectively). Results revealed that the message condition did not lead to more positive attitudes during the in-person portion ($b = .22$, $CI = -.29-.74$, $p = .39$, $d = .14$) but did two weeks later ($b = .47$, $CI = .03-.90$, $p = .04$, $d = .36$), and did lead to more positive beliefs

both during the in-person portion ($b = 1.34$, $CI = .79-1.90$, $p < .001$, $d = .80$) and two weeks later ($b = .94$, $CI = .42-1.45$, $p < .001$, $d = .61$), as well as greater knowledge during the in-person portion ($b = .49$, $CI = .39-.59$, $p < .001$, $d = 1.59$) and two weeks later ($b = .34$, $CI = .23-.45$, $p < .001$, $d = 1.04$).

The modeling video was expected to be most effective at increasing self-efficacy related to paper recycling at home. The modeling condition did not lead to higher self-efficacy compared to the other three conditions during the in-person portion ($b = .14$, $CI = -.53-.81$, $p = .69$, $d = .10$) or two weeks later ($b = .36$, $CI = -.24-.97$, $p = .24$, $d = .20$). Finally, it was expected that the planning condition would lead to the strongest plans to recycle paper at home, but the planning condition was not more effective than the other three conditions during the in-person portion ($b = .47$, $CI = -.21-1.14$, $p = .18$, $d = .22$), though it did have a marginal effect on plans reported two weeks later ($b = .61$, $CI = -.02-1.23$, $p = .056$, $d = .33$). The hypotheses were largely confirmed for the message condition and planning condition, but not the modeling condition.

Did the interventions increase intentions to recycle paper at home

(Hypotheses 4-5)? It was expected that the modeling and planning interventions would lead to the strongest intentions to recycle paper at home, followed by the persuasive message, and then the control condition (see Table 23 for the means and standard deviations of intentions to recycle paper at home by experimental condition during the first online survey, the in-person survey, and the final online survey). Results revealed that the modeling and planning conditions elicited marginally greater increases in intentions than the control and message conditions during the in-person portion of the

study ($b = .30$, $CI = -.06-.66$, $p = .10$, $d = .28$) but not two weeks later ($b = -.01$, $CI = -.34-.33$, $p = .96$, $d = -.01$); the modeling and planning conditions also increased intentions as compared to just the control condition during the in-person portion ($b = .53$, $CI = .10-.97$, $p = .017$, $d = .47$) but, again, not two weeks later ($b = .23$, $CI = -.16-.62$, $p = .25$, $d = .23$).

Follow-up analyses revealed that although the message condition did increase participants' intentions to recycle paper at home as compared to the control condition immediately after the intervention ($b = .68$, $CI = .24-1.11$, $p = .003$, $d = .75$), it did not do so two weeks later ($b = .33$, $CI = -.12-.78$, $p = .14$, $d = .37$). The modeling condition did increase intentions as compared to the control condition immediately after the intervention ($b = .52$, $CI = .02-1.01$, $p = .042$, $d = .52$) and two weeks later ($b = .52$, $CI = .02-1.02$, $p = .044$, $d = .52$). Finally, the planning condition did not increase intentions immediately after the intervention ($b = .38$, $CI = -.14-.91$, $p = .15$, $d = .35$) or two weeks later ($b = .13$, $CI = -.33-.60$, $p = .57$, $d = .14$). In sum, the modeling condition led to the greatest increase in paper recycling intentions and behavior at home; additionally, the planning condition was largely ineffective, but the message condition did increase initial intentions.

Did the interventions increase recycling paper behavior at home (Hypotheses 4-5)?

Turning to behavior, change in paper recycling at home by condition can be seen in Figure 3. Results revealed that the modeling and planning conditions did not elicit greater initial increases in behavior than the control and message conditions ($b = .21$, $CI = -.23-.66$, $p = .35$, $d = .16$); neither did the modeling and planning conditions increase

initial behavior as compared to the control condition ($b = .40$, $CI = -.14-.95$, $p = .15$, $d = .28$). Follow-up analyses revealed that the modeling condition did lead to initial increases in participants' paper recycling at home as compared to the control condition ($b = .84$, $CI = .24-1.45$, $p = .006$, $d = .70$), although this difference did marginally decrease over time ($b = -.04$, $CI = -.09-.01$, $p = .092$, $d = -.42$). Finally, neither the planning nor message conditions significantly increased behavior initially: message condition ($b = .43$, $CI = -.20-1.06$, $p = .18$, $d = .33$); planning condition ($b = -.04$, $CI = -.69-.60$, $p = .89$, $d = -.03$).

Did the interventions increase high, but not low, prototypicality intentions

(Hypotheses 6-7)? It was expected that the message intervention would lead to the greatest increases in intentions and engagement in behaviors high, but not low, in prototypicality, and that there should not be any difference between the modeling, planning, and control conditions (see Tables 23 and 24 for the means and standard deviations of intentions to engage in behaviors high and low in prototypicality during the first online survey, the in-person survey, and the final online survey). The hypothesized effect for behaviors high in prototypicality was observed; the message condition did elicit stronger intentions as compared to the modeling, planning, and control conditions immediately after the intervention ($b = .47$, $CI = .12-.83$, $p = .009$, $d = .45$) and two weeks later ($b = .39$, $CI = .08-.70$, $p = .014$, $d = .43$); these findings held when it was compared to the control condition alone immediately after the intervention ($b = .61$, $CI = .28-.94$, $p < .001$, $d = .93$) and two weeks later ($b = .51$, $CI = .17-.85$, $p = .004$, $d = .75$). The modeling and planning conditions combined did not lead to a greater increase in intentions than the control condition immediately after the intervention ($b = .23$, $CI = -$

.13-.59, $p = .21$, $d = .25$) or two weeks later ($b = .19$, $CI = -.15-.52$, $p = .27$, $d = .22$).

Additional analyses revealed that the modeling condition as compared to the control condition did lead to increased intentions immediately after the intervention ($b = .35$, $CI = .06-.63$, $p = .017$, $d = .59$) but not two weeks later ($b = .24$, $CI = -.14-.62$, $p = .22$, $d = .31$). Further analyses revealed that the planning condition as compared to the control condition did not lead to increased intentions immediately after the intervention ($b = .13$, $CI = -.32-.58$, $p = .56$, $d = .14$) or two weeks later ($b = .14$, $CI = -.24-.51$, $p = .48$, $d = .17$).

The three experimental interventions were not expected to influence intentions to engage in behaviors low in prototypicality. Indeed, the three experimental conditions did not increase intentions to engage in these behaviors as compared to the control condition immediately after the intervention ($b = -.002$, $CI = -.28-.27$, $p = .99$, $d = -.002$) or two weeks later ($b = .20$, $CI = -.22-.62$, $p = .35$, $d = .16$). A series of pair-wise comparisons revealed that the message condition was not more effective than the control condition immediately after the intervention ($b = .17$, $CI = -.13-.46$, $p = .26$, $d = .29$) or two weeks later ($b = .16$, $CI = -.29-.61$, $p = .47$, $d = .18$); the same held for the modeling condition and the planning condition as compared to the control condition immediately after the intervention ($b = -.04$, $CI = -.37-.28$, $p = .80$, $d = -.06$ and $b = -.09$, $CI = -.41-.23$, $p = .57$, $d = -.14$, respectively) and two weeks later ($b = .18$, $CI = -.37-.74$, $p = .51$, $d = .17$ and $b = .23$, $CI = -.20-.65$, $p = .29$, $d = .26$, respectively). The combined modeling and planning conditions were not more effective than the control condition immediately after the

intervention ($b = -.07$, $CI = -.36-.23$, $p = .64$, $d = -.13$) or two weeks later ($b = .20$, $CI = -.24-.65$, $p = .37$, $d = .18$).

Did the interventions increase high, but not low, prototypicality behavior

(Hypotheses 6-7)?

Turning to behavior, change in behaviors high in prototypicality by condition can be seen in Figure 4. The hypothesized effect for behaviors high in prototypicality was partially observed; the message condition did marginally elicit greater initial frequency of engagement in behaviors high in prototypicality as compared to the modeling, planning, and control conditions ($b = .38$, $CI = -.07-.83$, $p = .098$, $d = .28$; this trend generally held when it was compared to the control condition alone ($b = .41$, $CI = -.13-.94$, $p = .14$, $d = .42$). Additionally, the modeling and planning conditions combined did not more greatly increase initial behavior than the control condition ($b = -.02$, $CI = -.47-.43$, $p = .94$, $d = -.01$). The modeling and planning interventions, considered independently and compared to the control condition, did not influence increases in initial behaviors high in prototypicality (modeling: $b = .22$, $CI = -.33-.77$, $p = .44$, $d = .19$, with a marginal decrease over time $b = -.04$, $CI = -.08-.01$, $p = .086$, $d = -.42$; planning: $b = -.18$, $CI = -.69-.32$, $p = .48$, $d = -.16$).

Change in behaviors low in prototypicality by condition over the two weeks of daily surveys can be seen in Figure 5. The three experimental conditions did not increase initial engagement in the behaviors low in prototypicality as compared to the control condition ($b = .05$, $CI = -.57-.68$, $p = .86$, $d = .03$). A series of pair-wise comparisons revealed that the message condition was not more effective than the control condition (b

= .19, $CI = -.54-.93$, $p = .60$, $d = .13$); the same held for the modeling condition and the planning conditions as compared to the control condition ($b = .005$, $CI = -.73-.74$, $p = .99$, $d = .002$ and $b = -.07$, $CI = -.80-.65$, $p = .84$, $d = -.05$, respectively). The combined modeling and planning conditions were not more effective than the control condition ($b = -.02$, $CI = -.68-.63$, $p = .94$, $d = -.01$). In sum, the hypotheses were largely confirmed as the message condition led to the greatest increases in intentions and behavior for behaviors high in prototypicality; the modeling and planning conditions did not have a consistent effect on behaviors high in prototypicality, nor intentions aimed at these behaviors. Finally, none of the experimental conditions had an effect on intentions toward, or engagement in, behaviors low in prototypicality.

Did the interventions increase intentions to spread one's behavior to others (Hypothesis 8)? It was expected that the message intervention would lead to the greatest increases in intentions and efforts to spread one's paper recycling behavior to others, and that there would be no difference between the modeling, planning, and control conditions (see Table 24 for the means and standard deviations of intentions to spread one's behavior by experimental condition during the first online survey, the in-person survey, and the final online survey). Results revealed that the message condition led to the greatest increases in intentions as compared to the modeling, planning, and control conditions immediately after the intervention ($b = .63$, $CI = .23-1.04$, $p = .002$, $d = .53$) and two weeks later ($b = .62$, $CI = .07-1.17$, $p = .028$, $d = .39$). Additionally, follow-up analyses revealed that taken together the three experimental conditions marginally increased participants' intentions to spread their behaviors to others as compared to the

control condition immediately after the intervention ($b = .38, CI = -.02-.77, p = .059, d = .33$) and significantly two weeks later ($b = .55, CI = .02-1.074, p = .042, d = .36$).

Additional follow-up analyses revealed that only the message condition consistently increased intentions to spread one's behavior compared to the control condition. The message condition increased intentions immediately after the intervention ($b = .78, CI = .35-1.20, p < .001, d = .93$) and two weeks later ($b = .89, CI = .32-1.45, p = .003, d = .78$). However, the modeling condition did not increase intentions immediately after the intervention ($b = .28, CI = -.22-.79, p = .27, d = .27$) or two weeks later ($b = .04, CI = -.50-.59, p = .88, d = .04$), and the planning condition did not increase intentions immediately after the intervention ($b = .16, CI = -.29-.61, p = .49, d = .16$), but did increase intentions two weeks later ($b = .71, CI = .03-1.39, p = .040, d = .50$).

Did the interventions increase efforts to spread one's behavior to others (Hypothesis 8)?

Turning to behavior, change in efforts to spread one's behavior to others by condition can be seen in Figure 6. Results revealed that the message condition trended toward having the greatest influence on increasing efforts to spread one's behavior to others as compared to the modeling, planning, and control conditions ($b = .41, CI = -.17-.1.00, p = .17, d = .24$). However, follow-up analyses revealed that taken together the three experimental conditions did increase participants' efforts to spread their behaviors to others as compared to the control condition ($b = .68, CI = .16-1.20, p = .011, d = .44$). Additional follow-up analyses revealed that both the message and modeling conditions increased efforts to spread one's behavior compared to the control condition (message

condition: $b = .67$, $CI = .06-1.27$, $p = .032$, $d = .55$; modeling condition: $b = .83$, $CI = .19-1.46$, $p = .011$, $d = .65$), but the planning condition did not ($b = .32$, $CI = -.33-.96$, $p = .34$, $d = .22$). Overall, the hypothesis was largely confirmed as the persuasive message condition most consistently increased intentions and actual efforts to spread one's behavior to others; the modeling condition showed some success at influencing actual effort, and the planning condition failed to influence either intentions or behavior.

Individual-difference Effects on Proenvironmental Intentions and Behavior

I next tested hypotheses pertaining to the individual difference measures, including main effects and interactions with the experimental conditions (Hypotheses 9-16); for each statistical test predicting intentions, linear regression was used and condition was again effects coded as 1 for the experimental conditions, and -1 for the control condition for each hypothesis.⁶ Additionally, each individual difference measure was centered around the mean and entered in interactions with the relevant effects-coded experimental condition.

As with tests of the experimental effects on behavior, linear mixed-effects models were used to examine main effect predictions and interactions between individual differences and the experimental conditions; and, like the previous linear mixed-effects models, both fixed and random intercepts and slopes were included, as were interactions between predictors and time. Significant change in slope was rarely significant, and is

⁶ As with Study 2, because it was hypothesized that there would only be the general effect of experimental condition versus control condition as a moderator of how the individual differences related to the outcomes, interactions between a *specific* condition versus the control condition as a moderator are not examined in the text. However, relevant analyses were conducted and any support for moderation was weak and inconsistent.

only reported when it is indeed significant or marginal; most effects focus on initial rates of intentions or behavior after the intervention. All models that did not consider the interaction of an individual difference measure and the experimental condition controlled for whether the participant was in an experimental condition or the control condition. All models that tested for effects of the experimental condition controlled for relevant baseline measures of intentions/behavior.

Were individuals higher in moral exporting more likely to intend to, and actually try to, spread their behavior to others (Hypotheses 9-10)? It was expected that individuals higher in moral exporting would be more likely to spread their behaviors to others and would be more responsive to the experimental interventions designed to increase their intentions to spread their paper recycling behavior to others. At baseline, people higher in moral exporting were more likely to intend to spread their behavior to others ($r = .62, p < .001$) and to have actually tried to do so in the past ($r = .52, p < .001$). In addition, people higher in moral exporting were also more likely to intend to recycle paper at home ($r = .24, p = .002$) and to have recycled paper at home in the past ($r = .29, p < .001$), and intend to engage in behavior high and low in prototypicality ($r = .37, p < .001$ and $r = .20, p = .013$, respectively) and to have done so in the past ($r = .40, p < .001$ and $r = .21, p = .011$, respectively).

Moral exporting did predict initial recycling paper at home ($b = .40, CI = .17-.64, p = .001, d = .60$); though people higher in moral exporting did significantly decrease paper recycling over time, $b = -.02, CI = -.03-.001, p = .041, d = -.35$). Moral exporting also predicted initial engagement in behaviors high in prototypicality ($b = .32, CI = .13-$

.52, $p = .001$, $d = .58$) and low in prototypicality ($b = .31$, $CI = .04-.59$, $p = .026$, $d = .37$), and initially trying to spread one's behavior to others ($b = .25$, $CI = .04-.47$, $p = .021$, $d = .39$).

Next, I examined whether people higher in moral exporting were more affected by the experimental conditions, leading to higher intentions and behaviors relevant to spreading one's behavior to others. Analyses revealed that the interaction between moral exporting and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions immediately after the intervention ($b = .04$, $CI = -.11-.19$, $p = .60$, $d = .09$) or two weeks later ($b = -.09$, $CI = -.29-.11$, $p = .37$, $d = -.16$). Analyses also revealed that the interaction between moral exporting and the effects-coded variable for experimental conditions versus the control condition only marginally related to behavior ($b = .03$, $CI = -.003-.05$, $p = .083$, $d = .30$), such that people in the experimental conditions reported greater rates of behavior, but this was particularly true for people higher in moral exporting. Thus, there was support for the hypothesis that moral exporting would be linked to intentions and behaviors tied to the spreading of one's paper recycling behavior to others, but there was little support for the hypothesis that people high in moral exporting would be more likely to respond to the interventions by increasing their intentions and behavior relevant to spreading their behavior to others.

Were individuals higher in extraversion more likely to intend to, and actually try to, spread their behavior to others (Hypotheses 11-12)? It was expected that individuals higher in extraversion would be more likely to spread their behaviors to

others. It was also expected that people higher in extraversion would be more likely to be influenced by the experimental conditions, and thus be more likely to increase their intentions and behaviors relevant to the spreading of their paper recycling behavior to others. First considering the link between extraversion and intentions to spread one's paper recycling behavior to others, at baseline people high in extraversion were marginally more likely to intend to spread their behavior to others ($r = .15, p = .075$) and had actually tried to do so more in the past ($r = .18, p = .029$). In addition, people high in extraversion were not consistently more likely to intend to or actually engage in paper recycling at home or engage in behaviors high or low in prototypicality ($ps > .07$).

People higher in extraversion did try to spread their behavior to others ($b = .36, CI = .04-.67, p = .026, d = .38$), but their efforts to spread their behavior did decrease over time, $b = -.02, CI = -.04-.001, p = .06, d = -.32$). They, however, did not engage in more recycling of paper at home ($b = .06, CI = -.30-.42, p = .74, d = .06$) or behaviors low in prototypicality ($b = .09, CI = -.31-.49, p = .66, d = .08$); however, people higher in extraversion did engage in more behaviors high in prototypicality ($b = .32, CI = .04-.61, p = .028, d = .38$).

Next, I examined whether people higher in extraversion were more likely to be influenced by the experimental conditions, and thus become more likely to increase their intentions to spread their paper recycling behavior to others. Analyses revealed that the interaction between extraversion and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions immediately after the intervention ($b = .05, CI = -.20-.30, p = .68, d = .07$) or two weeks

later ($b = -.03$, $CI = -.36-.31$, $p = .88$, $d = -.03$). Turning to behavior, analyses revealed that the interaction between extraversion and the effects-coded variable for experimental conditions versus the control condition did not relate to initial increases in behavior ($b = .19$, $CI = -.10-.49$, $p = .20$, $d = .22$). Thus, I found little support for the hypothesis that people higher in extraversion would have higher intentions to spread their paper recycling behavior to others, though they did actually try to spread their behavior more to others. Again, there was little support for the hypothesis that people higher in extraversion would more likely to respond to the interventions by increasing their intentions and efforts to spread their behavior to others.

Were individuals with more positive environmental attitudes more likely to intend to, and actually, engage in the focal behavior, behaviors high and low in prototypicality, and to spread their behavior to other (Hypotheses 13-14)? It was expected that individuals holding more positive environmental attitudes would be more likely to intend to, and actually, recycle paper at home, to engage in the behaviors high and low in prototypicality, and to spread their behaviors to others. It was also expected that people holding stronger environmental attitudes would be more likely to be influenced by the experimental conditions, and thus be more likely to increase their intentions and behaviors, except in relation to behaviors low in prototypicality. At baseline, people with more positive environmental attitudes were more likely to intend to recycle paper at home ($r = .23$, $p = .005$) and to have recycled paper at home in the past ($r = .21$, $p = .009$), and intend to engage in behaviors high and low in prototypicality ($r = .30$, $p < .001$ and $r = .33$, $p < .001$, respectively) and to have done so in the past ($r = .22$,

$p = .007$ and $r = .30$, $p < .001$, respectively). In addition, people with more positive environmental attitudes were more likely to intend to spread their behavior to others ($r = .28$, $p < .001$) and to have actually tried to do so in the past ($r = .20$, $p = .014$).

Looking at post-intervention behavior over time, people with more positive environmental attitudes did recycle more paper at home ($b = .81$, $CI = .39-1.22$, $p < .001$, $d = .68$), but their behavior did decrease over time ($b = -.03$, $CI = -.06-.0002$, $p = .052$, $d = -.34$). Furthermore, they more frequently engaged in behaviors high in prototypicality ($b = .64$, $CI = .29-.99$, $p < .001$, $d = .64$) and low in prototypicality ($b = .60$, $CI = .11-1.09$, $p = .016$, $d = .42$), but did not try to spread their behavior to others ($b = .10$, $CI = -.30-.49$, $p = .63$, $d = .08$).

Next, I examined whether people holding stronger environmental attitudes were more likely to be influenced by the experimental conditions, and thus become more likely to increase their intentions and behaviors. Analyses revealed that the interaction between environmental attitudes and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions to recycle paper at home immediately after the intervention ($b = -.26$, $CI = -.57-.06$, $p = .11$, $d = -.28$) or two weeks later ($b = -.05$, $CI = -.36-.26$, $p = .77$, $d = -.05$), to engage in behaviors high or low in prototypicality immediately after the intervention ($b = -.15$, $CI = -.42-.11$, $p = .26$, $d = -.19$ and $b = -.08$, $CI = -.30-.14$, $p = .48$, $d = -.12$, respectively) or two weeks later ($b = -.01$, $CI = -.25-.24$, $p = .95$, $d = -.10$ and $b = -.26$, $CI = -.60-.09$, $p = .14$, $d = -.26$, respectively), or to spread one's paper recycling behavior to others immediately after the

intervention ($b = .04$, $CI = -.27-.35$, $p = .81$, $d = .04$) or two weeks later ($b = .07$, $CI = -.36-.50$, $p = .74$, $d = .06$).

Analyses revealed that the interaction between environmental attitudes and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to paper recycling at home ($b = -.13$, $CI = -.53-.28$, $p = .55$, $d = -.10$), engaging in behaviors high in prototypicality ($b = .29$, $CI = -.05-.62$, $p = .092$, $d = .29$), or spreading one's paper recycling behavior to others ($b = -.08$, $CI = -.52-.36$, $p = .73$, $d = -.06$); however, the interaction did relate to engaging in behaviors low in prototypicality ($b = -.53$, $CI = -1.02- -.03$, $p = .037$, $d = -.36$). Simple slope analyses revealed that individuals with more positive environmental attitudes in the experimental condition initially increased their behaviors low in prototypicality a marginal amount ($z = 1.83$, $p = .067$, $d = .32$).

Thus, even though I found support for the hypothesis that people with stronger environmental attitudes would have stronger intentions and more frequent behaviors, there was little support for the hypothesis that people with stronger environmental attitudes would be more likely to respond to the interventions by increasing their intentions to engage in these outcomes or to engage in these behaviors.

Were individuals higher in preference for consistency more likely to intend to, and actually, engage in the focal behavior, behaviors high in prototypicality, and to spread their behaviors to others after the intervention (Hypothesis 15)? It was expected that people with a stronger preference for consistency would be more likely to be influenced by the experimental conditions, and thus be more likely to increase their

intentions to, and actually, to recycle paper at home, to engage in behaviors high (but not low) in prototypicality, and to spread their behavior to others. Analyses revealed that the interaction between preference for consistency and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions to recycle paper at home immediately after the intervention ($b = -.01$, $CI = -.22-.20$, $p = .93$, $d = -.02$) or two weeks later ($b = .01$, $CI = -.18-.21$, $p = .90$, $d = .02$). The interaction also failed to relate to intentions to engage in behaviors high in prototypicality immediately after the intervention ($b = .03$, $CI = -.15-.20$, $p = .77$, $d = .13$) or two weeks later ($b = .07$, $CI = -.09-.23$, $p = .38$, $d = .15$), or low in prototypicality immediately after the intervention ($b = .05$, $CI = -.10-.19$, $p = .65$, $d = .11$) or two weeks later ($b = -.10$, $CI = -.32-.12$, $p = .37$, $d = -.16$). Finally, the interaction did not relate to participants' intentions to spread their paper recycling behavior to others immediately after the intervention ($b = -.11$, $CI = -.31-.10$, $p = .30$, $d = -.18$) or two weeks later ($b = -.04$, $CI = -.32-.23$, $p = .76$, $d = -.05$).

Analyses revealed that the interaction between preference for consistency and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to paper recycling at home ($b = .08$, $CI = -.17-.33$, $p = .55$, $d = .01$), though it did marginally relate to decreases in paper recycling behavior at home over time ($b = -.02$, $CI = -.03-.01$, $p = .098$, $d = -.29$), engagement in behavior low in prototypicality ($b = .08$, $CI = -.26-.42$, $p = .64$, $d = .08$), or efforts to spread one's paper recycling behavior to others ($b = -.10$, $CI = -.35-.15$, $p = .43$, $d = -.13$). However, preference for consistency and experimental condition did interact and were related to

behaviors high in prototypicality ($b = .21$, $CI = .005-.42$, $p = .045$, $d = .35$). Simple slope analyses revealed only people *lower* in preference for consistency in the experimental condition trended toward engaging in more behaviors high in prototypicality initially ($z = -1.39$, $p = .16$, $d = .24$). Thus, I found little support for the hypothesis that people with a stronger preference for consistency would respond to the experimental conditions with increased intentions and behavior.

Were individuals higher in self-monitoring more likely to intend to, and actually, engage in public behaviors after the intervention (Hypothesis 16)? It was expected that people higher in self-monitoring would be more likely to be influenced by the experimental conditions, and thus would be more likely to increase their intentions, and actual engagement in, public, but not private, proenvironmental behaviors. Given limited space in the daily survey portion of the study, only paper recycling at home and the behaviors highest and lowest in prototypicality were measured daily; thus, the two measures of public and private behaviors reflected this fact.

Past engagement in public behaviors were combined to form a summary measure of public behavior (i.e., recycling behaviors at school, taking public transportation from home to school, buying organic fruits and vegetables, and using reusable bags at the grocery store; Cronbach's alpha = .42). In addition, past engagement in private behaviors was combined to form a summary measure (i.e., recycling paper at home and recycling plastic, glass, and aluminum at home; $r = .71$). Intentions to engage in public behaviors were combined to form a summary measure of intentions (in-person Cronbach's alpha = .37; final online survey Cronbach's alpha = .49). In addition, intentions to engage in

private behaviors were combined to form a summary measure (in-person $r = .76$; final online survey $r = .84$). Finally, current engagement in public behaviors was combined to form a summary measure of public behavior (Cronbach's alpha = $.70$), and current engagement in private behaviors were combined to form a summary measure ($r = .73$).

Analyses revealed that the interaction between self-monitoring and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to intentions to engage in public behaviors immediately after the intervention ($b = -.23$, $CI = -1.04-.59$, $p = .58$, $d = -.09$) or two weeks later ($b = .19$, $CI = -.85-1.23$, $p = .72$, $d = .06$); similarly, the interaction did not relate to an increase in intentions to engage in private behaviors immediately after the intervention ($b = -.52$, $CI = -1.35-.31$, $p = .22$, $d = -.21$) or two weeks later ($b = -.27$, $CI = -1.54-1.00$, $p = .67$, $d = -.07$).

Analyses revealed that the interaction between self-monitoring and the effects-coded variable for experimental conditions versus the control condition did not significantly relate to engagement in public behaviors ($b = -.08$, $CI = -1.71-1.55$, $p = .92$, $d = -.02$); however, the interaction did relate to initial increases in private behaviors ($b = 1.85$, $CI = .41-3.30$, $p = .021$, $d = .44$) as well as decreases in behavior over time ($b = -.15$, $CI = -.26- -.03$, $p = .01$, $d = -.45$). Simple slope analyses revealed that individuals lower in self-monitoring in the experimental conditions were more likely to increase their private behavior initially ($z = -2.30$, $p = .022$, $d = -.40$).

Overall, there was little support for the hypothesis that people high in self-monitoring would respond to the experimental conditions with increased intentions to engage in public, but not private, behaviors.

Study 3 Discussion

Study 3 extended Study 2 by considering the effect of experimental interventions and individual difference variables on behaviors relevant to the spread of behavior: a target behavior (paper recycling at home), behaviors high and low in prototypicality, and efforts to spread one's own paper recycling behavior to others. First focusing on the experimental main effects on behavior, it was found that the modeling condition led to the greatest increase in paper recycling behavior at home, with neither the message nor planning interventions having a significant effect, offering partial support for the hypothesis that both the modeling and planning interventions should have the strongest effect on paper recycling at home. Turning to behaviors high in prototypicality, as predicted only the message condition led to a marginal increase in engagement in this type of proenvironmental behavior; as expected, none of the interventions increased engagement in behaviors low in prototypicality. Finally, mixed support was found for the spread of behavior between individuals, as *both* the message and modeling interventions led to a significant increase in efforts to spread one's behavior to others. By and large, these trends held when examining intentions, and expected effects were largely seen when considering cognitions relevant to paper recycling at home.

Even more than Study 2, examination of effect sizes in Study 3 provides additional support for the hypotheses. All three interventions led to positive effects on

recycling paper at home intentions and behavior, and the largest effects stemmed from the modeling intervention. The message condition led to the largest effect on intentions and actual engagement in behaviors high in prototypicality, though all three interventions did lead to positive effect sizes. As expected, all three interventions only contributed to small effects on behaviors low in prototypicality. Finally, the message condition had a large effect on intentions and efforts to spread one's behavior to others, and the modeling and planning interventions only had small or medium effects. Across all of the outcomes, however, all three interventions did have positive effects, something easy to miss when focusing only on the *p*-values. Not surprisingly, effects tended to be stronger on intentions than behaviors (e.g., Webb & Sheeran, 2006), and, in the case of intentions, stronger immediately after the intervention than two weeks later. Again, however, it is important to note that effect sizes were often sufficiently large to be of interest to researchers examining the spread of behavior both in the lab and in the field.

Examination of individual-difference effects suggested more mixed support for those hypotheses. As expected, people higher in moral exporting or with more positive environmental attitudes had stronger intentions, and more frequent behaviors, tied to the spread of behavior. Additionally, and as expected, extraverts were more likely to try to spread their behavior to others. However, very little support was found for hypotheses involving the interaction of the individual difference measures and the interventions. Across both Studies 2 and 3, in fact, little support was found for the interaction hypotheses. It is interesting to note that across both Studies 2 and 3, though strong individual-difference effects were found, particularly for people high in moral exporting

or people with positive environmental attitudes, and intervention effects were also found, these two approaches did not lead to fruitful interactions that explain intentions or behavior over time. This might be because of inadequate power to detect these interactions, but perhaps certain individuals do not require an additional push to engage in these behaviors (i.e., people high in moral exporting or people with positive environmental attitudes), and some of the other individual difference measures (i.e., people high in preference for consistency or self-monitoring) are just of limited value in this context.

Measuring both intentions and behavior over time did reveal that the interventions influenced change in these outcomes, and, in particular, the message and modeling conditions affected not only the target behavior of recycling paper at home, but they both had some success influencing behaviors high in prototypicality and people's efforts to spread their behavior to others. Though some correlational work does exist on whether people try to influence the proenvironmental behaviors of those around them (e.g., Southwell & Murphy, 2014; Southwell et al., 2014), very little experimental work has attempted to induce efforts to spread one's proenvironmental behavior, making the present work a step in a new direction. In the area of the spread of behavior within individuals, researchers have, however, begun to experimentally examine whether it is possible to influence people to engage in a range of proenvironmental behaviors (Evans et al., 2013; Lanzini & Thøgersen, 2014; Longoni et al., 2014). This work has found support for both ideas that influencing people to engage in a target proenvironmental behavior can influence those individuals to either engage in other behaviors more

frequently (Evans et al., 2013; Lanzini & Thøgersen, 2014) or actually *less* frequently (Longoni et al., 2014). The present results not only lend support for the notion that getting a person to engage in a target behavior can lead to increases in their other behaviors, but it also proposes, and finds evidence for, a key moderator of this effect, which is perceived prototypicality of the other behaviors.

Furthermore, and somewhat impressively, these effects were largely maintained over time, whether it was intentions over the two time points separated by two weeks, or it was over the two-week daily reporting of behavior. Given that researchers have rarely explored the spread of proenvironmental behaviors between individuals over time, and in particular repeated behaviors, it is hard to compare the present results of intention and behavior maintenance to past work. Experimental work on the spread of behavior within the individual has also tended to examine change in behavior immediately in the lab (i.e., Evans et al., 2013; Longoni et al., 2014). However, Lanzini and Thøgersen (2014) did look at the spread of proenvironmental behavior within the individual between two time points separated by six weeks; thus, the maintained effects on behavior observed in the current study are consistent with these past results. Maintained intervention effects over time have remained elusive in the literature (e.g., Rothman, 2000), but the current results demonstrate that, at least given a time frame of two weeks, it might be possible not only to maintain change in a targeted behavior, but the spread of behavior between and within individuals might also be maintained over time in certain circumstances. These findings are important, as they both indicate that the spread of behavior is possible when targeting

just a single behavior, but also that these downstream effects might not dissipate immediately.

General Discussion

Despite both longstanding (De Young, 1993; Rodgers, 2013) and renewed (Truelove et al., 2014) interest in the spread of behavior between individuals (Smith & Christakis, 2008) and within individuals (e.g., Thøgersen & Ölander, 2003), very little work has considered both types of spread in one program of research, using experimental methods, or over time. Nor has work consistently examined *how* behaviors spread between and within individuals, or *when* or *for whom* this spreading is more or less likely to occur. Greater understanding of these conceptual issues would help address social problems such as environmental issues, as most environmental problems stem from large groups of people failing to do all that they can for the environment. With this goal in mind, the present research set out to develop a model and to test hypotheses concerning the spread of proenvironmental behavior both between and within individuals.

This work first examined how people think about the spread of proenvironmental behavior between and within individuals, provided information on how prototypical various proenvironmental behaviors are perceived to be, in order to guide predictions about when and how the spread of proenvironmental behavior should occur. This research next considered, across two experimental studies, how different interventions influenced the spread of behavior, as well as the potential processes through which the spread of behavior occurs. Study 2 examined how effective interventions in the proenvironmental behavior change area (Osbaldiston & Schott, 2012) influenced

intentions to spread one's behavior to other individuals and to non-target behaviors.

Study 3 extended this paradigm by considering how the spread of behavior unfolded over a two-week period.

How Do People Think about the Spread of Behavior?

Study 1 demonstrated that people often think about how they can influence the proenvironmental behavior of others, through processes such as modeling the behavior to others, actively trying to persuade others to adopt a behavior, or bringing up the behavior in conversation with others. This work extends previous research demonstrating that people think about influencing the proenvironmental behaviors of others and try to do so (e.g., Southwell & Murphy, 2014; Southwell et al., 2014) by providing evidence of the *specific ways* through which they try to do so. Furthermore, when asked *why* they try to influence the behavior of others and *why* they strive to be consistent in the types of behaviors they engage in, many of the open-ended responses demonstrated a general concern about the importance of the environment and hoping to help provide a solution to current environmental problems. These findings both confirm previous results demonstrating the importance of general environmental attitudes in the spread of proenvironmental behavior (i.e., Thøgersen, 1999) and extend this line of work by linking a similar process to the spread of proenvironmental behavior both between and within individuals.

I also found evidence that people do consider some proenvironmental behaviors to be better examples of the more general category of environmental behavior. Recycling behaviors (e.g., recycling paper and recycling plastic, glass, and aluminum at home and at

school) were largely seen to be the most “prototypical” (Buss & Craik, 1980) proenvironmental behaviors, and behaviors such as taking public transportation from home to school, buying organic fruits and vegetables, and using reusable bags at the grocery store were mostly seen as being lowest in prototypicality. Although researchers have proposed prototypicality as a potential moderator of the spread of proenvironmental behavior within individuals (Evans et al., 2013; Olli et al., 2001), this premise had not been tested until now. Study 1 provides evidence of how people perceive the prototypicality of proenvironmental behaviors, and confirmed some predictions about recycling possibly being the most prototypical proenvironmental behavior (i.e., Ollie et al., 2001). These results speak to the extent to which the within-person spread of behavior should be expected, as interventions targeting a given proenvironmental behavior should be more likely to lead to the spread within the person to other behaviors high, but not low, in prototypicality, a premise that was empirically tested in Studies 2 and 3.

Is It Possible to Influence Intentions and Behaviors Tied to the Spread of Behavior?

Given the findings from Study 1 that general environmental attitudes tend to be linked to the spread of proenvironmental behavior between and within individuals, it was expected that a persuasive message crafted to link a target behavior (recycling paper at home) to other environmental outcomes and the wider social context would lead to the highest rates of the spread of proenvironmental behavior both between and within individuals. Studies 2 and 3 indeed found some support for these hypotheses, as even though modeling and planning interventions had the greatest influence on intentions to, and actual engagement in, a target behavior (consistent with prior meta-analytic work;

Osbaldiston & Schott, 2012), the persuasive message intervention led to the greatest increases in intentions to, and actual engagement in, behaviors high, but not low, in prototypicality, and efforts to spread one's behavior to others. Although results were somewhat inconsistent between Studies 2 and 3, the overall pattern supports the notion that interventions that focus on more than just a specific behavior in a context that focuses on the individual (i.e., the message intervention as compared to the modeling and planning interventions) have a larger effect on the spread of behavior between and within individuals.

This idea largely fits with past research, as Longoni et al. (2013) found that an intervention approach that focused on the specifics of only one behavior (feedback on green purchasing decisions) led individuals to engage in related proenvironmental behaviors *less* frequently. Evans et al. (2013), in contrast, found that providing more general environmental information, but not financial information about a specific behavior, led individuals to engage in related proenvironmental behaviors *more* frequently. It is worth noting, however, that Lanzini and Thøgersen (2014) found that financial incentives focused on a specific behavior (i.e., purchasing green products) did influence people to engage in other proenvironmental behaviors (e.g., recycling), so further research is needed to better determine the mechanisms that lead to the spread of proenvironmental behavior within the individual.

The interventions implemented in Studies 2 and 3 largely influenced cognitions relevant to recycling paper at home in expected ways. The message condition increased behavioral beliefs and knowledge concerning the link between recycling paper and other

environmental issues, and had some success making attitudes more positive toward paper recycling at home specifically. The modeling intervention did not increase self-efficacy tied to recycling paper at home, but the planning intervention did strengthen plans to recycle paper at home. These results suggest that a more general persuasive message that focuses on the links between a target behavior and other environmental outcomes, as well as the need for many people to attempt to address environmental issues, can influence beliefs relevant to the spread of behavior between and within individuals. This is important, as it provides some evidence for one process that might explain the present intention and behavior findings, as well as potentially the type of process that could have contributed to the effects found in Evans et al. (2013).

Furthermore, the results were largely, and impressively, maintained over time. Whether considering intentions or behavior, the message intervention, and to a certain extent the modeling intervention, led to a increases in intentions and behaviors that were sustained over the course of two weeks, something typically difficult to produce. This is important, as the maintenance of behavior is of great theoretical and practical value (e.g., Rothman, 2000), and current findings could shed light on the factors that contribute to maintenance, such as linking beliefs about a given behavior to beliefs about related behaviors and the social context (as done in the message condition). If participants continue to perceive connections between their own engagement in a target behavior, their engagement in other behaviors, and others' engagement in the target behavior, they may maintain their motivation to actively try to spread their own behavior over time.

Though significance levels were largely followed to determine reliability of the findings, effect sizes are also a useful tool for understanding the *strength* of effects (Cummings, 2011). Across Studies 2 and 3, effect sizes tended to be of small-to-medium size, although large effect sizes were occasionally found, such as the effect of the message intervention on increasing intentions to spread one's behavior to others in Study 3 ($d = .93$ immediately after the intervention and $d = .78$ two weeks later). This overall trend in effect sizes demonstrates that these are not trivial effects produced by the interventions. Instead, they are suitably large to be of both theoretical and practical value, worthy of further exploration in the lab and in the field. Even when hypotheses were not confirmed, effect sizes tended to indicate that the effects were in expected directions, but were perhaps too small to detect given the sample sizes in Studies 2 and 3. Because there is very little experimental work on the spread of proenvironmental behavior between and within individuals, it was unclear going into this research the types of effects sizes that should be expected. However, the effect sizes generated by the influence of the interventions on the target behavior, paper recycling at home, tended to be similar to those found in the most relevant meta-analysis (i.e., Osbaldiston & Schott, 2012) as they mostly ranged from small-to-medium to medium in size.

Were Individual Differences Linked to the Spread of Behavior?

I also found that some individual differences are linked to both intentions and actual efforts to spread one's behavior. Across both studies, people higher in moral exporting or people with more positive environmental attitudes were more likely to intend to, and actually engage in, all four outcomes: recycling paper at home, engaging in

behaviors high and low in prototypicality, and trying to spread one's behavior to others. Extraversion was inconsistently related to efforts to spread one's behavior to others, and rarely linked to the other outcomes. However, little support was found for the hypothesized interactions (such that the interventions were expected to have a stronger influence on people with certain attributes, such as those high in moral exporting), and most of the support found was inconsistent and weak. However, even though there was mixed support for the individual difference measures, the present results do suggest that when correctly identified and measured, individual differences are also important when appreciating the spread of behavior between and within individuals.

Just as work in the area of the spread of behavior between individuals has tended to eschew experimental paradigms (a rare exception being Bond et al., 2012), the personality/individual differences approach has also tended to be underappreciated (though see Peterson et al., 2009, for an exception in the political domain). Individual differences linked to environmental issues showed the most promise, and there may be value in considering other measures that relate to the environment such as other types of environmental attitudes (e.g., as captured by the New Ecological Paradigm; Dunlap, Van Liere, Mertig, & Jones, 2000), environmental values (e.g., biospheric values; Stern & Dietz, 1994), or environmental identity and connection to nature (e.g., Clayton, 2003; Mayer & Frantz, 2004; Whitmarsh & O'Neil, 2010). Perhaps certain individual difference measures that link the self to the environment, such as through attitudes, values, and identity, might be more closely linked to the spread of proenvironmental behaviors.

Additionally, certain environmental measures might be more closely linked to different aspects of the spread of behavior as compared to other measures. For example, moral exporting was more strongly linked to efforts to spread one's behavior to others as compared to environmental attitudes, whereas environmental attitudes were more closely linked to the spread of behavior within the individual. Future research should more systematically explore which constructs linking the self to the environment best explain the spread of proenvironmental behaviors between and within individuals. Finally, other individual differences not focused on environmental issues could also be relevant (though maybe not preference for consistency, or self-monitoring), such as moral values (e.g., concerns about harm; Graham, Haidt, & Nosek, 2009) or orientations toward society (e.g., altruistic personality; Penner, Fritzsche, Craiger, & Frefield, 1995).

Implications for Theory

The current work extends the field's theoretical conceptualization of the spread of behavior in a number of ways. First, it provides a more nuanced understanding of how people *intentionally* attempt to spread their behavior to others. Previous research had largely focused on whether environmental behaviors *can* spread from one person to others within a social network (e.g., Darley & Beniger, 1981; Noonan et al., 2013), but we had little knowledge *how* this might happen, and particularly whether people *try* to spread their proenvironmental behaviors to others (Southwell & Murphy, 2014). The current evidence suggests that some people do in fact try to influence the proenvironmental behaviors of others, and they primarily attempt to do so through three

processes: modeling of appropriate behavior, actively trying to persuade others to adopt a behavior, and bringing up the behavior in conversation.

In Study 1, people reported modeling behavior to others in the past most frequently, followed by actively trying to persuade others, and finally bringing up the topic in conversation. The ordering of their intentions in Study 1 also reflected this finding, and their daily self-reported behavior in Study 3 again mirrored this pattern. It is important to keep in mind that other approaches to influencing others might also be relevant, and the open-ended responses from Study 1 demonstrate that people think with a fair amount of nuance about how they try to influence the behavior of others, including relevant contexts to do so in and methods to use. The model of the spread of behavior between individuals is not meant to be exhaustive, but is simply set up to examine some of the most common ways in which these efforts unfold.

Taking it one step further, the present research not only demonstrates that people intend to spread their behaviors to others, but it also indicates *when* these efforts to spread one's behavior to others actually occur over time. Interventions commonly deployed in the proenvironmental behavior change intervention area (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Osbaldiston & Schott, 2012; Steg & Vlek, 2009) showed differing abilities to influence the intentions and behaviors relevant to the spread of a proenvironmental behavior to others; as expected, a persuasive message that provided a richer context for why paper recycling at home is important and why it relates to other environmental issues consistently influenced these intentions and behaviors. As expected, a planning intervention was less successful at influencing these outcomes. However,

unexpectedly, the modeling intervention was also relatively effective at increasing intentions and behaviors to spread one's paper recycling behavior to others. Some evidence suggests that the message intervention affected people's beliefs about the relevance of paper recycling to environmental issues, but because the modeling intervention did not significantly increase these beliefs, it is less clear why the modeling intervention led to this outcome. Perhaps the modeling intervention affected a sense of social norms (e.g., Cialdini, 2003), as the video manipulation did feature two individuals recycling paper. Future research should explore this possibility, as the current research did not attempt to measure sense of norms.

Turning to individual differences, it is worth noting that even though results revealed that certain types of individuals are more likely to intend to, and actually, engage in a range of behaviors, the idea that they were more likely to experience the spread of behavior within the individual is still unclear. The spread of behavior within the individual is typically conceptualized as change in one behavior leading to change in a different behavior (Truelove et al., 2014). Because the present results indicate that people with positive environmental attitudes, for example, did not change their behavior as a result of being assigned to an intervention, it is difficult to determine whether the present results indicate the spread of behavior or simply consistency in behavior over time. Thus, people with positive proenvironmental attitudes might not have changed their behavior over time; they might have simply been engaged in a range of behaviors before the study, and they maintained those behaviors over time.

The current work also sheds light on the spread of behavior *within* the individual. Research has just begun to examine, via experimentation, whether an intervention can influence more than one behavior (e.g., Evans et al., 2013; Lanzini & Thøgersen, 2014; Longoni et al., 2014). This work largely replicates those efforts, but also extends them in key ways. First, it examined intervention approaches that were differentially expected to influence the spread of behavior within the individual. Second, by building on past correlational work (Thøgersen, 1999), it largely replicated evidence of the role that linking attitudes about a behavior to beliefs about how that behavior relates to environmental issues might lead to the spread of behavior. Third, it demonstrates that the spread of behavior within the individual can begin to take place quickly after an intervention and on a day-to-day basis. Taken together, these insights suggest that targeted interventions that have a theoretical basic for influencing the spread of behavior within individuals should have more success at changing day-to-day behaviors (such as the message intervention in the present research).

Fourth, it largely found support for a key moderator of the spread of behavior within the individual – the degree to which other behaviors are high or low in prototypicality. This approach helps to determine limits in the extent to which a target behavior spreads to other, related behaviors; it seems unlikely that influencing someone to recycle paper at home would lead to decreased airline travel, or something even more removed such as adopting an abandoned dog from the animal shelter. Past research, even experimental in nature, has tended to provide little justification for why a target or non-target behavior is considered, and to my knowledge no experimental test has provided

evidence of a key, conceptual moderator that drives when proenvironmental behaviors do and do not spread within the individual (see Truelove et al., 2014, for a brief conceptual discussion of possible moderators).

Future research should attempt to replicate and extend the current findings regarding the moderator of prototypicality toward understanding the spread of proenvironmental behavior within the individual. For example, researchers should explore how people form their perceptions of prototypicality, as certain beliefs might drive these perceptions such as the perceived difficulty of the behavior. For example, people tend to view recycling behaviors as the easiest proenvironmental behaviors to perform (Kaiser & Carmen, 2001), and the present research also found them to be highest in perceived prototypicality. Additionally, researchers should consider how perceptions of prototypicality might vary across regions or cultures (Milfont, Duckitt, & Cameron, 2006). Furthermore, greater appreciation of exactly how far along the prototypicality spectrum the spread of proenvironmental behavior within the individual occurs would be of great value.

Given a renewed interest in trying to link types of environmental behaviors (e.g., Karlin et al., 2014), other categorizations or conceptualizations of behaviors might also be relevant when predicting the spread of behavior within individuals. One potentially useful categorization is the difference between curtailment behaviors, or reducing the use of energy through repeated behaviors, and efficiency behaviors, or making one-time upgrades to infrastructure to save energy; Attari, DeKay, Davidson, & Bruine de Bruin, 2010; Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009). Though it has not been

tested empirically yet, getting someone to engage in a one-time efficiency behavior might not translate into them being more likely to engage in repeated, curtailment behaviors. Instead, influencing an individual to engage in an initial curtailment behavior might be more likely to lead to the spread of behavior within the individual to other curtailment behaviors.

Other processes, in addition to the linking of a behavior to more general environmental issues, seem like prime candidates for understanding how the spread of behavior within individuals occur. For example, prior work has considered such mediators such as change in identity (e.g., Bem, 1967; DeJong, 1979; Whitmarsh & O'Neill, 2010), arousal of consistency concerns (e.g., Dickerson et al., 1992), or changing affordances in the physical environment to allow someone to engage in more than one related behavior more easily (such as recycling more than one product; Duffy & Verges, 2009; Gibson, 1977; Luyben & Bailey, 1979). Using different routes to influence the spread of behavior between individuals might be more effective; future work should consider such empirical questions. The present interventions could perhaps be tailored to also manipulate these processes (in particular, the persuasive message), but the current forms of these interventions do not adequately attempt to manipulate these mediators.

By considering the types of spread in the same line of research, both between individuals and within them, this work more closely draws together work from these two disparate areas of research, hopefully leading to fruitful cross-pollination. This work suggests that a given type of intervention can influence both types of spread, suggesting perhaps similar mechanisms that can contribute to both, including increasing positive

beliefs about the link between a target behavior, related behaviors, and the social context. It also suggests how certain individual differences might be linked to both types of spread, such as people high in moral exporting or with more positive environmental attitudes. However, beyond these overlapping interventions, mechanisms, or individual difference predictors, appreciation of both types of spread at the same time might allow for better consideration, and exploration, of instances in which both between and within individual spread of behavior occurs at the *same time* (see Figure 7). For example, imagine the individual who is concerned about environmental issues and who notices that their neighbor has recently put up solar panels on the roof of their home. This individual who noticed their neighbor's behavior might be influenced to do something positive for the environment as well, but perhaps does not have enough disposable income to purchase their own solar panels. Instead, they might choose to put in a composting pile in the backyard. This example, and others like it, demonstrates that the spread of behavior between people could lead to the second person engaging in a second, distinct behavior. Future conceptual and empirical work must consider these various other forms in which the spread of behavior between and within individuals can influence one another.

Of course, the spread of behavior between and within individuals is not of relevance solely to proenvironmental behaviors; other relevant domains include workplace settings, health contexts, interpersonal relationships, and aggression/prosocial behavior. These domains all implicate a range of behaviors and interpersonal interactions that could benefit from insights provided in the current research, and could also influence future work on the spread of behavior between and within individuals in the

environmental context. For example, current insights into the ability of certain interventions to influence both types of the spread of behavior at the same time would be useful in contexts such as behaviors relevant to communicable diseases. To the extent that certain diseases require large groups of people to become vaccinated, it is important to influence when vaccination behavior spreads among people (Compton & Pfau, 2009); additionally, we also want people to stay caught up on a range of vaccinations, again demonstrating the value of both types of spread.

Research from domains outside of environmental behavior, including work on health behavior, can also influence work in the environmental domain by offering relevant constructs and theories, as well as new statistical and methodological approaches to studying the spread of environmental behaviors. Certain types of relationships might lead to higher or lower rates of spreading between individuals (such as people being more influenced by close friends; Christakis & Fowler, 2007); additionally, dyadic and social network types of analyses can enrich and strengthen insights into when, how, and for whom the spread of proenvironmental behavior occurs between and within individuals. Aspects of the social network, such as centrality of the person spreading the behavior (e.g., Freeman, 1978-1979) or the concentration of the members in a social network (e.g., Girvan & Newman, 2002), implicate how behaviors might spread between individuals. Similarly, research on how dyads reach decisions could shed light on how behaviors might spread across a household (e.g., Shestowsky, Wegener, & Fabrigar, 1998).

Implications for Intervention

Just as the present research can enrich and extend theoretical accounts of the spread of behavior between and within individuals, it can also inform efforts to change behavior out in the world. This is particularly true for persuasive messages, as many public campaigns already use various forms of persuasive messages to try to influence the behavior of viewers. These past and ongoing interventions may have actually been effective in ways that we do not currently measure or appreciate. For example, efforts to change green consumer behaviors could lead to additional changes in recycling behaviors (such as found by Lanzini and Thøgersen, 2014), but failures of past research to track other, related behaviors might have provided an incomplete picture of the total effects of a given intervention.

It also seems plausible that combining the best elements of different interventions might be effective; thus, aspects of the modeling intervention that are most potent could potentially be combined with aspects of the message intervention most successful at influencing the spread of behavior. For example, the ability of the message intervention to link the target behavior to other environmental issues and the social context could be possibly strengthened by using images of other people recycling paper that were present in the modeling intervention. Though such an effort would obviously require research to determine these elements, it does keep open the possibility that combined interventions could do a better job of increasing intentions and behavior pertinent to the spread of behavior. Because properly addressing many social problems requires influencing numerous people to engage in a range of related behaviors, it might be possible to design

interventions even more effective than the ones investigated in the current research.

Perhaps training people how to effectively communicate with others, such as providing them with research-based tips on how to persuade others, would not only make it more likely that those individuals would try to influence the behavior of others, but it might also make them more effective “spreaders” of a given behavior.

In addition, though little evidence was found for the moderating influence of various individual differences on the relationship between behavior-change interventions and the spread of behavior between and within individuals, a long tradition of message matching and message tailoring (e.g., Clary, Snyder, Ridge, Miene, & Haugen, 1994; Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008; Rothman & Salovey, 1997) suggests that there might still be a number of individual differences that could be targeted when disseminating efforts to influence the spread of behavior. These include individual differences as basic as gender (e.g., Stern, Dietz, & Kalof, 1993; Zelezny, Chua, & Aldrich, 2000) or socioeconomic status (e.g., Clark, Kotchen, & Moore, 2003), or beliefs as complex as current support for the social structure one lives in (system justification; Feygina, Jost, & Goldsmith, 2010) or beliefs about the reasons for one’s life situations (belief in a just world; Feinberg & Willer, 2011). Researchers have already found links between these variables and proenvironmental behavior, and thus they make prime targets for tailoring. Indeed, tailoring of messages has long been an approach to changing behavior in applied domains, and has been conceptually and empirically explored in the proenvironmental behavior context, though not yet in relation to the spread of

proenvironmental behavior (Abrahamse, Steg, Vlek, & Rothengatter, 2007; Daamen, Staats, Wilke, & Engelen, 2001; Pelletier & Sharp, 2008).

Limitations and Future Directions

Despite its strengths, there are a number of limitations to the current research. First, in a methodological climate in the social sciences where the value of large sample sizes has been clearly articulated (e.g., Simmons, Nelson, & Simonsohn, 2011; Simonsohn, in press), the current research, while informed by *a priori* power analyses, was perhaps still limited by an inability to reliably detect hypothesized interaction effects. Some small effect sizes were observed when examining interactions and these interactions were rarely significant; thus, support for hypotheses that certain types of individuals would be most influenced by the examined interventions was weak and inconsistent at best. Although it may be true that none of these individual differences (i.e., moral exporting, extraversion, environmental attitudes, preference for consistency, and self-monitoring) affect the extent to which the interventions influenced the outcomes tied to the spread of behavior, it also seems possible that these effect sizes were smaller than expected, and larger samples might have picked up on these trends. Thus, future work should continue to examine potential moderators, even some of the variables lacking empirical support in the present work.

Inconsistencies between the findings concerning behavioral intentions from Studies 2 and 3 are also interesting and limiting. The designs of the two studies were nearly identical, from measures to manipulations, except for the inclusion of the daily survey portion and the two-week online survey follow-up in Study 3. Although some of

the trends were consistent across the two studies, other findings were conflicting. For example, Study 2 found heightened intentions to engage in behaviors low in prototypicality after the interventions, specifically the modeling and planning interventions, whereas Study 3 found support for the influence of interventions, in particular the message condition, on intentions to, and actual, engagement in behaviors *high*, not low, in prototypicality, as originally hypothesized.

It is unclear why these differences emerged, and it is important to take this conflicting evidence into account. However, it is possible that, given the more intensive and involved nature of Study 3, it might better inform expected results moving forward. Participants in Study 3 knew ahead of time that they were going to be followed for two weeks after the lab session, and they also knew that there was a financial incentive for taking the study seriously. Thus, participants in Study 3 potentially had greater motivation, perhaps making the results from Study 3 more reliable. Finally, it is also worthwhile to note that the Cronbach's alphas for the scale that combined the behaviors low in prototypicality were generally quite low, and did greatly vary across studies and behavioral/intention measures (from as low as .22 to as high as .69), which may account for the inconsistencies in these effects.

Additionally, I decided to focus on one particular behavior as the target behavior in this set of studies: recycling paper at home. Given this necessary focus on just one behavior, it is unclear to what extent the current findings might generalize to other proenvironmental behaviors. It seems reasonable that originally targeting energy conservation behaviors in the home would generalize to energy conservation behaviors in

different settings (e.g., at school), but it is less clear whether this would lead to the spread of behavior within the individual to water conservation behaviors. Furthermore, the key moderator of prototypicality could have been a stand-in for other moderators, such as ease of the behavior, the normative appropriateness of behavior, or just similarities of the behaviors grouped together. Because all of the behaviors high in prototypicality were recycling behaviors, it is difficult to tease apart these distinctions using the current data. Future research should further explore behavioral categories or distinctions that drive the spread of behavior within the individual, such as the ease or difficulty of the behavior (e.g., Fujii, 2006) or single versus repeated proenvironmental behaviors (e.g., efficiency behaviors versus curtailment behaviors; Stern, 2000).

Studying college students also brings its own set of benefits and costs (Henrich, Heine, & Norenzayan, 2010); it is unclear whether the current effects will necessarily hold up across the general population in the United States, or in other cultures or countries across the world. For example, evidence suggests that older adults in the United States tend to more frequently engage in proenvironmental behaviors as compared to younger adults (Wiernik, Ones, & Dilchert, 2013), perhaps suggesting the effects demonstrated here should hold or should be even stronger in the general population. Thus, future research should explore whether the current experimental and individual-difference effects hold when considering more diverse samples.

Finally, the current program of research did not consider whether people were actually able to spread their proenvironmental behavior to others. Future work would greatly benefit from combining the current approach with the rich data gathered in

current social network approaches to provide a more comprehensive image of the spread of behavior between individuals sharing a social network or physical space (e.g., Christakis & Fowler, 2007; Noonan et al., 2013). To date, I do not know of any empirical effort to explore the relationship between people's efforts to spread their behavior to others, how much people perceive their efforts to actually lead to the spread of behavior to others, and objective measures of the spread of behavior between people. Evidence in the environmental area suggests that there can be sizable differences in self-reported and objective measures of proenvironmental behavior (Kormos & Gifford, 2014), again highlighting the importance of these issues and the current shortcoming of relying upon self-reported behavior. Research on how these three distinct outcomes relate to one another would help us understand how perceptions and the objective change in behavior overlap, as well as determine the validity of various measures of the spread of behavior between individuals.

It is also unclear how long these effects might last over time. The current research was unique in that it examined behavior and beliefs over time, finding that changes in intentions tended to hold over the two weeks, as did the effects on behavior over time. These are important discoveries, but future research should explore how long these effects are maintained. Given that one proposed mechanism for the spread of behavior is change in more general attitudes towards the behavior targeted, it might be that change in intentions and behavior over time is tethered to the ability to maintain these more general beliefs. If this is the case, occasional "booster" interventions (Müller-Riemenschneider, Reinhold, Nocon, & Willich, 2008; Long Tolan, Gorman-Smith, Henry, & Schoeny,

2009) could help maintain and strengthen these beliefs, contributing to long-term maintenance of intentions and behaviors linked to the spread of behaviors between and within individuals.

Conclusion

Across three studies, I found evidence for the notion that people generally think about the spread of behavior between and within individuals, that certain *types* of people are more likely to engage in efforts linked to the spread of behavior, that it is possible to *influence* intentions and actions tied to the spread of behavior, and that there are specific *processes* linked to the spreading of behavior between and within individuals. This work extends prior research by considering both the spread of behavior between and within individuals in one program of research, by looking to experimentally influence the spreading of behavior, and by following up with participants daily for two weeks to track efforts related to the spread of behavior. If social scientists are going to truly have a say in how society addresses such pressing problems as climate change or water pollution, we need to more clearly understand, and more effectively influence, the spread of behaviors between and within individuals. The current research contributes to that conversation, and demonstrates the ability to influence future work on these related phenomena.

Table 1

The independent variables, dependent variables, and predictions relevant to each hypothesis

Hypothesis	Independent Variable	Dependent Variable	Prediction
1	Message condition (as compared to the modeling, planning, and control conditions)	Attitudes, beliefs, and knowledge	Participants in the message condition will have more positive attitudes and beliefs and greater knowledge
2	Modeling condition (as compared to the message, planning, and control conditions)	Self-efficacy	Participants in the modeling condition will have greater self-efficacy
3	Planning condition (as compared to the message, modeling, and control conditions)	Plans	Participants in the planning condition will have stronger plans
4	Modeling and planning conditions (as compared to the message and control conditions)	Recycling paper at home intentions and behavior	Participants in the modeling and planning condition will report stronger intentions and greater frequency of recycling paper at home
5	Message condition (as compared to the control condition)	Recycling paper at home intentions and behavior	Participants in the message condition will report stronger intentions and greater frequency of recycling paper at home

6	Message condition (as compared to the modeling, planning, and control conditions)	Efforts to spread one's behavior to others	Participants in the message condition will report stronger intentions and greater frequency of efforts to spread one's behavior to others
7	Message condition (as compared to the modeling, planning, and control conditions)	Behaviors high in prototypicality	Participants in the message condition will report stronger intentions and greater frequency of behaviors high in prototypicality
8	Message, modeling, planning, and control conditions	Behaviors low in prototypicality	None of the interventions will influence participants to report stronger intentions and greater frequency of behaviors low in prototypicality
9	Moral exporting	Efforts to spread one's behavior to others	Individuals higher in moral exporting will report stronger intentions and greater frequency of efforts to spread one's behavior to others
10	Moral exporting x experimental condition (as compared to the control condition)	Efforts to spread one's behavior to others	People higher in moral exporting and randomly assigned to an experimental condition will report stronger intentions and greater frequency of efforts to spread one's behavior to others
11	Extraversion	Efforts to spread one's behavior to others	Individuals higher in extraversion will report stronger intentions and greater frequency of efforts to spread one's behavior to others
12	Extraversion x experimental condition (as compared to the control condition)	Efforts to spread one's behavior to others	People higher in extraversion and randomly assigned to an experimental condition will report stronger intentions and greater frequency of efforts to spread one's behavior to others

13	Environmental attitudes	(1) Efforts to spread one's behavior to others; (2) Behaviors high and low in prototypicality	Individuals with more positive environmental attitudes will: (1) report stronger intentions and greater frequency of efforts to spread one's behavior to others, (2) report stronger intentions and greater frequency of behaviors both high and low in prototypicality
14	Environmental attitudes x experimental condition (as compared to the control condition)	(1) Efforts to spread one's behavior to others; (2) Behaviors high and low in prototypicality	People with more positive environmental attitudes and randomly assigned to an experimental condition will (1) report stronger intentions and greater frequency of efforts to spread one's behavior to others, and (2) report stronger intentions and greater frequency of behaviors high, but not low, in prototypicality
15	Preference for consistency x experimental condition (as compared to the control condition)	(1) Efforts to spread one's behavior to others; (2) Behaviors high and low in prototypicality	People higher in preference for consistency and randomly assigned to an experimental condition will (1) report stronger intentions and greater frequency of efforts to spread one's behavior to others, and (2) report stronger intentions and greater frequency of behaviors high, but not low, in prototypicality
16	Self-monitoring x experimental condition (as compared to the control condition)	Public behaviors	People higher in self-monitoring and randomly assigned to an experimental condition will report stronger intentions and greater frequency of public behaviors

Table 2

Percentage of participants engaged in spread/consistency efforts in Study 1

<u>Spread/Consistency Effort</u>	<u>%</u>
Try to influence the proenvironmental behavior of others	49
Consistently engage in different types of behaviors	83

Note: $N = 104$.

Table 3

Coded open-ended responses for where people try to influence the proenvironmental behaviors of others in Study 1

Where Influence Others	Mentions	%
Home	24	53%
School	12	27%
Public areas	8	18%
Friends' homes	7	16%
Work	6	13%
When I see the wrong behavior	5	11%
Setting is irrelevant	3	7%
Social gatherings	3	7%
The store	3	7%
Other contexts	3	7%

Note: Forty-five participants responded to this question.

Table 4

Coded open-ended responses for when people try to influence the proenvironmental behaviors of others in Study 1

When Influence Others	Mentions	%
Other times	12	26%
At all times	11	23%
When I see the wrong behavior	11	23%
At home	5	11%
At school	5	11%
At night	5	11%
Social gatherings	5	11%
At work	3	6%
One on one	1	2%

Note: Forty-seven participants responded to this question.

Table 5

Coded open-ended responses for how people try to influence the proenvironmental behaviors of others in Study 1

How Influence Others	Mentions	%
Ask them/tell them	18	38%
Mention it/remind them	9	19%
Lead by example	8	17%
Encourage them	7	15%
Explain benefits/costs	7	15%
Conversation/ask questions	3	6%
Offer tips	3	6%
Other strategies	3	6%

Note: Forty-eight participants responded to this question.

Table 6

Coded open-ended responses for why people try to influence the proenvironmental behaviors of others in Study 1

Why Influence Others	Mentions	%
Environmental health	24	52%
Other reasons	10	22%
Limited resources	8	17%
Every action helps	5	11%
Easy to do	5	11%
Future generations	3	7%
Right thing to do	3	7%
Saves money	3	7%
People and environment interconnected	1	2%

Note: Forty-six participants responded to this question.

Table 7

Coded open-ended responses for why people consistently engage in different proenvironmental behaviors in Study 1

Why Consistent Behaviors	Mentions	%
Environmental health	34	45%
Saves money	11	14%
Other reasons	10	13%
Limited resources	9	12%
Easy to do	8	11%
Right thing to do	7	9%
Personal upbringing	6	8%
Future generations	4	5%
Feel better about self	3	4%
To influence others	3	4%
Personality responsibility	2	3%
Habit	2	3%
Society thinks I should	1	1%

Note: Seventy-six participants responded to this question.

Table 8

Coded open-ended responses for why people do not consistently engage in different proenvironmental behaviors in Study 1

Why Not Consistent Behaviors	Mentions	%
Inconvenient	5	31%
Forget	4	25%
Laziness	2	13%
Not always available	2	13%
Not enough time	2	13%
Not worth effort	2	13%
Other reason	2	13%
Not personally important	1	7%

Note: Sixteen participants responded to this question.

Table 9

Past behavioral efforts to influence the proenvironmental behavior of others in Study 1

<u>Between-Person Spread of Behavior Measures</u>	<i>M</i>	<i>SD</i>
Modeled behavior	3.28	1.60
Attempted to persuade others	1.36	1.78
Brought up in conversation	1.02	1.59

Table 10

Future intentions to influence the proenvironmental behavior of others in Study 1

Between-Person Spread of Behavior Intention Measures	<i>M</i>	<i>SD</i>
Modeled behavior	3.33	1.54
Attempted to persuade others	1.44	1.69
Brought up in conversation	1.24	1.57

Table 11

Prototypicality ratings for each proenvironmental behavior in Study 1

Behavior	<i>M</i>	<i>SD</i>
Recycle plastic, glass, and aluminum at school	6.28	1.16
Recycle paper at school	6.16	1.33
Recycle plastic, glass, and aluminum at home	6.14	1.27
Conserve electricity at home	6.05	1.27
Recycle paper at home	6.00	1.32
Conserve water at home	5.92	1.39
Recycle plastic, glass, and aluminum at friends' homes	5.76	1.47
Conserve water at school	5.75	1.47
Conserve electricity at friends' homes	5.62	1.48
Take public transportation from home to school	5.62	1.74
Conserve electricity at school	5.60	1.55
Conserve water at friends' homes	5.59	1.53
Recycle paper at friends' homes	5.58	1.56
Take public transportation from home to work	5.46	1.84
Use a reusable bag when shopping at the grocery store	5.25	2.01
Use a reusable bag when shopping at the corner store	4.96	2.01
Take public transportation from home to friends' homes	4.79	1.98
Use a reusable bag when shopping at the department store	4.77	2.07
Buy organic fruits and vegetables at the grocery store	4.45	1.95
Buy organic foods other than fruits and vegetables	4.23	1.98

Table 12

Correlations between measures assessed during the online survey in Study 2

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. RPH Intentions	4.21	1.66	--								
2. HP Intentions	4.50	1.31	.67**	--							
3. LP Intentions	2.73	1.47	.27**	.25**	--						
4. Spread Intentions	2.44	1.25	.35**	.40**	.24**	--					
5. Moral Exporting	3.27	1.09	.37**	.48**	.38**	.53**	--				
6. Environmental Attitudes	4.30	0.59	.22**	.27**	.26**	.18*	.40**	--			
7. Extraversion	3.21	0.81	-.07	-.11	-.05	.08	.06	-.18*	--		
8. PFC	5.88	1.02	.04	.05	-.06	.11	.14	-.05	-.09	--	
9. Self-Monitoring	1.54	0.14	-.08	-.06	-.03	-.02	.03	-.10	.39**	-.16*	--

Note: * $p < .05$. ** $p < .01$. RPH = recycle paper at home. HP = high prototypicality behaviors. LP = low prototypicality behaviors.

PFC = preference for consistency.

Table 13

Correlations between measures assessed during the in-person survey in Study 2

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Attitudes	2.44	1.24	--								
2. Beliefs	2.39	1.30	.28**	--							
3. Knowledge	0.31	0.36	-.06	.16	--						
4. Self-Efficacy	2.45	1.69	.40**	.15	.06	--					
5. Plans	2.06	1.58	.46**	.28**	.12	.44**	--				
6. RPH Intentions	4.77	1.34	.50**	.28**	.03	.33**	.53**	--			
7. HP Intentions	4.80	1.08	.40**	.30**	.05	.21*	.35**	.61**	--		
8. LP Intentions	2.86	1.42	.26**	.25**	.05	.03	.18*	.29**	.28**	--	
9. Spread Intentions	2.86	1.13	.28**	.20*	.00	.08	.17	.32**	.26**	.27**	--

Note: * $p < .05$. ** $p < .01$. RPH = recycle paper at home. HP = high prototypicality behaviors. LP = low prototypicality behaviors.

Table 14

Post-intervention cognitions relevant to paper recycling at home by condition in Study 2

Condition	Attitudes		Beliefs		Knowledge		Self-Efficacy		Plans	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	2.51	1.33	3.39	0.74	0.58	0.38	2.59	1.25	2.11	1.68
Modeling	2.34	1.13	1.78	1.33	0.24	0.28	2.13	1.97	1.73	1.54
Planning	2.15	1.04	2.30	1.33	0.27	0.34	2.50	1.70	2.74	0.92
Control	2.74	1.40	2.06	1.13	0.13	0.23	2.68	1.79	1.73	1.85

Table 15

Behavioral intentions over time by experimental condition in Study 2

Condition	RPH Intentions (T1)		RPH Intentions (T2)		HP Intentions (T1)		HP Intentions (T2)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	4.59	1.46	4.70	1.10	4.44	1.37	4.79	1.15
Modeling	4.13	1.77	4.85	1.42	4.59	1.37	4.79	1.21
Planning	3.96	1.87	4.77	1.36	4.38	1.34	4.69	0.96
Control	4.45	1.82	4.76	1.52	4.87	1.32	4.89	1.08

Note: RPH = recycling paper at home. HP = high prototypicality. T1 = time point one/the

online survey. T2 = time point two/the in-person lab portion.

Table 16

Behavioral intentions over time by experimental condition in Study 2

Condition	LP Intentions (T1)		LP Intention (T2)		Spread Intentions (T1)		Spread Intentions (T2)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	3.07	1.54	3.10	1.41	2.23	0.96	2.77	1.10
Modeling	2.47	1.42	2.87	1.43	2.19	1.19	2.78	0.96
Planning	2.64	1.48	3.14	1.38	2.65	1.46	3.27	1.28
Control	2.40	1.47	2.35	1.40	2.40	1.20	2.65	1.14

Note: LP = low prototypicality. T1 = time point one/the online survey. T2 = time point

two/the in-person lab portion.

Table 17

Total number of surveys participants completed in Study 3

Number of Daily Surveys Completed	<i>N</i>	%
14	43	29%
13	46	31%
12	28	19%
11	7	5%
10	7	5%
9	2	1%
8	6	4%
7	3	2%
6	3	2%
5	1	1%
4	0	0%
3	0	0%
2	1	1%
1	0	0%

Note: *N* = the number of participants who completed that given amount of daily surveys.

% = the percentage of overall participants (overall *N* = 147) who completed that given amount of daily surveys.

Table 18

Correlations between measures assessed during the first online survey in Study 3

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Past RPH	3.37	2.03	--												
2. Past HP	4.18	1.61	.64**	--											
3. Past LP	2.45	1.45	-.004	.11	--										
4. Past Spread	1.99	1.44	.46**	.51**	.14	--									
5. RPH Intentions	4.63	1.61	.59**	.52**	.05	.36**	--								
6. HP Intentions	4.56	1.45	.57**	.84**	.17*	.49**	.61**	--							
7. LP Intentions	2.82	1.51	-.08	.10	.83**	.14	.08	.17*	--						
8. Spread Intentions	2.37	1.33	.38**	.53**	.19*	.79**	.44**	.56**	.23**	--					
9. Moral Exporting	3.62	1.19	.29**	.40**	.21*	.52**	.23**	.37**	.20*	.62**	--				
10. Extraversion	3.37	0.80	.05	.12	.10	.18*	.02	.09	.11	.15	.05	--			
11. Environmental Attitudes	4.51	0.64	.22**	.22**	.30**	.20*	.29**	.30**	.33**	.28**	.51**	-.08	--		
12. PFC	5.97	1.04	.08	-.01	-.05	-.002	-.06	-.02	-.03	-.001	.05	-.13	-.01	--	
13. Self-Monitoring	1.53	0.16	-.02	.03	.01	-.01	.16	.04	.004	.03	.02	.33**	-.05	-.04	--

Note: * $p < .05$. ** $p < .01$. RPH = recycle paper at home. HP = high prototypicality behaviors. LP = low prototypicality behaviors.

PFC = preference for consistency.

Table 19

Correlations between measures assessed during the in-person survey in Study 3

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Attitudes	2.36	1.35	--								
2. Beliefs	2.02	1.55	.24**	--							
3. Knowledge	0.31	0.34	.004	.20*	--						
4. Self-Efficacy	2.34	1.78	.18*	.12	.02	--					
5. Plans	1.86	1.84	.34**	.24**	.01	.53**	--				
6. RPH Intentions	4.63	1.61	.48**	.18*	.03	.44**	.59**	--			
7. HP Intentions	4.82	1.36	.38**	.21**	.02	.27**	.40**	.71**	--		
8. LP Intentions	2.83	1.41	.14	.18*	-.01	-.06	-.03	.16	.21*	--	
9. Spread Intentions	2.87	1.31	.34**	.35**	.05	.13	.31**	.50**	.52**	.30**	--

Note: * $p < .05$. ** $p < .01$. RPH = recycle paper at home. HP = high prototypicality behaviors. LP = low prototypicality behaviors.

Table 20

Correlations between measures assessed during final online survey in Study 3

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Attitudes	2.81	1.14	--								
2. Beliefs	2.33	1.39	.51**	--							
3. Knowledge	0.29	0.32	.15	.11	--						
4. Self-Efficacy	2.59	1.56	.29**	.16	.10	--					
5. Plans	2.27	1.67	.57**	.22**	.10	.61**	--				
6. RPH Intentions	4.77	1.47	.65**	.30**	.20*	.53**	.67**	--			
7. HP Intentions	4.85	1.21	.53**	.30**	.13	.35**	.51**	.73**	--		
8. LP Intentions	3.04	1.57	.17*	.19*	-.05	.20*	.17*	.18*	.20*	--	
9. Spread Intentions	2.96	1.50	.48**	.38**	-.04	.18*	.33**	.35**	.37**	.44**	--

Note: * $p < .05$. ** $p < .01$. RPH = recycle paper at home. HP = high prototypicality behaviors. LP = low prototypicality behaviors.

Table 21

Post-intervention cognitions relevant to paper recycling at home by condition during the in-person survey in Study 3

Condition	Attitudes		Beliefs		Knowledge		Self-Efficacy		Plans	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	2.53	1.47	3.05	1.01	0.69	0.30	2.39	1.89	1.78	2.10
Modeling	2.28	1.38	1.46	1.63	0.22	0.25	2.45	1.62	2.10	1.61
Planning	2.27	1.33	1.88	1.44	0.22	0.28	2.65	1.56	2.21	1.51
Control	2.36	1.23	1.77	1.60	0.15	0.23	1.88	2.00	1.34	2.06

Table 22

Post-intervention cognitions relevant to paper recycling at home by condition during the final online survey in Study 3

Condition	Attitudes		Beliefs		Knowledge		Self-Efficacy		Plans	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	3.16	0.87	3.04	1.14	0.54	0.31	2.43	1.53	2.34	1.72
Modeling	2.69	1.09	2.03	1.47	0.21	0.28	2.85	1.41	2.57	1.41
Planning	2.78	1.17	2.13	1.29	0.17	0.27	2.80	1.28	2.71	1.07
Control	2.60	1.36	2.14	1.45	0.24	0.28	2.22	1.93	1.44	2.09

Table 23

Behavioral intentions over time by experimental condition in Study 3

Condition	RPH Intentions (T1)		RPH Intentions (T2)		RPH Intentions (T3)		HP Intentions (T1)		HP Intentions (T2)		HP Intentions (T3)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	4.17	2.02	4.63	1.56	4.91	1.58	4.41	1.56	4.90	1.26	4.89	1.34
Modeling	4.41	1.99	5.03	1.19	4.91	1.49	4.59	1.60	5.05	1.32	4.92	1.35
Planning	4.31	1.72	4.62	1.66	4.71	1.27	4.43	1.42	4.63	1.57	4.79	1.12
Control	4.20	1.68	4.24	1.91	4.53	1.58	4.63	1.27	4.73	1.24	4.77	1.05

Note: RPH = recycling paper at home. HP = high prototypicality. T1 = time point one/the first online survey. T2 = time point two/the in-person lab survey. T3 = time point three/ the final online survey.

Table 24

Behavioral intentions over time by experimental condition in Study 3

Condition	LP Intentions (T1)		LP Intentions (T2)		LP Intentions (T3)		Spread Intentions (T1)		Spread Intentions (T2)		Spread Intentions (T3)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>M</i>	<i>SD</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message	3.07	1.26	3.07	1.22	3.15	1.41	2.33	1.38	3.18	1.18	3.22	1.38
Modeling	2.70	1.71	2.68	1.71	2.98	1.85	2.29	1.31	2.95	1.35	2.72	1.44
Planning	2.72	1.47	2.67	1.33	3.10	1.52	2.29	1.29	2.70	1.33	3.28	1.73
Control	2.86	1.48	2.93	1.33	2.97	1.58	2.35	1.46	2.69	1.33	2.63	1.36

Note: RPH = recycling paper at home. LP = low prototypicality. T1 = time point one/the first online survey. T2 = time point two/the in-person lab survey. T3 = time point three/ the final online survey.

Figure 1

Proposed model of how behaviors spread between individuals

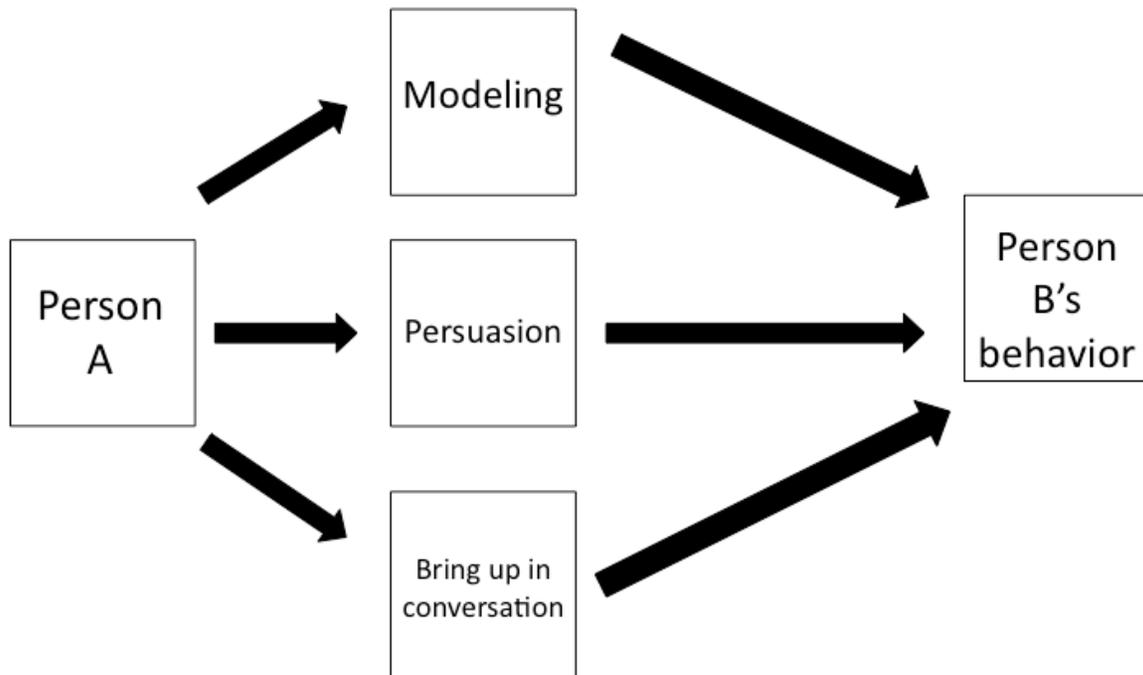


Figure 2

Proposed model of how behaviors spread within an individual from a target behavior to a non-target behavior

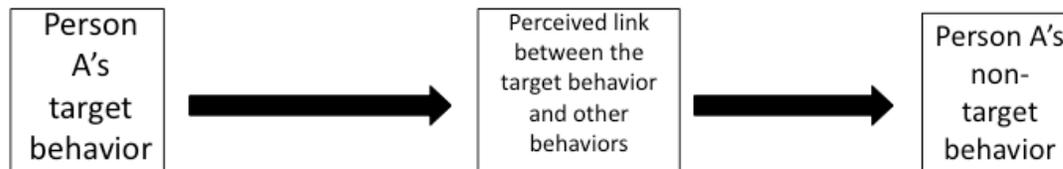
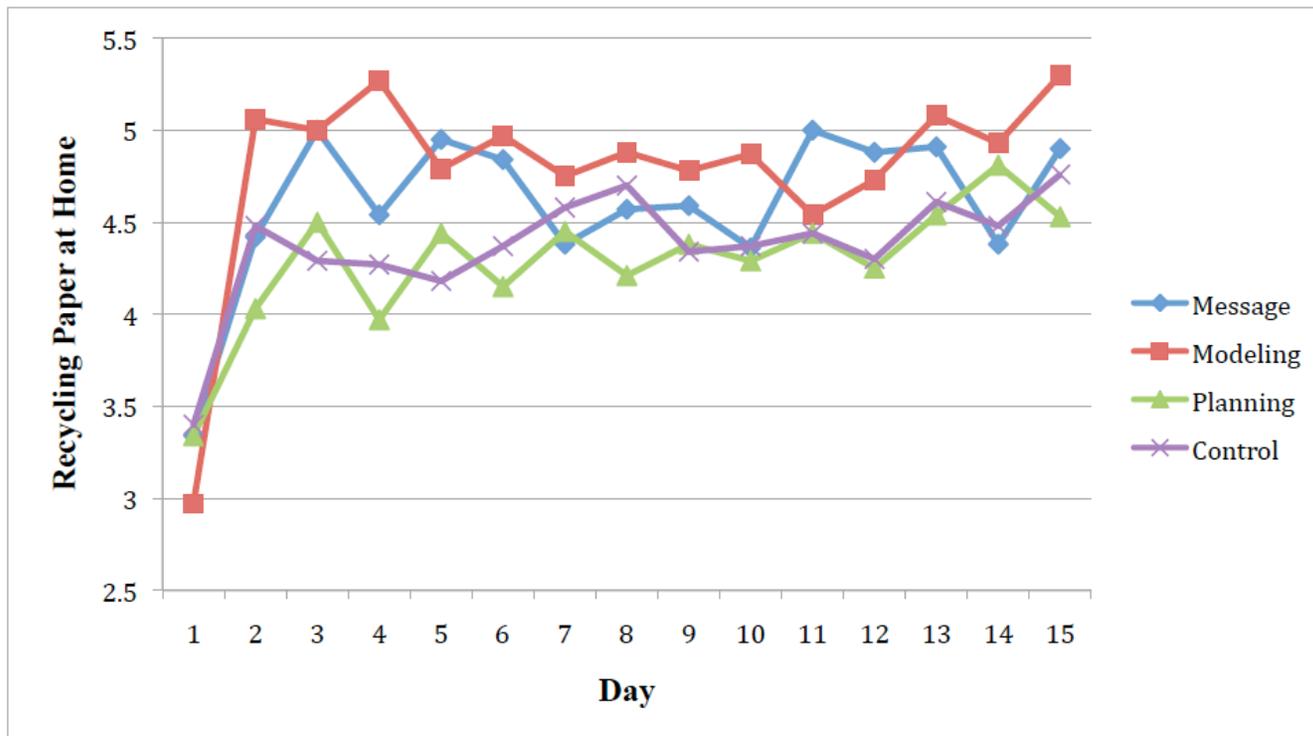


Figure 3

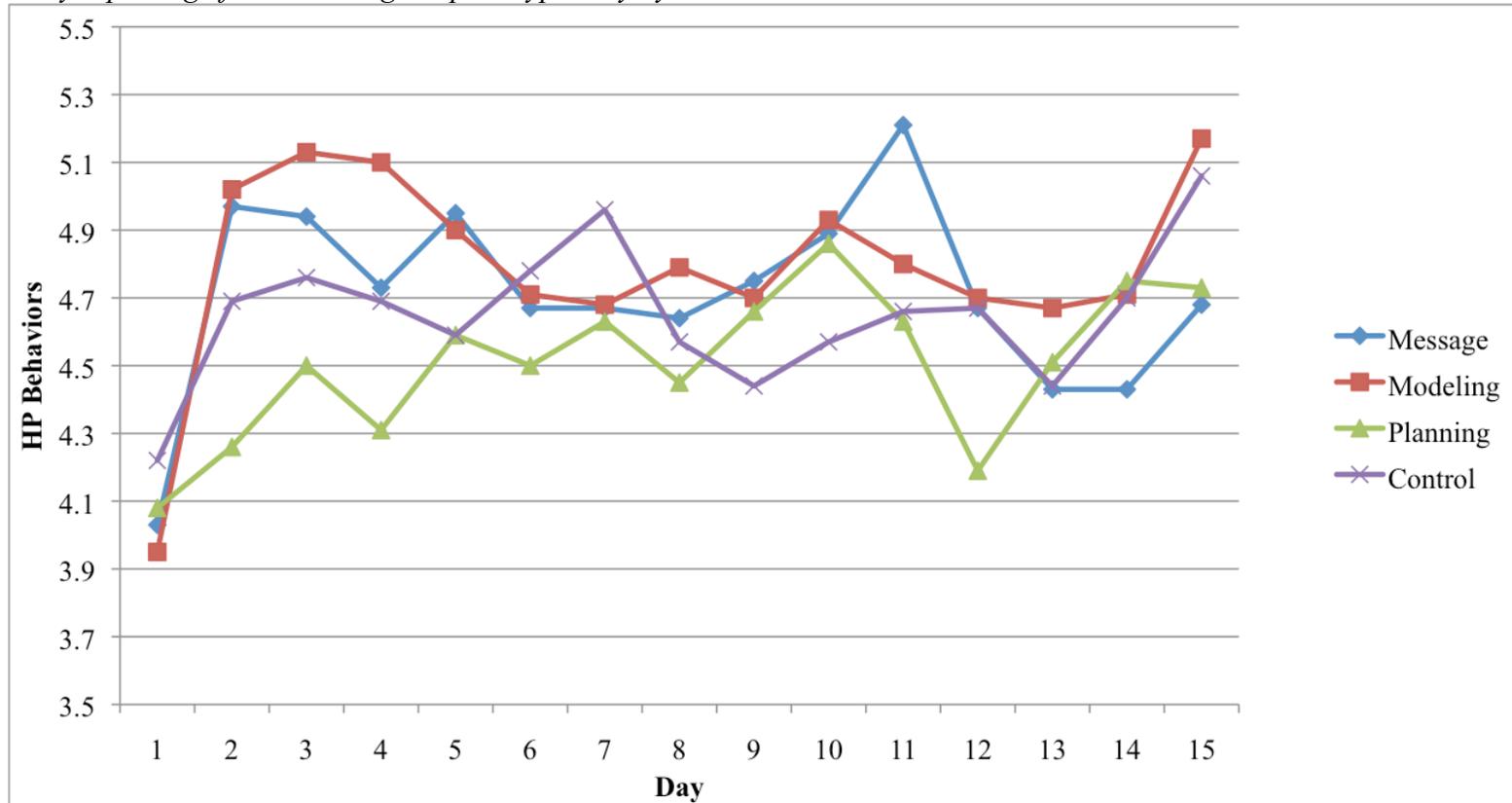
Daily reporting of recycling paper at home by condition



Note: Day 1 on the graph represents the baseline measure of behavior; subsequent time points are days during the two-week text surveys.

Figure 4

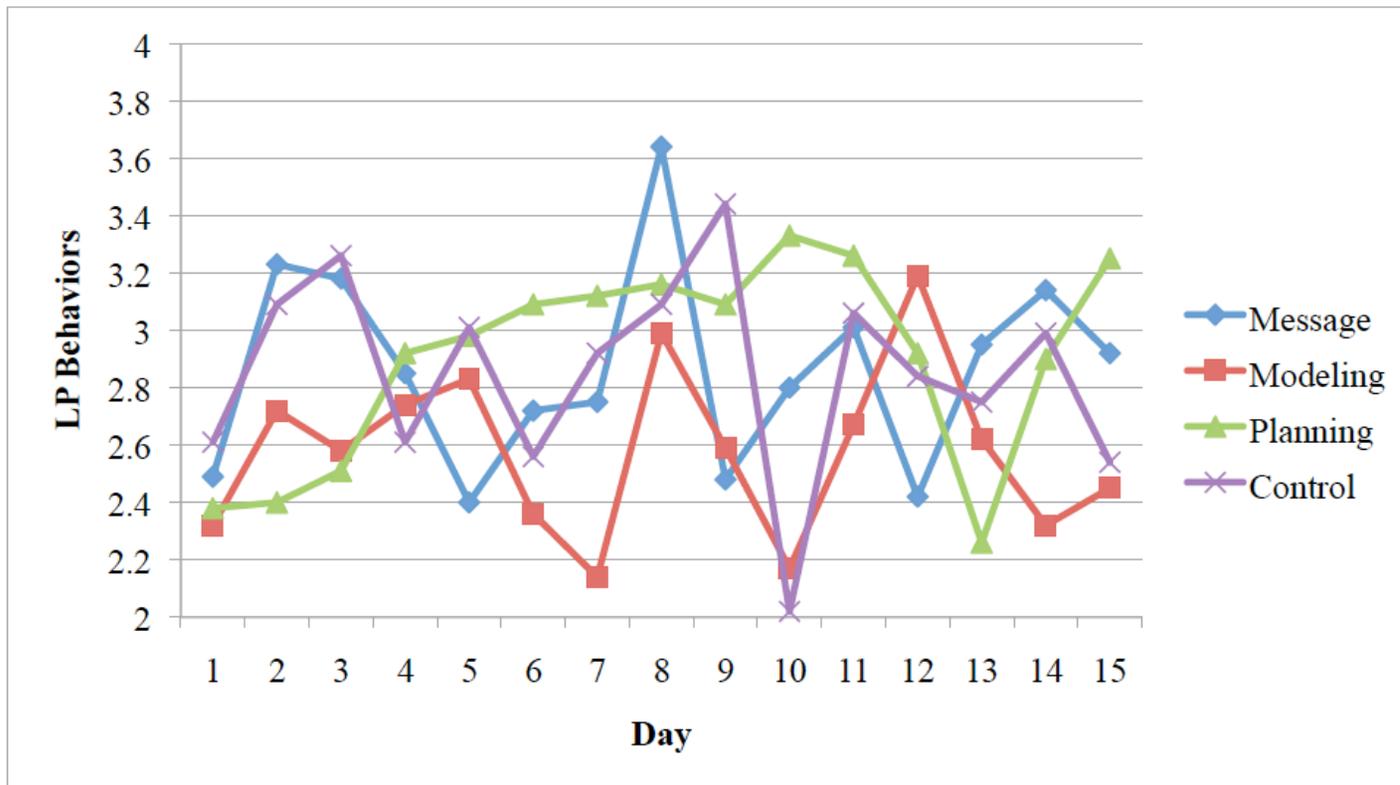
Daily reporting of behavior high in prototypicality by condition



Note: Day 1 on the graph represents the baseline measure of behavior; subsequent time points are days during the two-week text surveys. HP = high prototypicality.

Figure 5

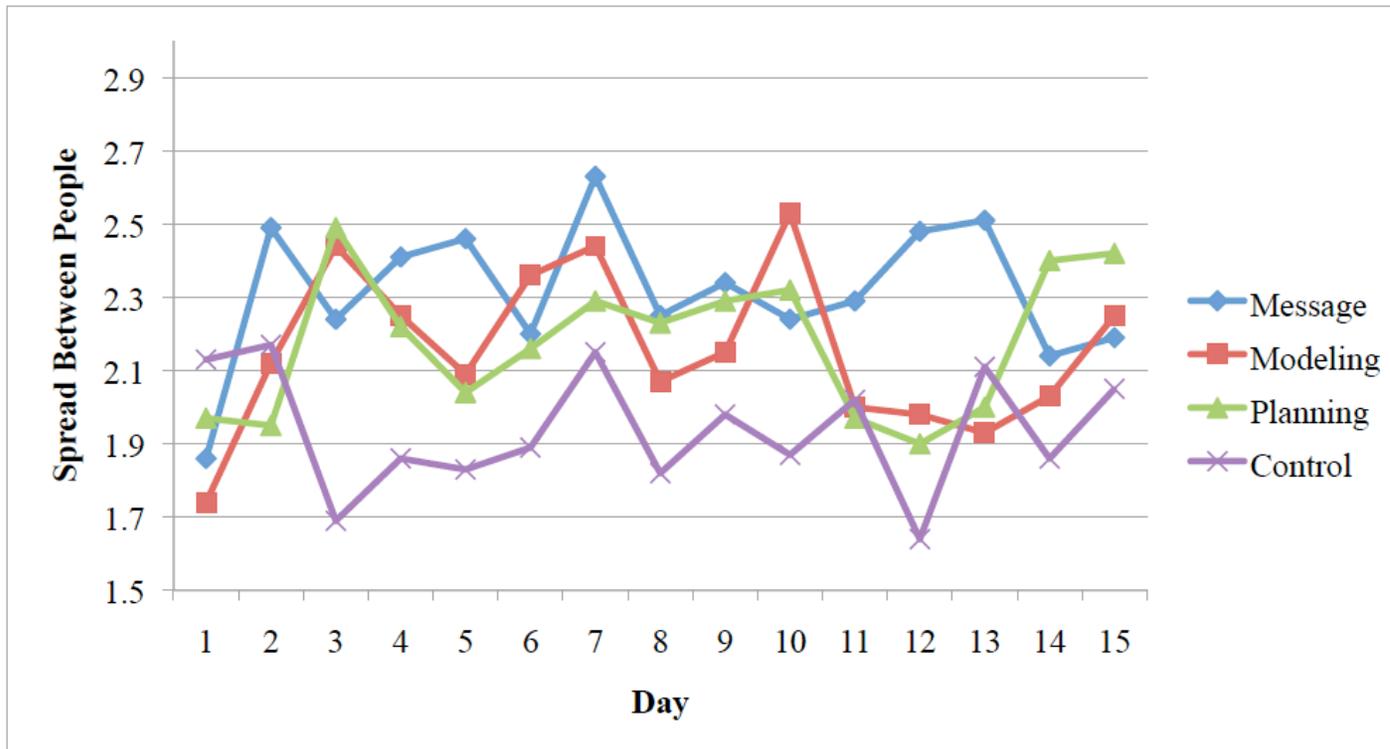
Daily reporting of behavior low in prototypicality by condition



Note: Day 1 on the graph represents the baseline measure of behavior; subsequent time points are days during the two-week text surveys. LP = low prototypicality.

Figure 6

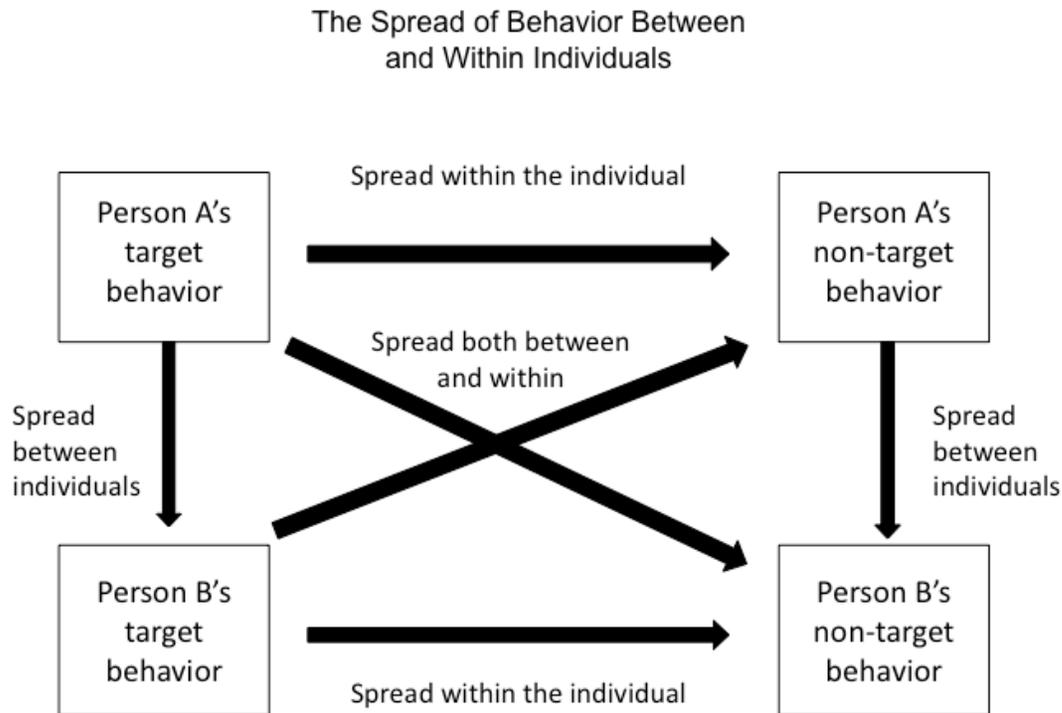
Daily reporting of efforts to spread one's behavior to others by condition



Note: Day 1 on the graph represents the baseline measure of behavior; subsequent time points are days during the two-week text surveys.

Figure 7

Proposed model of the spread of behavior both between and within individuals



References

- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology, 25*, 273-291.
- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology, 27*, 265-276.
- Aronson, E., & Gonzales, M. H. (1990). Alternative social influence processes applied to energy conservation. In Edwards, J., Tinsdale, R. S. (Eds.), *Social influence processes and prevention: Social psychological applications to social issues* (Vol. 1, pp. 301-325). New York, NY: Plenum.
- Attari, S. Z., DeKay, M. L., Davidson, C. I., & Bruine de Bruin, W. (2010). Public perceptions of energy consumption and savings. *Proceedings of the National Academy of Sciences of the United States of America, 107*, 16054-16059.
- Bamberg, S. (2006). Is a residential relocation a good opportunity to change people's travel behavior? Results from a theory-driven intervention study. *Environment and Behavior, 38*, 820-840.
- Bandura, A., Ross, D., & Ross, S. A. (1963). Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology, 66*, 3-11.
- Baumeister, R. F., & Tice, D. M. (1988). Metatracts. *Journal of Personality, 56*, 571-589.

- Beaman, A. L., Cole, C. M., Preston, M., Klentz, B., & Steblay, N M. (1983). Fifteen years of foot-in-the-door research: A meta-analysis. *Personality and Social Psychology Bulletin*, *9*, 181-196.
- Bem, D. J. (1967). Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological Review*, *74*, 183-200.
- Bem, D. J., & Allen, A. (1974). On predicting some of the people some of the time: The search for cross-situational consistencies in behavior. *Psychological Review*, *81*, 506-520.
- Benet-Martínez, V. & John, O. P. (1998). Los cinco grandes across cultures and ethnic groups: Multitrait multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology*, *75*, 729-750.
- Bond, R. M., Fariss, C. J., Jones, J. J., Kramer, A. D. I., Marlow, C., Settle, J. E., & Fowler, J. H. (2012). A 61-million-person experiment in social influence and political mobilization. *Nature*, *489*, 295-298.
- Bono, J. E., & Ilies, R. (2006). Charisma, positive emotions, and mood contagion. *The Leadership Quarterly*, *17*, 317-344.
- Brown, J. J., & Reingen, P. H. (1987). Social ties and word-of-mouth referral behavior. *Journal of Consumer Research*, *14*, 350-362.
- Brown, M. A. (1984). Change mechanisms in the diffusion residential energy conservation practices: An empirical study. *Technological Forecasting and Social Change*, *25*, 123-138.

- Burger, J. M. (1999). The foot-in-the-door compliance procedure: A multiple-process analysis and review. *Personality and Social Psychology Review*, 3, 303-325.
- Burn, S. M. (1991). Social psychology and the stimulation of recycling behaviors: The block leader approach. *Journal of Applied Social Psychology*, 21, 611-629.
- Burt, R. S. (1987). Social contagion and innovation: Cohesion versus Structural Equivalence. *American Journal of Sociology*, 92, 1287-135.
- Buss, D. M., & Craik, K. H. (1980). The frequency concept of disposition: Dominance and prototypically dominant acts. *Journal of Personality*, 48, 379-392.
- Caldwell, D. F., & Burger, J. M. (1997). Personality and social influence strategies in the workplace. *Personality and Social Psychology Bulletin*, 23, 1003-1012.
- Carment, D. W., Miles, C. G., & Cervin, V. B. (1965). Persuasiveness and persuasibility as related to intelligence and extraversion. *British Journal of Clinical Psychology*, 4, 1-7.
- Christakis, N. A., & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years. *The New England Journal of Medicine*, 357, 370-379.
- Christakis, N. A., & Fowler, J. H. (2013). Social contagion theory: Examining dynamic social networks and human behavior. *Statistics in Medicine*, 32, 556-577.
- Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12, 105-109.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, 1015-1026.

- Cialdini, R. B., Trost, M. R., & Newsom, J. T. (1995). Preference for consistency: The development of a valid measure and the discovery of surprising behavioral implications. *Journal of Personality and Social Psychology, 69*, 318-328.
- Clark, C. F., Kotchen, M. J., & Moore, M. R. (2003). Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology, 23*, 237-246.
- Clary, E. G., Snyder, M., Ridge, R. D., Miene, P. K., & Haugen, J. A. (1994). Matching messages to motives in persuasion: A functional approach to promoting volunteerism. *Journal of Applied Social Psychology, 24*, 1129-1146.
- Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. In S. Clayton, & S. Opatow (Eds.), *Identity and the natural environment* (pp. 45-65). Cambridge, MA: MIT Press.
- Compton, J., & Pfau, M. (2009). Spreading inoculation: Inoculation, resistance to influence, and word-of-mouth communication. *Communication Theory, 19*, 9-28.
- Costa, P. T., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology, 38*, 668-678.
- Costanzo, M., Archer, D., Aronson, E., & Pettigrew, T. (1986). Energy conservation behavior: The difficult path from information to action. *American Psychologist, 41*, 521-528.
- Cummings, G. (2011). *Understanding the new statistics: Effect sizes, confidence intervals, and meta-analysis*. New York, NY: Routledge.

- Daamen, D. D. L., Staats, H., Wilke, H. A. M., & Engelen, M. (2001). Improving environmental behavior in companies: The effectiveness of tailored versus nontailored interventions. *Environment and Behavior, 33*, 229-248.
- Darley, J. M. (1977/78). Energy conservation techniques as innovations, and their diffusion. *Energy and Buildings, 1*, 339-343.
- Darley, J. M., & Beniger, J. R. (1981). Diffusion of energy-conserving innovation. *Journal of Social Issues, 37*, 150-171.
- De Young, R. (1993). Changing behavior and making it stick: The conceptualization and management of conservation behavior. *Environment and Behavior, 25*, 485-505.
- DeJong, W. (1979). An examination of self-perception mediation of the foot-in-the-door effect. *Journal of Personality and Social Psychology, 37*, 2221-2239.
- Derzon, J. H., & Lipsey, M. W. (2002). A meta-analysis of the effectiveness of mass-communication for changing substance-use knowledge, attitudes, and behaviour. In W. D. Crano, & M. Burgoon (Eds.), *Mass media and drug prevention: Classic and contemporary theories and research* (pp. 231-258). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Dickerson, C. A., Thibodeau, R., Aronson, E., & Miller, D. (1992). Using cognitive dissonance to encourage water conservation. *Journal of Applied Social Psychology, 22*, 841-854.
- Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenberg, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon

emissions. *Proceedings of the National Academy of Sciences of the United States of America*, *106*, 18452-18456.

Dolan, P., & Galizzi, M. M. (2015). Like ripples on a pond: Behavioral spillovers and their implications for research and policy. *Journal of Economic Psychology*, *47*, 1-16.

Duffy, S., & Verges, M. (2009). It matters a hole lot: Perceptual affordances of waste containers influence recycling compliance. *Environment and Behavior*, *41*, 741-749.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). New trends in measuring environmental attitudes: Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, *56*, 425-442.

Dutton, G. R., Napolitano, M. A., Whiteley, J. A., & Marcus, B. H. (2008). Is physical activity a gateway behavior for diet? Findings from a physical activity trial. *Preventive Medicine*, *46*, 216-221.

Environmental Protection Agency. (2014). Frequent Questions. Retrieved from <http://www.epa.gov/osw/consERVE/materials/paper/faqs.htm>

Evans, L., Maio, G. R., Corner, A., Hodgetts, C. J., Ahmed, S., & Hahn, U. (2013). Self-interest and pro-environmental behaviour. *Nature Climate Change*, *3*, 122-125.

Faul F., Erdfelder, E., Lang, A., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191.

- Feinberg, M., & Willer, R. (2011). Apocalypse soon? Dire messages reduce belief in global warming by contradicting just-world beliefs. *Psychological Science, 22*, 34-38.
- Feygina, I., Jost, J. T., & Goldsmith, R. E. (2010). System justification, the denial of global warming, and the possibility of “System-Sanctioned Change.” *Personality and Social Psychology Bulletin, 36*, 326-338.
- Foster, S., Giles-Corti, B., & Knuiman M. (2011). Creating safe walkable streetscapes: Does house design and upkeep discourage incivilities in suburban neighbourhoods. *Journal of Environmental Psychology, 31*, 79-88.
- Freedman, J. L., & Fraser, S. C. (1966). Compliance without pressure: The foot-in-the-door technique. *Journal of Personality and Social Psychology, 4*, 195-202.
- Freeman, L. C. (1978-1979). Centrality in social networks conceptual clarification. *Social Networks, 1*, 215-239.
- Fujii, S. (2006). Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. *Journal of Environmental Psychology, 26*, 262-268.
- Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing: Toward an ecological psychology* (pp. 67-82). Hillsdale, NJ: Erlbaum.
- Gifford, R. (2014). Environmental psychology matters. *Annual Review of Psychology, 65*, 541-579.

- Girvan, M., & Newman, M. E. J. (2002). Community structure in social and biological networks. *Proceedings of the National Academy of Sciences of the United States of America*, *99*, 7821-7826.
- Goffman, E. (1959). *The presentation of self in everyday life*. Garden City, NY: Anchor Books.
- Goldstein, N. J., Cialdini, R.B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research*, *35*, 472-482.
- Gosling, S. D., Ko, S. J., Mannarelli, T., & Morris, M. E. (2002). A room with a cue: Personality judgments based on the offices and bedrooms. *Journal of Personality and Social Psychology*, *82*, 379-398.
- Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, *96*, 1029-1046.
- Hawkins, R. P., Kreuter, M., Resnicow, K., Fishbein, M., & Dijkstra, A. (2008). Understanding tailoring in communicating about health. *Health Education Research*, *23*, 454-466.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*, 61-135.
- Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on food intake: A normative interpretation. *Psychological Bulletin*, *129*, 873-886.

- Hyde, M. K. & White, K. M. (2013). A test of three interventions to promote people's communication of their consent for organ donation. *Psychology & Health, 28*, 399-417.
- Kaiser, F. G., & Carmen, K. (2001). Disclosing situational constraints to ecological behavior: A confirmatory application of the mixed Rasch model. *European Journal of Psychological Assessment, 17*, 212-221.
- Karlin, B., Davis, N., Sanguinetti, K. G., Kirby, D., & Stokols, D. (2014). Dimensions of conservation: Exploring differences among energy behaviors. *Environment and Behavior, 46*, 423-452.
- Kazdin, A. E. (2009). Psychological science's contributions to a sustainable environment: Extending our reach to a grand challenge of society. *American Psychologist, 64*, 339-356.
- Keizer, K., Lindenberg, S., & Steg, L. (2008). The spreading of disorder. *Science, 322*, 1681-1685.
- Kenrick, D. T., & Stringfield, D. O. (1980). Personality traits and the eye of the beholder: crossing some traditional philosophical boundaries in the search for consistency in all of the people. *Psychological Review, 87*, 88-104.
- King, A. C., Castro, C. M., Buman, M. P., Hekler, E. B., Urizar, G. G., & Ahn, D. K. (2013). Behavioral impacts of sequentially versus simultaneously delivered dietary plus physical activity interventions: The CALM trial. *Annals of Behavioral Medicine, 46*, 157-168.

- Kormos, C., & Gifford, R. (2014). The validity of self-report measures of proenvironmental behavior: A meta-analytic review. *Journal of Environmental Psychology, 40*, 359-371.
- Lanzini, P., & Thøgersen, J. (2014). Behavioural spillover in the environmental domain: An intervention study. *Journal of Environmental Psychology, 40*, 381-390.
- Leary, M. R., & Kowalski, R. M. (1990). Impression management: A literature review and two-component model. *Psychological Bulletin, 107*, 34-47.
- Littleford, C., Ryley, T. J., & Firth, S. K. (2014). Context, control and the spillover of energy use behaviours between office and home settings. *Journal of Environmental Psychology, 40*, 157-166.
- Longoni, C., Gollwitzer, P. M., & Oettingen, G. (2014). A green paradox: Validating green choices has ironic effects on behavior, cognition, and perception. *Journal of Experimental Social Psychology, 50*, 158-165.
- Luszczynska, A. (2006). An implementation intentions intervention, the use of a planning strategy, and physical activity after myocardial infarction. *Social Science & Medicine, 62*, 900-908.
- Luyben, P. D., & Bailey, J. S. (1979). Newspaper recycling: The effects of rewards and proximity of containers. *Environment and Behavior, 11*, 539-557.
- Maki, A., & Rothman, A. J. (in preparation). Recycling and conservation intentions and behaviors: Do considerations of the setting and the type of behavior matter?
- Mata, J., Silva, M. N., Vieira, P. N., Carraça, E. V., Andrade, A. M., Coutinho, S. R., Sardinha, L. B., & Teixeira, P. J. (2009). Motivational “spill-over” during weight

- control: Increased self-determination and exercise intrinsic motivation predict eating self-regulation. *Health Psychology, 28*, 709-716.
- Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology, 24*, 503-515.
- McCann, J. A., Partin, R. W., Rapoport, R. B., & Stone, W. J. (1996). Presidential nomination campaigns and party mobilization: An assessment of spillover effects. *American Journal of Political Science, 40*, 756-767.
- Milfont, T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology, 30*, 80-94.
- Milfont, T. L., Duckitt, J., & Cameron, L. D. (2006). A cross-cultural study of environmental motive concerns and their implications for proenvironmental behavior. *Environment and Behavior, 38*, 745-767.
- Mistry, C. D., Sweet, S. N., Rhodes, R. E., & Latimer-Cheung, A. E. (2015). Text2Plan: Exploring changes in the quantity and quality of action plans and physical activity in a text messaging intervention. *Psychology & Health, 30*, 839-856.
- Müller-Riemenschneider, F., Reinhold, T., Nocon, M., & Willich, S. N. (2008). Long-term effectiveness of interventions promoting physical activity: A systematic review. *Preventive Medicine, 47*, 354-368.
- Noonan, D. S., Hsieh, L., C., & Matisoff, D. (2011). Spatial effects in energy-efficient residential HVAC technology adoption. *Environment and Behavior, 45*, 476-503.

- Olli, E., Grendstad, G., & Wollebaek, D. (2001). Correlations of environmental behaviors: Bringing back social context. *Environment and Behavior*, *33*, 181-208.
- Oreg, S., & Sverdlik, N. (2014). Source personality and persuasiveness: Big Five predispositions to being persuasive and the role of message involvement. *Journal of Personality*, *82*, 250-264.
- Osbaldiston, R., & Schott, J. P. (2012). Environmental sustainability and behavioral science: Meta-analysis of proenvironmental behavior experiments. *Environment and Behavior*, *44*, 257-299.
- Pelletier, L. G., & Sharp, E. (2008). Persuasive communication and proenvironmental behaviours: How message tailoring and message framing can improve the integration of behaviours through self-determined motivation. *Canadian Psychology*, *49*, 210-217.
- Penner, L. A., Fritzsche, B. A., Craiger, J. P., & Frefield, T. R. (1995). Measuring the prosocial personality. In J. Butcher & C. D. Spielberger (Eds.), *Advances in personality assessment* (Vol. 10). Hillsdale, NJ: Lawrence Erlbaum.
- Peterson, B., Smith, J. A., Tannenbaum, D., & Shaw, M. P. (2009). On the “exporting” of morality: Its relation to political conservatism and epistemic motivation. *Social Justice Research*, *22*, 206-230.
- Prochaska, J. J., Velicer, W. F., Nigg, C. R., & Prochaska, J. O. (2008). Methods of quantifying change in multiple risk factor interventions. *Preventive Medicine*, *46*, 260-265.

- Rice, L., & Markey, P. M. (2009). The role of extraversion and neuroticism in influencing anxiety following computer-mediated interactions. *Personality and Individual Differences, 46*, 35-39.
- Rise, J., Thompson, M., & Verplanken, B. (2003). Measuring implementation intentions in the context of the theory of planned behavior. *Scandinavian Journal of Psychology, 44*, 87-95.
- Rodgers, J. L., & Rowe, D. C. (1993). Social contagion and adolescent sexual behavior: A developmental EMOSA model. *Psychological Review, 100*, 479-510.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Rosch, E. (1975). Cognitive representation of semantic categories. *Journal of Experimental Psychology, 104*, 192-233.
- Rothman, A. J. (2000). Toward a theory-based analysis of behavioral maintenance. *Health Psychology, 19*, 64-69.
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin, 121*, 3-19.
- Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77*, 313-322.
- Schwarz, G. E. (1978). Estimating the dimensions of a model. *Annals of Statistics, 6*, 461-464.
- Seltman, H. J. (2014). *Experimental Design and Analysis*. Retrieved from <http://www.stat.cmu.edu/~hseltman/309/Book/Book.pdf>

- Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2005). The interplay between goal intentions and implementation intentions. *Personality and Social Psychology Bulletin, 31*, 87-98.
- Shestowsky, D., Wegener, D. T., & Fabrigar, L. R. (1998). Need for cognition and interpersonal influence: Individual differences in impact on dyadic decisions. *Journal of Personality and Social Psychology, 74*, 1317-1328.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*, 1359-1366.
- Simonsohn, U. (in press). Small telescopes: Detestability and the evaluation of replication results. *Psychological Science*.
- Smith, K. P., & Christakis, N. A. (2008). Social networks and health. *Annual Review of Sociology, 34*, 405-429.
- Snyder, M. (1974). Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology, 30*, 526-537.
- Snyder, M., & Ickes, W. (1985). Personality and social behavior. In G. Lindzey & E. Aronson (Eds.), *The handbook of social psychology: Vol. 2*. (3rd ed., pp. 883-948). New York: Random House.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology, 13*, 290-312.

- Southwell, B. G., & Murphy, J. (2014). Weatherization behavior and social context: The influence of factual knowledge and social interaction. *Energy Research & Social Science, 2*, 59-65.
- Southwell, B. G., Murphy, J., DeWaters, J. E., LeBaron, P. A., & Willoughby, J. F. (2014). Energy information sharing in social networks: The roles of objective knowledge and perceived understanding. *Journal of Sustainability Education*, June.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*, 309-317.
- Stern, P. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*, 407-424.
- Stern, P. C., & Dietz, T. (1994). The value basis of environmental concern. *Journal of Social Issues, 50*, 65-84.
- Stern, P. C., Dietz, T., & Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and Behavior, 25*, 322-348.
- Swim, J. K., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., Stern, P., & Weber, E. (2009). *Psychology and global climate change: Addressing a multifaceted phenomenon and set of challenges*. Retrieved from <https://www.apa.org/science/about/publications/climate-change-booklet.pdf>
- Thøgersen, J. (1999). Spillover processes in the development of a sustainable consumption pattern. *Journal of Economic Psychology, 20*, 53-81.

- Thøgersen, J., & Crompton, T. (2009). Simple and painless? The limitations of spillover in environmental campaigning. *Journal of Consumer Policy*, *32*, 141-163.
- Thøgersen, J. & Ölander, F. (2003). Spillover of environmentally-friendly consumer behaviour. *Journal of Environmental Psychology*, *23*, 225-236.
- Thøgersen, J. & Ölander, F. (2006). To what degree are environmentally beneficial choices reflective of a general conservation stance? *Environment and Behavior*, *38*, 550-569.
- Tolan, P. H., Gorman-Smith, D., Henry, D., & Schoeny, M. (2009). *Prevention Science*, *10*, 287-297.
- Truelove, H. B., Carrico, A. R., Weber, E. U., Raimi, K. T., & Vandenberg, M. P. (2014). Positive and negative spillover of pro-environmental behavior: An integrative review and theoretical framework. *Global Environmental Change*, *29*, 127-138.
- Vohs, K. D., Redden, J. P., & Rahinel, R. (2013). Physical order produces health choices, generosity, conventionality, whereas disorder produces creativity. *Psychological Science*, *24*, 1860-1867.
- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, *132*, 249-268.
- White, K. M., & Hyde, M. K. (2012). The role of self-perceptions in the prediction of household recycling behavior in Australia. *Environment and Behavior*, *44*, 785-799.

- Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*, 305-314.
- Wiernik, B. M., Ones, D. S., & Dilchert, S. (2013). Age and environmental sustainability: A meta-analysis. *Journal of Managerial Psychology, 28*, 826-856.
- Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior, 27*, 591-615.
- Zaltman, G., & Duncan, R. (1977). *Strategies for planned change*. New York: John Wiley & Sons.
- Zelezny, L. C., Chua, P., & Aldrich, C. (2000). New ways of thinking about environmentalism: Elaborating on gender differences in environmentalism. *Journal of Social Issues, 56*, 443-457.
- Zhang, H. & Vorobeychik, Y. (2015). Data-driven agent-based modeling, with application to rooftop solar adoption. In Bordini, Elkind, Weiss, & Yolum (Eds.), *Proceedings of the 14th International Conference on Autonomous Agents and Multiagent Systems*. Istanbul, Turkey.

Appendix 1: Study Measures

Study 1 Measures

In this survey you will be asked to respond to items relating to environmental behavior, such as recycling and conservation, as well as your view of those behaviors. While responding to these items, please keep the following in mind:

- a. *Home* is defined as your current place of residence, whether that is your dorm, apartment, house, etc.
- b. *School* is defined as all events that you participate in on the University of Minnesota campus.
- c. “*Friends’ homes*” refer to the homes of your acquaintances you spend time at.
- d. If the behavior described is not applicable to you, please circle N/A.

Prototypicality Measures

This part of the study has to do with what we have in mind when we use the words that refer to categories. Let’s take the word *red* for example. Close your eyes and imagine a true red. Now imagine an orange-ish red...imagine a purple red. Although you might still name the orange-red or the purple-red with the term *red*, they are not as good examples of red (as clear cases of what *red* refers to) as the clear “true” red. In short, some reds are “redder” than others.

In this specific study, you are asked to judge how good an example of a category various instances of each category are. The category is *behaviors that affect the natural environment*. Below is a list of 12 acts. You are to use a 7-point scale to rate how good an example of that category each act is. A “7” means that you feel that the behavior is a very good example of your idea of something that affects the natural environment; a “1” means that you feel that the behavior fits very poorly with your idea something that affects the natural environment (or it is not a member of that category at all). A “4”

means you feel the behavior fits moderately well. Use the other numerals of the 7-point scale to indicate intermediate judgments.

Recycling paper at home

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Recycling paper at school

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Recycling paper in friends' homes

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Recycling plastic, glass, and aluminum at home

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Recycling plastic, glass, and aluminum at school

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Recycling plastic, glass, and aluminum in friends' homes

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Conserving water at home

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Conserving water at school

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Conserving water in friends' homes

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Conserving electricity at home

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Conserving electricity at school

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Conserving electricity in friends' homes

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Taking public transportation from home to school

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Taking public transportation from home to work

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Taking public transportation from home to a friends' home

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Buying organic fruits and vegetables at the grocery store

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Buying organic foods other than fruits and vegetables at the grocery store

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Using a reusable bag when shopping at the grocery store

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Using a reusable bag when shopping at the department store

1	2	3	4	5	6	7	N/A
very poor fit			moderate fit			very good fit	

Similarity of Behaviors

not at all similar						very similar
Recycling plastic, glass, and aluminum and conserving electricity						
	0	1	2	3	4	
not at all similar						very similar
Recycling plastic, glass, and aluminum and taking public transportation						
	0	1	2	3	4	
not at all similar						very similar
Recycling plastic, glass, and aluminum and buying organic food						
	0	1	2	3	4	
not at all similar						very similar
Recycling plastic, glass, and aluminum and using a reusable bag at the store						
	0	1	2	3	4	
not at all similar						very similar
Conserving water and conserving electricity						
	0	1	2	3	4	
not at all similar						very similar
Conserving water and taking public transportation						
	0	1	2	3	4	
not at all similar						very similar
Conserving water and buying organic food						
	0	1	2	3	4	
not at all similar						very similar

not at all similar

very similar

Using a disposable bag at grocery stores and using a disposable bag at department stores

0 1 2 3 4

not at all similar

very similar

Open-ended Questions

Do you ever try to influence the environmental behaviors (e.g., recycling, conservation)

of other people? Yes _____ No _____

If yes:

Where do you try to influence the environmental behaviors of other people?

When (times of the day or at specific events) do you try to influence the environmental behaviors of other people?

How do you try to influence the environmental behaviors of other people?

Why do you try to influence the environmental behaviors of other people?

Do you consistently engage in different types of environmental behaviors (e.g., recycling paper, recycling plastic, glass, and aluminum, conserving water, conserving electricity)?

Yes _____ No _____

If yes, why do you consistently engage in different types of environmental behaviors?

If no, why do you not consistently engage in different types of environmental behaviors?

Do you consistently engage in the same types of environmental behaviors (e.g., recycling paper) across different settings (e.g., at home, at school, in friends' homes)? Yes _____

No _____

If yes, why do you consistently engage in the same types of environmental behaviors across different settings?

If no, why do you not consistently engage in the same types of environmental behaviors across different settings?

Past Behavior

For 1a-1d, please consider your behavior in the *past two weeks*.

For all items that mention "paper," please consider items such as office paper, notebook paper, newspaper, and magazines. "Recycled" refers to the act of putting the item in a recycling container (e.g., a recycling bin or a container holding recyclables).

1a.

In the past two weeks I have recycled paper at home:

0	1	2	3	4	5	6	
never		seldom		usually		always	N/A

In the past two weeks I have recycled paper at school:

0	1	2	3	4	5	6	
never		seldom		usually		always	N/A

In the past two weeks I have recycled paper at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “plastic, glass, and aluminum,” please consider plastic bottles, glass containers, and aluminum cans.

1b.

In the past two weeks, I have recycled plastic, glass, and aluminum at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have recycled plastic, glass, and aluminum at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have recycled plastic, glass, and aluminum at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “conserving water,” please consider activities such as turning off the faucet when washing your hands, brushing your teeth, or washing the dishes. Also consider if you take short showers, if you wash full loads of clothing, etc. Keep in mind both occasions when you do not use water when you could as well as using less water than you could.

1c.

In the past two weeks, I have conserved water at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have conserved water at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have conserved water at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “conserve electricity,” please consider activities such as shutting off lights when a room is not in use and shutting off computers or computer

monitors when not in use. Also consider activities such as using lights or computers less.

1d.

In the past two weeks, I have conserved electricity at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have conserved electricity at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have conserved electricity at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention "take public transportation," imagine such activities as taking the bus or a subway or lightrail.

1e.

In the past two weeks, I have taken the bus from home to school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have taken the bus from home to work:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have taken the bus from home to friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention "bought organic," imagine choosing organic options over non-organic options. For "other organic foods," imagine such foods as milks and dairy products, other beverages, and meats.

1f.

In the past two weeks, I have bought organic fruits and vegetables:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, I have bought other organic foods:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “using a reusable bag,” imagine using a bag specifically designed for reuse (e.g., a tote or a canvas bag).

1g.

In the past two weeks, if I went to the grocery store I used a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, if I went to the department store I used a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

In the past two weeks, if I went to the corner store I used a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

Past Behavior Spread Processes

For the following items, please consider your behavior in the *past two weeks*.

6a.

During the past two weeks, I recycled paper in places where other people saw or know that I recycled paper:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the past next two weeks, I tried to persuade other people to recycle paper:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the past two weeks, I brought up the behavior of recycling paper in conversations with other people:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

Past Behavior Spread

During the past two weeks, my close friends and family recycled paper:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

Behavior Spread Intentions

For the following items, please consider your behavior in the <i>upcoming two weeks</i>.

6a.

During the next two weeks, I expect to recycle paper in places where other people will see or know that I recycled paper:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to try to persuade other people to recycle paper:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to bring up the behavior of recycling paper in conversations with other people:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

Behavioral Intentions

For the following items, please consider your behavior in the <i>upcoming two weeks</i>.

1a.

During the next two weeks, I expect to recycle paper at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to recycle paper at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to recycle paper at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

1b.

During the next two weeks, I expect to recycle plastic, glass, and aluminum at home:

0	1	2	3	4	5	6	N/A
---	---	---	---	---	---	---	-----

never seldom usually always

During the next two weeks, I expect to recycle plastic, glass, and aluminum at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to recycle plastic, glass, and aluminum at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

1c.

During the next two weeks, I expect to conserve water at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to conserve water at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to conserve water at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

1d.

During the next two weeks, I expect to conserve electricity at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to conserve electricity at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to conserve electricity at friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

1e.

During the next two weeks, I expect to take the bus from home to school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to take the bus from home to work:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to take the bus from home to friends' homes:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

1f.

During the next two weeks, I expect to buy organic fruits and vegetables:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, I expect to buy other organic foods:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

1g.

During the next two weeks, if I go to the grocery store I expect to use a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, if I go to department stores I expect to use a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the next two weeks, if I go to corner stores I expect to use a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

Demographics

Finally, we would like you to give us a little information about yourself. Before completing this questionnaire, please respond to the following background questions.

What is your age? _____

Your gender? _____

Please indicate your race/ethnicity. You may choose more than one race/ethnicity.

- a. Latino/Hispanic
- b. Black/African American/African
- c. Asian/Asian American
- d. White/Caucasian
- e. Native American
- f. Other _____

Are you a U.S. citizen? Yes No

What is your total family (including parent income if dependent on parents) income?

- 1. _____ Less than \$10,000
- 2. _____ \$10,000-\$19,999
- 3. _____ \$20,000-\$29,999
- 4. _____ \$30,000-\$39,999
- 5. _____ \$40,000-\$49,999
- 6. _____ \$50,000-\$59,999
- 7. _____ \$60,000-\$69,999
- 8. _____ \$70,000-\$79,999
- 9. _____ \$80,000-\$89,999
- 10. _____ \$90,000-\$99,999
- 11. _____ \$100,000 or greater

How many people does this income support? _____

Are you currently employed? Yes No

How many semesters of university education have you completed? _____

What is your marital status? Single Married Widowed
Other: _____

How many children do you have? _____

Do you currently live on campus? Yes _____ No _____

Do you currently live with other people? Yes _____ No _____

If yes, who are there? (check all that apply) Friends _____
Parents/Caregivers _____ Siblings _____
Other family _____ Acquaintances _____

How would you describe the location of your current residency?

- a. Urban

- b. Suburban
- c. Rural
- d. Other

Please list all unique locations for which you have resided to present. If you cannot recall the exact zip code, you may leave the zip code blank. An example is provided. If you have lived in another country in the past, please list the country in the city/country column, and skip the state and zip code columns.

City/Country	State	Zip Code	Age range (in years)
<i>Greendale</i>	<i>WI</i>	<i>53129</i>	<i>0-4</i>
<i>Madison</i>	<i>WI</i>	<i>53703</i>	<i>4-18</i>
<i>Minneapolis</i>	<i>MN</i>	<i>55455</i>	<i>18-19</i>

City/Country	State	Zip Code	Age range (in years)

Political Partisanship/Ideology

We'd like you to respond to the following questions about your political beliefs.

1. How would you describe your **political party preference** (circle one)?

- 1 Strong Democrat
- 2 Weak Democrat
- 3 Independent/Lean Democrat
- 4 Independent
- 5 Independent/Lean Republican
- 6 Weak Republican
- 7 Strong Republican

2. To what extent do you feel certain about your political party preference?

Extraversion (Big Five Inventory Version)

Instructions: Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please choose a number for each statement to indicate the extent to which you agree or disagree with that statement.

1	2	3	4	5
Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree Strongly

I see myself as *someone who* . . .

- _____ 1. is talkative
- _____ 2. is reserved
- _____ 3. is full of energy
- _____ 4. generates a lot of enthusiasm
- _____ 5. tends to be quiet
- _____ 6. has an assertive personality
- _____ 7. is sometimes shy, inhibited
- _____ 8. is outgoing, sociable

Environmental Attitudes

1	2	3	4	5	6	7
Strongly Disagree		Disagree	Uncertain	Agree		Strongly Agree

1. I really like going on trips into the countryside, for example, to forests or fields.
2. I think spending time in nature is boring.
3. Governments should control the rate at which raw materials are used to ensure that they last as long as possible.
4. I am opposed to governments controlling and regulating the way raw materials are used in order to try and make them last longer.
5. I would like to join and actively participate in an environmental group.
6. I would NOT get involved in an environmental organization.

7. One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports.
8. We need to keep rivers and lakes clean in order to protect the environment, and NOT as places for people to enjoy water sports.
9. Modern science will NOT be able to solve our environmental problems.
10. Modern science will solve our environmental problems.
11. Humans are severely abusing the environment.
12. I do not believe that the environment has been severely abused by humans.
13. I'd prefer a garden that is wild and natural to a well groomed and ordered one.
14. I'd much prefer a garden that is well groomed and ordered to a wild and natural one.
15. I am NOT the kind of person who makes effort to conserve natural resources.
16. Whenever possible, I try to save natural resources.
17. Human beings were created or evolved to dominate the rest of nature.
18. I DO NOT believe humans were created or evolved to dominate the rest of nature.
19. Protecting peoples' jobs is more important than protecting the environment.
20. Protecting the environment is more important than protecting peoples' jobs.
21. It makes me sad to see forests cleared for agriculture.
22. It does NOT make me sad to see natural environments destroyed.
23. Families should be encouraged to limit themselves to two children or less.
24. A married couple should have as many children as they wish as long as they can adequately provide for them.

Preference for Consistency Scale

1	2	3	4	5	6	7
Strongly Disagree		Disagree	Uncertain	Agree		Strongly Agree

1. I prefer to be around people whose reactions I can anticipate.
2. It is important to me that my actions are consistent with my beliefs.
3. Even if my attitudes and actions seemed consistent with one another to me, it would bother me if they did not seem consistent in the eyes of others.
4. It is important to me that those who know me can predict what I will do.
5. I want to be described by others as a stable, predictable person.
6. Admirable people are consistent and predictable.
7. The appearance of consistency is an important part of my image I present to the world.
8. It bothers me when someone I depend upon is unpredictable.
9. I don't like to appear as if I am inconsistent.
10. I get uncomfortable when I found my behavior contradicts my beliefs.

11. An important requirement for any friend of mine is personal consistency.
12. I typically prefer to do things the same way.
13. I dislike people who are constantly changing their opinions.
14. I want my close friends to be predictable.
15. It is important to me that others view me as a stable person.
16. I make an effort to appear consistent to others.
17. I'm uncomfortable holding two beliefs that are inconsistent.
18. It doesn't bother me much if my actions are inconsistent.

Self-Monitoring Scale

DIRECTIONS: The statements below concern your personal reactions to a number of different situations. No two statements are exactly alike, so consider each statement carefully before answering. IF a statement is TRUE or MOSTLY TRUE as applied to you, circle the "T" next to the question. If a statement is FALSE or NOT USUALLY TRUE as applied to you, circle the "F" next to the question.

- (T) (F) 1. I find it hard to imitate the behavior of other people.
- (T) (F) 2. My behavior is usually an expression of my true inner feelings, attitudes, and beliefs.
- (T) (F) 3. At parties and social gatherings, I do not attempt to do or say things that others will like.
- (T) (F) 4. I can only argue for ideas which I already believe.
- (T) (F) 5. I can make impromptu speeches even on topics about which I have almost no information.
- (T) (F) 6. I guess I put on a show to impress or entertain people.
- (T) (F) 7. When I am uncertain how to act in a social situation, I look to the behavior of others for cues.
- (T) (F) 8. I would probably make a good actor.
- (T) (F) 9. I rarely seek the advice of my friends to choose movies, books, or music.
- (T) (F) 10. I sometimes appear to others to be experiencing deeper emotions than I actually am.
- (T) (F) 11. I laugh more when I watch a comedy with others than when alone.

- (T) (F) 12. In groups of people, I am rarely the center of attention.
- (T) (F) 13. In different situations and with different people, I often act like very different persons.
- (T) (F) 14. I am not particularly good at making other people like me.
- (T) (F) 15. Even if I am not enjoying myself, I often pretend to be having a good time.
- (T) (F) 16. I'm not always the person I appear to be.
- (T) (F) 17. I would not change my opinions (or the way I do things) in order to please someone else or win their favor.
- (T) (F) 18. I have considered being an entertainer.
- (T) (F) 19. In order to get along and be liked, I tend to be what people expect me to be rather than anything else.
- (T) (F) 20. I have never been good at games like charades or improvisational acting.
- (T) (F) 21. I have trouble changing my behavior to suit different people and different situations.
- (T) (F) 22. At a party, I let others keep the jokes and stories going.
- (T) (F) 23. I feel a bit awkward in company and do not show up quite as well as I should.
- (T) (F) 24. I can look anyone in the eye and tell a lie with a straight face (if for a right end).
- (T) (F) 25. I may deceive people by being friendly when I really dislike them.

Behavioral Beliefs

Recycling paper at home is an important part of taking care of the natural environment:

-4	-3	-2	-1	0	1	2	3	4	N/A
strongly disagree		disagree		neither agree nor disagree		agree		strongly agree	

Recycling paper at home contributes to energy conservation:

-4	-3	-2	-1	0	1	2	3	4	N/A
----	----	----	----	---	---	---	---	---	-----

Self-Efficacy

For the following items, please consider the level of control you feel you have over your recycling and conservation behavior. Control can be thought of as your ability to enact a behavior if you had the desire to carry it out.

I have complete control over recycling paper at home:

-4	-3	-2	-1	0	1	2	3	4	N/A
strongly disagree	disagree			neither agree nor disagree		agree		strongly agree	

My recycling paper at home is up to me:

-4	-3	-2	-1	0	1	2	3	4	N/A
strongly disagree	disagree			neither agree nor disagree		agree		strongly agree	

Plans

For the following items please indicate whether or not you have explicit plans for the following behaviors.

I have a plan for when to recycle paper at home:

-4	-3	-2	-1	0	1	2	3	4	N/A
strongly disagree	disagree			neither agree nor disagree		agree		strongly agree	

I have a plan for where to recycle paper at home:

-4	-3	-2	-1	0	1	2	3	4	N/A
strongly disagree	disagree			neither agree nor disagree		agree		strongly agree	

I have a plan for how to recycle paper at home:

-4	-3	-2	-1	0	1	2	3	4	N/A
strongly disagree	disagree			neither agree nor disagree		agree		strongly agree	

Additional Measures for Study 3

Current Behavior

In this survey you will be asked to respond to items relating to your recycling and conservation behavior, as well as your view of those behaviors. While responding to these items, please keep the following in mind:

- a. *Home* is defined as your current place of residence, whether that is your dorm, apartment, house, etc.
- b. *School* is defined as all events that you participate in on the University of Minnesota campus.
- c. "*Friends' homes*" refer to the homes of your acquaintances you spend time at.
- d. If the behavior described is not applicable to you, or you did not have a chance to engage in the behavior in the past 24 hours, please circle N/A.

For 1a-1d, please consider your behavior *during the past 24 hours*.

For all items mentioning "paper," please consider items such as office paper, notebook paper, newspaper, and magazines.

During the past 24 hours, I have recycled paper at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the past 24 hours, I have recycled paper at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items mentioning "plastic, glass, and aluminum," please consider plastic bottles, glass containers, and aluminum cans.

During the past 24 hours, I have recycled plastic, glass, and aluminum at home:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

During the past 24 hours, I have recycled plastic, glass, and aluminum at school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “take public transportation,” imagine such activities as taking the bus or a subway or lightrail.

In the past 24 hours, I have taken the bus from home to school:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “bought organic,” imagine choosing organic options over non-organic options. For “other organic foods,” imagine such foods as milks and dairy products, other beverages, and meats.

In the past 24 hours, I have bought organic fruits and vegetables:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

For all items that mention “using a reusable bag,” imagine using a bag specifically designed for reuse (e.g., a tote or a canvas bag).

In the past 24 hours, if I went to the grocery store I used a reusable bag:

0	1	2	3	4	5	6	N/A
never		seldom		usually		always	

Current Efforts to Spread Behavior

For the following items, please consider your behavior in the *past 24 hours*

6a.

During the past 24 hours, I have recycled paper in places where other people saw or know that I recycled paper:

0	1	2	3	4	5	N/A
not at all	some of the time	some of the time	half of the time	most of the time	all of the time	

During the past 24 hours, I have tried to persuade other people to recycle paper:

0	1	2	3	4	5	N/A
not at all	some of the time	some of the time	half of the time	most of the time	all of the time	

During the past 24 hours, I have brought up the behavior of recycling paper in conversations with other people:

0	1	2	3	4	5	N/A
not at all	some of the time	some of the time	half of the time	most of the time	all of the time	

Current Spread of Behavior

During the past 24 hours, my close friends and family have recycled paper:

0	1	2	3	4	5	N/A
not at all	some of the time	some of the time	half of the time	most of the time	all of the time	

Appendix 2: Experimental Materials

Message Condition (page 1)

Recycling Paper at Home: The Missed Opportunity



Recycling paper at home is an important behavior to consistently engage in over time. People tend to recycle paper when they are at school or at work, but people are less likely to recycle paper in their home. The following details why you should care about recycling paper at home, and why an improvement in overall rates of recycling paper at home would be good for both the natural environment and for human beings.

Why is it important to recycle paper at home?

When people are asked to list materials that they should recycle at home, people tend to name products such as plastics, metals, and glass. However, it is important that we also consistently recycle paper products at home. The act of recycling paper affects a wide range of issues relevant to the health of the natural environment. Paper recycling at home plays a role in the health of our forests, the quality of our water and our air, conservation of important natural resources, and the health of our local economy.

Message Condition (page 2)**Recycling Paper at Home Protect Our Forests, Our Water, and Our Air**

Recycling paper at home has the ability to influence the health of our forest. By recycling paper for reuse in the future, people can save additional trees from being harvested. **Did you know that every ton of recycled paper translates into 17 saved trees?**

Forests play an important part in ensuring a healthy atmosphere. Trees help recycle the air by pulling carbon dioxide in from the atmosphere and breathing out clean oxygen.

Paper recycling is also important to the quality of our water and our air, as paper recycling reduces water pollution by 35%, and general air pollution by as much as 73%.

To ensure the health of our forests, our water, and our air, it is important that we recycle paper as consistently as possible in our homes.

Message Condition (page 3)

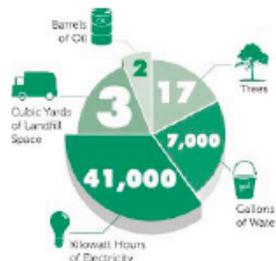
Recycling Paper at Home Leads to Conservation of Important Resources



Recycling paper at home not only contributes to the conservation and health of our forests, but it also leads to the conservation of other important natural resources.

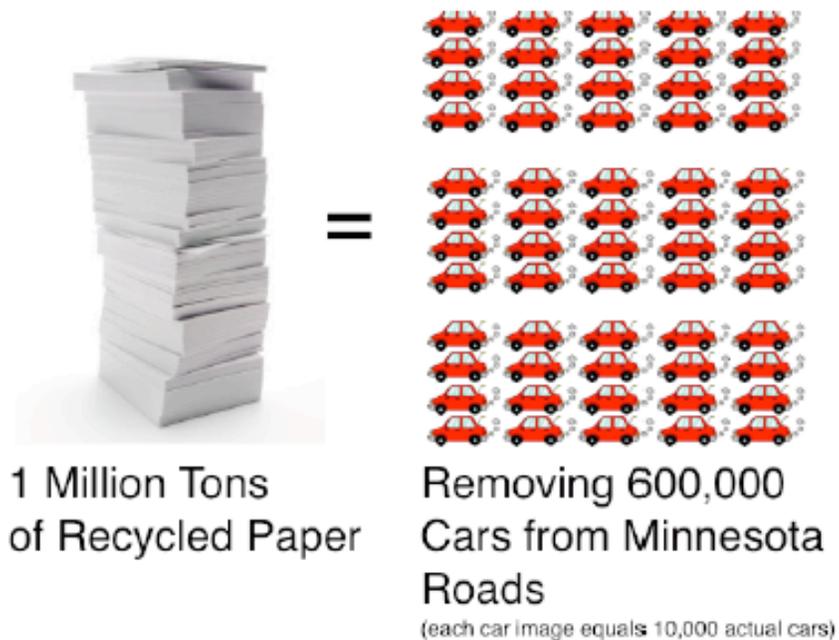
For every ton of paper that we recycle, we save:

- 7,000 gallons of water
- 3 cubic yards of landfill space
- 2 barrels of oil



Each ton of recycled paper also saves us 41,000 kilowatt hours of electricity, enough energy to power an average home in the United States for six months. This decrease in energy use leads to a reduction in greenhouse gas emissions equal to one metric ton of carbon, the amount of carbon emitted by the average car in America driven roundtrip from Minneapolis to New York City (2,400 miles).

In 2006, Minnesota alone recycled 1 million tons of paper products, equal to taking 600,000 cars off of our roads.



Consistent recycling of paper at home is important because it helps us (1) protect our forests, (2) keep our air and water systems clean, and (3) conserve other natural resources. Since recycling paper is closely related to a wide range of environmental issues, it is important to the overall health of our natural environment to strive to recycle all of the paper that we use at home.

Message Condition (page 4)

Recycling Paper at Home Benefits the National and Local Economies



The United States paper industry, and Minnesota's paper industry in particular, is now prepared to fully utilize recycled paper products. Of the current paper mills in the United States, 80% are outfitted to use recycled paper in their production of new paper products. Minnesota has a large number of paper mills outfitted for using recycled paper, ensuring that the state is able to economically capitalize on paper recycling.



In Minnesota the recycling industry is responsible for 20,000 jobs, and adds \$2.98 billion dollars to the state's economy. It currently costs Minnesotans \$200 million a year to throw away recyclable materials. Recycling those materials would not only save us that money, but it would also generate an additional \$312 million for the state.

Message Condition (page 5)**Recycling Paper at Home: Room for Improvement**

When it comes to recycling paper in the United States, there is clear room for improvement. Although there has been an 89% increase from 1990 levels of paper recycling, in 2010 only 63.5% of the paper used in the United States was recycled. Much of this improvement in paper recycling rates has occurred in our workplaces and our schools. The problem is that we are still throwing away too many paper products in our homes.



When considering local recycling rates of paper in our homes, we know that 12% of all trash in

the Twin Cities consists of recyclable paper. Meanwhile, other recyclable materials are rarely found in the trash of homes in the Twin Cities. Given the current evidence, it is clear that we clearly have room to improve our rates of paper recycling in our homes.



Recycling of paper products at home affects the health of our forests, our water, and our air, and also benefits the economy. Recycling paper at home is but one of many important behaviors that we can engage in to protect the natural environment, and it is one that we all must consistently engage in. We have done a good job of recycling paper products in our places of work and in our schools. Now, we need to do a better job of recycling paper in our homes. Improving our rates of recycling paper at home, both as individuals and as a community, is an important step toward making a difference. Please strive to consistently recycle all of your paper products at home; it will play an important role in helping us reach our goal of taking care of the natural environment.



Modeling Condition

Please click the Play arrow to watch the video below. If you do not hear sound with this video, please let the researcher know.



Please click the Play arrow to watch the video below. If you do not hear sound with this video, please let the researcher know.



Please click the Play arrow to watch the video below. If you do not hear sound with this video, please let the researcher know.



Planning Condition (page 1)

Many people intend to consistently recycle all of their paper products at home. However, when people need to dispose of paper products they sometimes forget to recycle the paper products, or they simply choose to throw the paper products away if it is easier in the moment. It has been found that if you form a clear behavior plan of where, when, and how you will engage in an intended behavior, it is actually more likely that you will consistently engage in the behavior. Toward this end, we would like you to form a clear plan for increasing the consistency of your paper recycling behavior at home, including where, when, and how you will recycle paper products at home.

First, think about your home. Is it a house, an apartment, or a dormitory?

- House
- Apartment
- Dormitory

Planning Condition (page 2)

Next, we want you to think about the types of rooms that you have in your home. Please select all that apply:

- Living room
- Dining room
- Kitchen
- Bathroom
- Bedroom
- Office

Planning Condition (page 3)

Considering your Living room, Kitchen, Bathroom, Bedroom in your Apartment, which types of paper products do you use in these rooms?

- plain white or color paper
- notebook paper
- junk mail
- newspapers
- paper bags
- paper receipts
- post-it notes
- envelopes
- cartons (e.g., milk or juice)
- cardboard (including dry food boxes, cardboard boxes, and cardboard centers of paper towels or toilet paper)

Planning Condition (page 4)

Reminder - You reported using the following paper products in your home: plain white or color paper, junk mail, paper bags, paper receipts

Next, we want you to describe *where* you will recycle your reported paper products in your Apartment (e.g., If I find myself in my Apartment with any unwanted reported paper products, then I will recycle my reported paper products *in the recycling bin in my kitchen*).

If I find myself in my Apartment with any of my unwanted reported paper products, then I will recycle my reported paper products:

in my kitchen.

Planning Condition (page 5)

Reminder - You reported using the following paper products in your home: plain white or color paper, junk mail, paper bags, paper receipts

Next, describe a specific point in time *when* you will recycle your reported paper products in your Apartment (e.g., If I find myself in my Apartment with any unwanted reported paper products, then I will recycle my reported paper products *immediately*).

If I find myself in my Apartment with any of my unwanted reported paper products, then I will recycle my reported paper products:

at the end of the day

Planning Condition (page 6)

Reminder - You reported using the following paper products in your home: plain white or color paper, junk mail, paper bags, paper receipts

Next, describe a specific point in time *how* you will recycle your reported paper products in your Apartment (e.g., If I find myself in my Apartment with any unwanted reported paper products, then I will recycle my unwanted reported paper products by *walking to the recycling bin and proceeding to place these paper products inside of the recycling bin*).

If I find myself in my Apartment with any of my unwanted reported paper products, then I will recycle my unwanted reported paper products:

walk to the kitchen and recycle the paper

Planning Condition (page 7)

Reminder - You reported using the following paper products in your home: plain white or color paper, junk mail, paper bags, paper receipts

Finally, we would like you to write the complete plan of where, when, and how you will recycle your reported paper products in your Apartment (e.g., If I find myself in my Apartment with any unwanted reported paper products, then I will recycle my unwanted reported paper products *in the recycling bin in my kitchen immediately by walking to the recycling bin and proceeding to place these paper products inside of the recycling bin*).

I will recycle my unwanted reported paper products:

Where

in my kitchen

When

at the end of the day

By

walking into the kitchen :