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### On justifying eco-unfriendly behaviors

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# Chapter 5

## Media Science Reports Providing Justification

This chapter is based on:

Meijers, M. H. C., & Rutjens, B. T. (2014). Affirming belief in scientific progress reduces environmentally friendly behaviour. *European Journal of Social Psychology*, *44*(5), 487- 485, doi: 10.1002/ejsp.2009.



## Media Science Reports Providing Justification

The climate is changing, but media coverage often appears to convey the message that science is one step ahead (e.g., Miller, Tegen, & Perlwitz, 2004; Rosenfeld et al., 2008). For instance, the media report on scientists inventing huge mirrors that will reflect the sunlight to evade the burning sun, on individuals that will live in floating cities when the sea level rises, and on solar powered cars that will crowd the roads by the time that the fossil fuels are exhausted. Research has indeed shown that the popular media often overstate the progress of science and its ability to generate technological advances and provide solutions to pressing problems such as climate change and disease (i.e., a progress frame; e.g., Corbett & Durfee, 2004; Nisbet et al., 2002; Stewart et al., 2009; Weaver et al., 2009). For example, diseases like cancer and HIV are still very difficult to combat, but are regularly portrayed as nearly 'solved' problems (Donovan, Carter, & Byrne, 2006). Since lay individuals' knowledge about science is often based on popular media coverage of science (e.g., Caulfield, 2004; Elliott & Rosenberg, 1987; McInerney et al., 2004; Zimmerman et al., 2001), such a progress frame may affect their views on science as well as subsequent behaviors.

The current paper investigates whether overly optimistic reports on scientific progress might, ironically, contribute to the fact that individuals often fail to be environmentally friendly. Employing compensatory control theory (Kay et al., 2008) as our theoretical framework, we argue that a scientific progress frame functions as an order-providing psychological mechanism (Rutjens et al., 2013). Overstating the progress of science might enhance perceptions of order, which in turn decreases the motivation to engage in environmentally friendly actions. Therefore, media science reports using a progress frame may serve as an external source of justification, and as a result, justify environmentally unfriendly behavior. In the following, we will elaborate upon the theoretical foundations for this prediction.

### **Compensatory Control Theory**

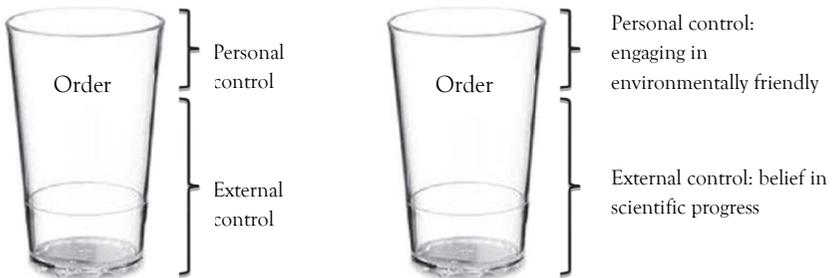
Research has shown that individuals are highly motivated to perceive the world as meaningful, orderly, and structured (e.g., Heine, Proulx, & Vohs, 2006; Kay et al., 2008; Kruglanski & Webster, 1996; Landau, Greenberg, Solomon, Pyszczynski, & Martens, 2006; Landau et al., 2004; Whitson & Galinsky, 2008). When they perceive the world to be less orderly than desired, they aim to alleviate these feelings of disorder as these are generally thought to be stressful and anxiety inducing (e.g., Kay et al., 2008; Pennebaker & Stone, 2004). Understanding the different ways in which individuals try to maintain perceptions of the world as orderly and controlled forms the basic tenet of compensatory control theory (Kay et al., 2008).

Compensatory control theory argues that individuals have the fundamental motivation to perceive order in the world (Kay et al., 2008). The theory distinguishes two main routes to maintain such order perceptions: *personal* control and *external* control (see also Rothbaum et al., 1982). In the case of personal control, it is the feeling that individuals are able to influence their environment that provides them with the notion of an orderly world. In the case of external control, it is the feeling that an external source (e.g., a God who actively intervenes and exerts control over the world or a powerful government) exerts influence over individuals' environments and the world in general that provides similar perceptions of an orderly world that is under

control. Personal control and external control thus function as two separate routes to perceiving the world as orderly.

Importantly, compensatory control theory posits that these different routes to orderly world perceptions function in a hydraulic fashion. In other words, a threat to one source of order (e.g., external control) enhances the motivation to affirm an alternative means (e.g., personal control) and thus prevent perceptions of disorder. Kay and colleagues (2008) used an analogy of a full glass that represents sufficient order perceptions to explain this hydraulic nature of external and personal control. To reach the preferred level of order, personal control and external control together should fill up the glass. Strongly affirming an external source of control (e.g., believing in God) will largely fill the glass, leaving only little need to exert personal control. By contrast, when belief in such an external source of control is there to a lesser extent the glass will be far from full, which enhances the motivation to affirm personal control (see Figure 5.1).

Ample research has provided evidence for this hydraulic relation between personal and external control in satiating individuals' need to perceive order. Specifically, studies have shown that when the controlling abilities of a particular external source are limited (e.g., governmental instability) individuals seek to reaffirm order by exerting (occasionally illusory) personal control or



*Figure 5.1.* The figure on the left represents an analogy of compensatory control theory (Kay et al., 2008); a full glass represents sufficient levels of perceived order. When one source of order fluctuates (e.g., decreases), the other does so too (e.g., increases). The figure on the right represents our environmental version of compensatory control theory: when belief in scientific progress fluctuates (e.g., increases), the likelihood to engage in environmentally friendly behavior will fluctuate accordingly (e.g., decreases).

affirming their belief in alternative external sources of control (e.g., God). In a similar vein, when individuals lack personal control, they bolster beliefs in an external source of control to restore order perceptions (e.g., Kay et al., 2008; Kay, Shepherd et al., 2010; Laurin, Kay, & Moscovitch, 2008; Shepherd, Kay, Landau, & Keefer, 2011).

The majority of research sparked by compensatory control theory has shown that compensatory external control is observed in the domains of religious and socio-political beliefs (Kay, Gaucher et al., 2010; Kay et al., 2008; Kay, Shepherd et al., 2010; Rutjens, van der Pligt, & van Harreveld, 2010). Of importance to the current paper, however, is that recent research shows that *belief in scientific progress* can also function as compensation for low personal control (Rutjens, van Harreveld et al., 2010). This research showed that experimentally lowering personal control increases the tendency to defend the notion of progress, and generally increased faith in scientific and technological advances. Below we will elaborate on belief in scientific progress as an external source of control.

### **External Control: Scientific Progress**

Scientific progress can be viewed as proof of humanity's increasing ability to exert control over the world. Bolstering belief in scientific progress can therefore provide order (Rutjens, van Harreveld et al., 2010). A simple example would be the advances made in the medical and environmental sciences, which help to solve previously uncontrollable problems (e.g., natural disasters, disease). By being able to solve these problems, science as an institution exerts control over the world, and thus it could be argued that it functions as an external source of control that helps to maintain order perceptions. This suggests that the more one endorses science as an external source of control, the more order one perceives in the environment.

Whereas the research by Rutjens et al. (2010) showed that lowering personal control enhances belief in scientific progress, it did not yet provide evidence for the extent to which this belief actually helps to maintain order perceptions. Nor that, as a (hydraulic) consequence, this belief in scientific progress may reduce the motivation to exert personal control. In other words, evidence for the functional value of belief in science has not yet been reported.

In the current research, we aim to provide such evidence, and contend that the progress frame often used by media when communicating about science will affirm individuals' belief in science and thus enhance order perceptions. Based on the hydraulic nature of compensatory control theory (Kay, Shepherd et al., 2010), we expect that this consequently lowers individuals' need to engage in personal action. Related to this idea, recent research in the domain of religious compensatory control has observed that when individuals are reminded of a controlling God, their motivation to actively pursue goals is undermined (Laurin, Kay, & Fitzsimons, 2012). By contrast, when scientific progress is tempered and science thus does not provide a potent source of external control, feelings of order should come from elsewhere. One way to fill the glass (see Figure 5.1) and restore order perceptions would be to exert personal control. In sum, we posit that the way the media portrays science has effects on the extent to which individuals feel the need to exert personal control. Importantly, we argue that – in the context of environmental challenges and natural threats – one way to regain a feeling of personal control is through environmentally friendly behavior. Science communication might therefore have detrimental or beneficial effects on environmentally friendly behavior, depending on whether scientific progress is affirmed or tempered.

### **Personal Control: Environmentally Friendly Behavior**

As pointed out before, besides endorsing external sources of order, another way to cope with the aversive experience of disorder is to affirm a sense of personal control. When individuals experience personal control, they feel that they are able to predict and influence their environment. The events in their lives, no matter whether they are positive or negative, are perceived to be caused by their own actions. This instills the belief that individuals live in a sense-making world in which events do not just happen haphazardly (Kay et al., 2008).

We posit that one way to restore order is to reaffirm personal control by being environmentally friendly, because – in the context of environmental challenges and natural threats – such behaviors boosts feelings of personal control through self-action. Engaging in environmentally friendly behavior will provide individuals with the perception that they are able to influence

outcomes in the world. Therefore, being environmentally friendly may work as an order-providing mechanism and thus help to alleviate feelings of disorder. There is some indirect evidence suggesting that such behavior enhances perceptions of order; a recent study shows that individuals tend to engage in pro-social behavior when the notion of an orderly world is threatened (Banfield, 2011). The idea is that behaving in a pro-social manner restores order because individuals experience personal control through influencing a certain outcome. We contend that being environmentally friendly will similarly give individuals a notion of order. Therefore, we expect that individuals will be more likely to engage in environmentally friendly behavior when they perceive disorder in the world, for example when external sources of control (e.g., belief in scientific progress) are threatened.

In sum, based on the basic tenet of compensatory control theory that personal and external feelings of control are substitutable (Kay, Shepherd et al., 2010) we contend that a strong belief in scientific progress (i.e., external control) and engaging in environmentally friendly behavior (i.e., personal control) are two substitutable sources of order. We hypothesize that media reports portraying science as rapidly progressing may have disadvantageous side-effects for environmentally friendly intentions and behavior. Since desired levels of order are already met through the endorsement of an external source of order (i.e., science), exerting personal control (i.e., being environmentally friendly) becomes less necessary.

Returning to compensatory control theory's glass analogy, when belief in scientific progress is affirmed the glass is largely filled by external control, see Figure 5.1. This reduces the need to exert personal control. Therefore, communicating about science in a way that it appears infallible and rapidly progressing may cause inertia as individuals may use this as an external source of justification, justifying their environmentally unfriendly behaviors. By contrast, tempering scientific progress should lead to a relative increase in environmentally friendly intentions and behaviors. Since optimal levels of order are not provided by an external source of control, the motivation to exert personal control through environmentally friendly behavior is enhanced.

### Overview of studies

We conducted four studies to experimentally test our environmental compensatory control hypothesis (see Figure 5.2). We began by examining whether reading a newspaper article that affirms (versus tempers) belief in scientific progress increases feelings of order (Study 5.1). In Study 5.2, we investigated whether implicitly priming order (versus disorder) perceptions, decreases the need to exert personal control by making environmentally friendly choices. In Study 5.3, we sought to demonstrate that being environmentally friendly indeed boosts feelings of personal control (i.e., can be seen as a way to exert control and therefore enhance generalized feelings of control). In our fourth and final study, we replicated and extended Studies 5.1 and 5.2 by testing our main hypothesis that communication affirming scientific progress enhances feelings of order and therefore reduces environmentally friendly attitudes, intentions, and behaviors. In other words, individuals may use the feeling that science has everything under control as an external source of justification, making environmentally friendly behaviors less likely. By contrast, when media look more critically at the power of science and communicate the limits of progress, this decreases feelings of order and therefore increases environmentally friendly attitudes, intentions, and behaviors. In other words, individuals are then unable to use the feeling that science has everything under control as an external source of justification, making environmentally friendly behaviors more likely.

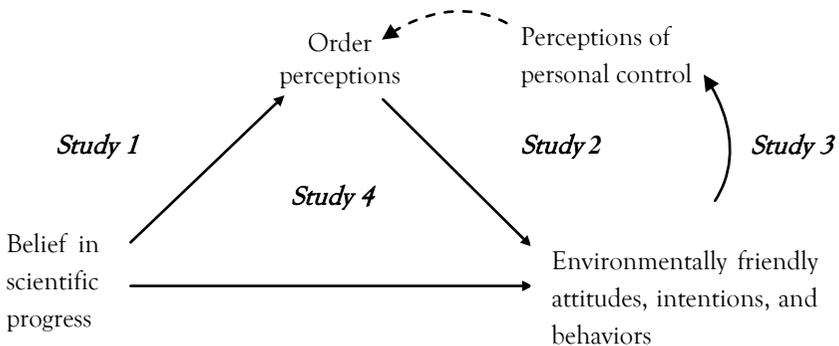


Figure 5.2. Overview of the current research.

### Study 5.1: Progress frame providing feelings of order

In this study, we tested whether participants whose belief in the progress of science was affirmed by reading a counterfeit newspaper article employing a progress frame were more likely to perceive order than participants whose belief in the progress of science was tempered by reading a counterfeit newspaper article.

#### Method

**Participants and Design.** One hundred and three university students ( $M_{age} = 19.57$ ,  $SD_{age} = 3.04$ , 78.6% female) participated in the study in exchange of a monetary reward or partial course credit. The participants were randomly assigned to one of two conditions (newspaper article: affirmed versus tempered belief in scientific progress) of a between-subjects design. One participant only partially completed the questionnaire without answering the target measures and was therefore not included in the analyses.

**Procedure.** Participants were seated in individual cubicles and received a questionnaire booklet that ostensibly consisted of several unrelated questionnaires. They were asked to read all the instructions carefully and to ask for help if they had any questions. Participants first read a newspaper article about the progress of science, after which they completed a questionnaire on perceptions of order.

***Belief in scientific progress manipulation.*** We created two counterfeit newspaper articles to manipulate belief in scientific progress. These articles were identical in length (420 words). Moreover, the lay-out and writing style were modeled after articles of a popular news website, such that they appeared to be regular newspaper articles downloaded from the internet. In the *affirmed belief in scientific progress* condition, we stressed that science progresses rapidly. The article described how diseases that used to have disastrous consequences, like tuberculosis, are now more easily combated. Furthermore, it described how the treatments for potential deadly diseases like HIV and cancer are improving and how science provides solutions for problems like climate change by inventions such as electric cars and floating cities.

In the *tempered belief in scientific progress* condition, we stressed that while scientific progress does occur, its pace is often insufficient to provide solutions to urgent problems. The article described how diseases that used to

have disastrous consequences, like tuberculosis, are now more easily combated, just like in the affirmed belief condition. However, the article stressed that although the treatments for potential deadly diseases like HIV and cancer are improving, these diseases are still hard to combat. Moreover, it was posited that although science is starting to provide initial solutions for climate change issues, these solutions do not yet suffice. For example, electric cars still require energy and therefore still contribute to climate change.

***Dependent measures.*** After reading one of the newspaper articles, the participants completed a questionnaire that included several items measuring perceptions of order, a manipulation check item, and several filler items. All items were measured on a scale from 1 (*completely disagree*) to 7 (*completely agree*). To verify that our manipulation of a tempered versus affirmed belief in scientific progress was effective, we measured participants' belief in science with the item: *to what extent do you think science is capable of solving climate-related problems?* Participants' perceptions of order were measured by the following items: *to a great extent my life is controlled by accidental happenings* and *our lives are ruled by randomness* (reverse coded – see Kay et al., 2008),  $r = .56, p < .001$ . After completing the questionnaires, participants were thanked for their participation and debriefed.

## Results and Discussion

Results of a one-way ANOVA indicated that we successfully manipulated belief in scientific progress; participants who read the article that affirmed belief in scientific progress believed more strongly in the ability of science to solve climate-related problems ( $M = 5.24, SD = 1.06$ ) than participants who read the article that tempered belief in scientific progress ( $M = 4.85, SD = 0.89$ ),  $F(1, 100) = 4.12, p = .045, \eta_p^2 = .04$ .

Next, we averaged the scores on the two order items into an index and used this as the dependent variable in an ANOVA, which yielded a significant effect of condition,  $F(1, 100) = 6.88, p = .010, \eta_p^2 = .06$ . As expected, participants who read the newspaper article which tempered belief in scientific progress experienced lower feelings of order ( $M = 3.99, SD = 1.04$ ) than participants who read the newspaper article which affirmed progress ( $M = 4.51, SD = 0.96$ ). Study 5.1 thus shows that reading a newspaper article that affirms

belief in scientific progress heightened feelings of order compared to reading a newspaper article that tempers belief in scientific progress. The study thus provides initial evidence for the idea that employing a progress frame in science communication increases belief in scientific progress, which comprises an effective external source of control that enhances perceptions of order.

### **Study 5.2: Order and environmentally unfriendly behavior**

In a second study we investigated the relationship between order and environmentally friendly behavior. Therefore, we built on the results of Study 5.1 and investigated whether directly priming feelings of order lowers environmentally friendly intentions, compared to directly priming feelings of disorder.

### **Method**

**Participants and design.** One hundred and seven participants ( $M_{age} = 19.86$ ,  $SD_{age} = 2.17$ , 73.8% female) participated in the study in exchange for a monetary reward or partial course credit. They were randomly assigned to one of two conditions (order versus disorder) of a between-subjects design. One participant inaccurately completed the priming task that was used to manipulate order and therefore could not be included in the analyses.

**Procedure.** Participants came into the lab for a series of unrelated experiments and completed our questionnaire on a personal computer. Participants first completed a scrambled sentence task (Srull & Wyer, 1979) that either primed the concept of order or disorder (Kay, Moscovitch, & Laurin, 2010). Participants unscrambled sixteen word sets, each set consisting of five words of which four words had to be used to form a sentence. Eight word sets were related to order or disorder (depending on condition). In the order condition, participants unscrambled word sets such as *the orderly door meeting proceeds (the meeting proceeds orderly)*, whereas in the disorder condition these were sets such as *the chaotically door meeting proceeds (the meeting proceeds chaotically)*.

Next, participants read that a research institute affiliated with their university was interested in students' opinions regarding environmental issues. This comprised the dependent measure that tapped into environmentally

friendly attitudes (e.g., *we have to take the greenhouse effect seriously*) and behavioral intentions (e.g., *the next time it is cold inside I will turn up the thermostat rather than put on a sweater* – reverse coded) consisting of twelve items on a seven point-scale ranging from 1 (*completely disagree*) to 7 (*completely agree*),  $\alpha = .80$ . Finally, participants were thanked and debriefed.

## Results and Discussion

We averaged the scores on the attitudes and behavioral intentions items into an index and used this as the dependent variable in an ANOVA. As expected, participants who unscrambled the order sentences displayed less positive environmental attitudes and intentions ( $M = 4.97$ ,  $SD = 0.87$ ) than participants who unscrambled the sentences concerning disorder ( $M = 5.35$ ,  $SD = 0.76$ ),  $F(1, 104) = 5.78$ ,  $p = .018$ ,  $\eta_p^2 = .05$ . Study 5.2 thus supports our hypothesis that activating feelings of order (vs. disorder) enhances the likelihood of making environmentally friendly choices.

### Study 5.3: Environmental behavior providing feelings of personal control

Study 5.2 confirmed that individuals are less likely to make environmentally friendly choices when confronted with order compared to disorder. As elaborated upon in the introduction, we suggest that disorder perceptions increase environmentally friendly behavior because engaging in such behavior boosts feelings of personal control through self-action. In Study 5.3, we therefore investigated whether engaging in environmentally friendly behavior can be understood as an order-providing mechanism, by directly testing whether making environmentally friendly choices boosts individuals' generalized feelings of personal control.

## Method

**Participants and design.** Fifty-eight university students ( $M_{age} = 21.02$ ,  $SD_{age} = 2.40$ , 59.6% female) participated in the study in exchange for a monetary reward. They were randomly assigned to one of two conditions (order of tasks: environmentally friendly behavior first versus personal control first) of a between-subjects design. One participant failed to follow instructions and was excluded from the analyses.

**Procedure.** Participants came to the lab for a series of unrelated experiments and completed our questionnaire on a personal computer. We balanced the order of the following tasks: a task concerning environmentally friendly choices and a questionnaire measuring personal control. So, half of the participants first completed two tasks on environmentally friendly behavior and then completed a questionnaire on generalized perceptions of control, whereas the other half first completed a questionnaire on perceptions of control and then completed two tasks on environmentally friendly behavior. By reversing the task order, we provided half of the participants with the chance to be environmentally friendly prior to reporting levels of perceived levels of personal control, whereas the other half was not provided with this chance. This enabled us to test our hypothesis that performing environmentally friendly behavior enhances perceptions of personal control.

***Environmental behavior tasks.*** Participants read that a research institute interested in students' opinions regarding environmental issues. Participants completed the same measures of environmentally friendly attitudes and intentions used in Study 5.2,  $\alpha = .75$ . Participants then completed a task in which they imagined managing a manufacturing plant that pollutes the air via smokestacks (Sachdeva et al., 2009; see also Tenbrunsel & Messick, 1999). In order to prevent the release of pollutants they could run filters at monetary costs. Under pressure from environmental lobbyists all manufacturing plants agreed with the lobbyists to run the filters at 60% of the time (at a cost of €1.2 million). The participants were told that they could stick with this agreement but could also choose to run the filters for any 10% interval between 0% and 100%, with each incremental step costing €0.2 million. The more often the filters would run the better this would be for the environment, but also the higher the financial costs.

***Personal control questionnaire.*** We measured generalized feelings of personal control with the items 'are you the actor in, or the director of, your own life?', ranging from 1 (*actor*) to 7 (*director*), and 'to what extent do you feel that you can control what happens in your life?', ranging from 1 (*not at all*) to 7 (*totally*),  $r = .58$ ,  $p < .001$  (Rutjens, van der Pligt et al., 2010). The task measuring feelings of personal control was disguised as a separate study and also contained some filler items.

## Results and Discussion

As expected, the results of an ANOVA showed that the order of tasks had a significant effect on participants' reported feelings of personal control,  $F(1, 55) = 4.15, p = .046, \eta_p^2 = .07$ . Participants who first engaged in the environmental tasks experienced higher levels of personal control ( $M = 5.23, SD = 1.03$ ) than participants who first completed the questionnaire regarding personal perceptions of control ( $M = 4.62, SD = 1.22$ ). In other words, participants who engaged in environmentally friendly behavior experienced higher levels of general personal control than participants who did *not* have the chance to engage in environmentally friendly behavior. This implies that behaving in an environmentally friendly way indeed boosts more general perceptions of personal control.

Finally, we checked whether the extent to which participants expressed their environmentally friendly attitudes and intentions and engaged in environmentally friendly behavior differed between the two conditions. As expected, there were no differences of task order on expressing environmentally friendly attitudes and intentions,  $F < 1$ , nor in engaging in environmentally friendly behavior,  $F < 1$ .

### Study 5.4: Progress frames providing justification

So far, our studies show that reading a newspaper article affirming (versus tempering) belief in scientific progress increases perceptions of order (Study 5.1) and that implicitly priming order (versus disorder) decreases the intention to engage in environmentally friendly behavior (Study 5.2). Furthermore, we observed that being environmentally friendly boosts perceptions of personal control (Study 5.3) – which is one route to maintaining order perceptions according to compensatory control theory (Kay et al., 2008). In our final study, we conducted a full test of our hypothesis that media reports affirming scientific progress enhance feelings of order and consequently reduce environmentally friendly attitudes, intentions, and behaviors, whereas media reports tempering scientific progress diminish feelings of order and consequently heighten environmentally friendly attitudes, intentions, and behaviors. Thus, in Study 5.4, we investigated whether the effects of reading a newspaper article that affirms (vs. tempers) scientific progress on

environmentally friendly behavioral intentions is mediated by perceptions of order.

## Method

**Participants and design.** Forty three university students ( $M_{age} = 24.68$ ,  $SD_{age} = 6.91$ , 70.7% female) participated in the study in exchange for a monetary reward. They were randomly assigned to one of the conditions (newspaper article: affirmed versus tempered belief in scientific progress) of a between-subjects design. Two extremes (i.e., multivariate outliers) were excluded based on the Mahalanobis Distance method (Pallant, 2001; Tabachnick & Fidell, 2007).

**Procedure.** Upon arrival in the lab participants received a paper-and-pencil questionnaire that ostensibly consisted of several unrelated questionnaires. Participants first read one out of two counterfeit newspaper articles concerning the progress of science. In one condition the progress of science was affirmed whereas in the other condition the progress of science was tempered (see Study 5.1). Next, participants were asked to complete a questionnaire that measured order perceptions with the item *our lives are ruled by randomness* (reverse coded, see Kay et al., 2008), on a seven-point scale from 1 (*completely disagree*) to 7 (*completely agree*). Hereafter, participants answered six items measuring environmentally friendly attitudes and behavioral intentions (e.g., *I intend to wash my clothes at a lower temperature for the sake of the environment*; *I believe waste sorting is unnecessary* – reverse coded) that were measured on a seven-point scale ranging from 1 (*completely disagree*) to 7 (*completely agree*),  $\alpha = .79$ .

Next, participants continued with an additional task pertaining to environmental consumer behavior. Previous research has shown that consumers associate organic products with caring for the environment and that environmental consumers are more likely to purchase organic products (Sparks & Shepherd, 1992; Tacken et al., 2007; Thøgersen & Ölander, 2003). Therefore, we operationalized environmentally friendly consumer behavior by measuring the number of organic food items that participants chose in this task. Participants were asked to imagine that they are shopping at a grocery shop that was unknown to them. They were asked to look at six product categories (e.g.,

spinach and beans). For each category, they were instructed to choose one product out of three available options. One of the options was always an organic, environmentally friendly option. Lastly, participants were thanked and debriefed.

## Results and Discussion

**Disorder.** First, we replicated the results of Study 5.1 that shows that affirming (vs. tempering) belief in scientific progress heightens perceptions of order. An ANOVA showed that participants who read a newspaper article affirming scientific progress experienced stronger feelings of order ( $M = 4.86$ ,  $SD = 0.73$ ) than participants who read a newspaper article that tempered belief in scientific progress ( $M = 3.90$ ,  $SD = 1.17$ ),  $F(1, 39) = 10.06$ ,  $p = .003$ ,  $\eta_p^2 = .21$ .

**Environmentally friendly attitudes and intentions.** Next, we averaged the scores on the attitudes and intentions items into an index and used this as the dependent variable in an ANOVA, which yielded a significant effect,  $F(1, 39) = 9.40$ ,  $p = .004$ ,  $\eta_p^2 = .19$ . As expected, participants who read an article affirming belief in scientific progress displayed less environmentally friendly attitudes and intentions ( $M = 5.11$ ,  $SD = 0.95$ ) than participants who read an article tempering belief in scientific progress ( $M = 5.93$ ,  $SD = 0.73$ ). Hereafter, we assessed whether feelings of disorder mediate the effect of belief in scientific progress on environmentally friendly attitudes and intentions. We performed a mediation analysis and computed three regression equations (see Figure 5.3). A bootstrapping analyses with 5000 samples (see Preacher & Hayes, 2004) confirmed mediation through feelings of disorder (indirect effect = .26,  $SE = .14$ , 95% confidence interval = .039 to .624). This result confirms our hypothesis that communication that tempers (vs. affirms) belief in scientific progress increases environmentally friendly behavior via perceptions of disorder.

**Organic food preference.** We added the number of organic products that participants chose in the grocery shopping task and entered this as a dependent variable in ANOVA, which revealed a marginally significant effect,  $F(1, 39) = 3.91$ ,  $p = .055$ ,  $\eta_p^2 = .09$ . Participants who read an article affirming belief in scientific progress chose less organic products ( $M = 1.95$ ,  $SD = 1.63$ ) than participants who read an article tempering belief in scientific progress ( $M$

= 3.10,  $SD = 2.07$ ). The amount of environmentally friendly products that participants chose correlated significantly with participants' environmentally friendly attitudes and intentions,  $\beta = .31, p = .048^6$ .

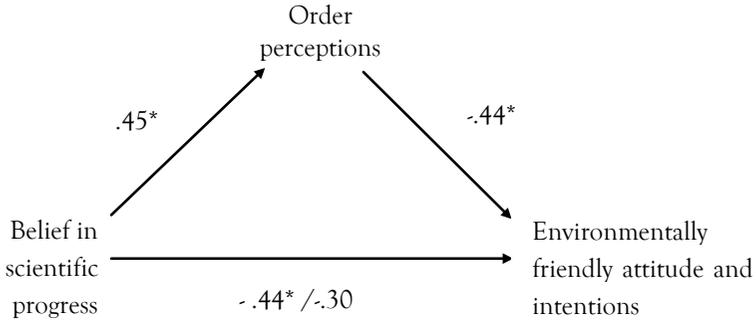


Figure 5.3. Standardized regression coefficients for the relationship between belief in scientific progress (manipulated) and environmentally friendly attitudes and intentions, mediated by feelings of disorder, in Study 5.4,  $*p < .05$ .

### General Discussion

Although most individuals understand the importance of environmentally friendly behavior, they generally appear to have difficulty putting this into practice (Dunlap, Gallup, & Gallup, 1993; Meijers & Van Dam, 2012; Tanner & Kast, 2003). The current research demonstrates that one explanation for this lies in the way science communication is framed. A strong focus on a rapidly progressing science that has the potential to provide solutions to pressing problems negatively affects environmentally friendly intentions and behavior, as it may provide individuals with an external source of justification. By contrast, tempering scientific progress results in a relative increase in disorder perceptions, which in turn triggers the motivation to

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<sup>6</sup> Although the main effect of belief in scientific progress on organic food preference was marginal, we tested whether order might (partially) mediate this effect, similar to the mediation effect on attitudes and intentions. This was not the case; a bootstrapping analysis with 5000 samples revealed an indirect effect of .13 (CI -.89 to .45). This lack of mediation might be due to the main effect of condition that was marginal, which might have been caused by a) low sample size; DV consisting of series of nominal choices b) participants having already affirmed their intentions on the previous task.

restore order via personal actions such as engaging in environmentally friendly behavior.

The current results complement recent research on how environmentally friendly behavior may be influenced by communication (see e.g., Feinberg & Willer, 2011; Gifford & Comeau, 2011; Nisbet & Mooney, 2007; Rabinovich, Morton, & Birney, 2011; Ter Mors, Weenig, Ellemers, & Daamen, 2010). Research has, for example, shown that perceptions of the scientific agenda when communicating about climate change influence individuals' willingness to perform environmentally friendly behaviors and that the way climate change is framed influences engagement in environmental issues (O'Neill & Nicholson-Cole, 2009; Rabinovich et al., 2011). Our paper advances knowledge on the effects of (science) communication by showing that the often employed progress frame negatively impacts on individuals' environmentally friendly attitudes, intentions, and behaviors.

So far, most research has focused on the effects of science communication on individuals' attitudes and beliefs toward science (Hwang & Southwell, 2009). How individuals' beliefs about science affect their subsequent behaviors has, however, been largely unstudied. The current research fills this gap by showing that beliefs about scientific progress influence environmentally friendly behavior. Second, this paper underpins the importance of investigating how media and science communication affect individuals' environmentally friendly behavior. There is not much known yet on how science-related uncertainties and contradictions influence individuals' environmentally friendly attitudes and behaviors (but see e.g., Lewandowsky, Gignac, & Vaughan, 2013; Morton et al., 2011). It could be argued that media reports on contradictory scientific results and even fraud might decrease individuals' belief in science as an institution, which in turn increases feelings of disorder and – somewhat ironically – the likelihood of engaging in environmentally friendly behavior. Alternatively, it could also be the case that such reports increase skepticism and perhaps even a disregard for science all together (Gleick et al., 2010). As a consequence, this might undermine the idea that environmentally friendly behavior is necessary in the first place and therefore decrease environmentally friendly behavior – especially among the scientific illiterate (Nisbet et al., 2002). This poses an interesting question for future research.

The current paper also contributes to the understanding of order motivation and compensatory control. First, it shows that affirming belief in an external source of control has a downside in the sense that individuals are less likely to take control themselves; they become more passive. It is plausible that this is not only the case for a strong belief in scientific progress, but also holds in the context of strong beliefs in God, government, and other external agents or institutions that may provide order (Laurin et al., 2012). Therefore, it may be interesting for future research to investigate how a strong belief in governmental institutions could affect the motivation to exert personal control over outcomes in a wide range of domains. Other types of personal action in different domains are likely to increase feelings of control as well.

At the same time we believe that environmentally friendly behaviors and pro-social behaviors in general are particularly potent providers of control. For example, as Banfield (2011) has argued and shown in her research, these behaviors give individuals the possibility to influence not only an outcome in their personal life but also instill the notion that they can exert control over their environment. This sense of being able to influence or alter the environment likely renders such behaviors especially suitable for providing individuals with a sense of control over outcomes. Moreover, it is likely that the substitutability of personal and external control is strongest when these concern similar domains, as is the case with environmentally friendly behavior and scientific progress. Second, this research is among the first to provide evidence for the functional value of affirming external sources of order ((i.e., whether it actually helps to enhance perceptions of order; Rutjens et al., 2013). Notably, the psychological value of affirming external control (enhanced order perceptions) is accompanied by inertia.

Finally, our research complements other work that documents variables that have ironic effects on environmentally friendly behaviors (such as recent work suggesting that validating the purchase of green products hampers subsequent green behaviours; Meijers, Noordewier, & Avramova, 2013). Previous research mainly showed how internal sources may serve as a justification for environmentally unfriendly behavior. For example, how individuals' previous environmentally friendly behaviors may ironically justify environmentally unfriendly behaviors (see Chapter 2 and 3 of this dissertation). Our research shows that also external sources (such as the

progress of science as depicted in media reports) may serve as a justification for environmentally unfriendly behaviors and therefore impair environmentally friendly behavior.

### **Alternative Explanations**

It could be argued that there are alternative explanations for our results, particularly those of Studies 5.1 and 5.4. When individuals learn about science progressing at a rapid rate they might simply infer from this information that their personal actions against climate change are redundant as the problem is beyond their control. Such an explanation would converge with previous research in the domain of compensatory control theory, which has shown that belief in a controlling God leads to decreases in active goal pursuit (personal action; Laurin et al., 2012) because outcomes are influenced by God and are therefore perceived to be beyond the individual's control. Other research also has shown that individuals experience a reduced sense of personal agency when being primed with God (Dijksterhuis, Preston, Wegner, & Aarts, 2008). It could thus be the case that our participants outsourced responsibility to science when they learned about rapid progress because they perceive the environmental problem to be beyond their control.

We, however, deem this alternative explanation less likely than our hypotheses concerning order and justification. In Study 5.1, one of our filler items was a question regarding how much individuals think they themselves can contribute to a better environment. In contrast to the alternative hypothesis, we observe that participants in both conditions (e.g., science is progressing rapidly versus science is progressing rapidly but is not there yet) feel they are able to influence the environment to the same extent<sup>7</sup>. So, we believe that it is unlikely that individuals feel their behavior becomes redundant because they perceive the problem as beyond their control, instead, they no longer feel the need to exert personal control as order perceptions are already met – which they therefore may use as a justification. This is also supported by our results in Study 5.2 and 5.3 and the results of the mediation analysis in Study 5.4.

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<sup>7</sup> Affirmed ( $M = 5.40$ ,  $SD = 1.07$ ) versus tempered belief in scientific progress ( $M = 5.15$ ,  $SD = 1.13$ ),  $F(1, 101) = 1.31$ ,  $p = .255$ .

## Multiple Motives

We do not argue that a fulfilled need for order in itself provides individuals with a justification for environmentally friendly behaviors. Instead, we argue that these two motives (justification and need for order) together may provide an explanation for individuals' environmentally unfriendly behaviors. Importantly, they do appear to be interrelated. Consider the example of rapid progress in science that helps in finding solutions to environmental problems, however, these solutions come with potentially hazardous consequences and the potential for disorder and chaos (e.g., rapid technological advances in the domain of genetically modified food or nuclear energy). In this case, science will unlikely function as an external source of *control*, but also will be unlikely to function as an external course of *justification* - albeit for different, but related, reasons.

If the progress of science potentially creates disorder, it unlikely functions as an external source of control, as it does not help fulfill the motivation of order. Similarly, if the progress of science potentially comes with hazardous consequences the environment, it unlikely functions as an external source of justification, as this does not appear to be a valid source for justification. Although individuals appear to be able to use all sorts of justifications, even irrational ones, they do require to be valid reasons (Shafir et al., 1993). So, if science progresses rapidly, but this comes with negative consequences it would not sufficiently help the environment in the end. Therefore, it would be unlikely that individuals will be able to justify their environmentally unfriendly behaviors by such an external source of justification.

It would be interesting for future research to pull these two different motives (justification and order) for environmentally unfriendly behaviors apart. Based on our results in Chapter 3 (i.e., individuals with a strong environmental self-identity do not show justification effects), it could be argued that media reports using a progress frame will not decrease individuals' environmentally friendly behaviors when individuals have a strong environmental self-identity. So, even if for individuals with an environmental self-identity order motivations would be fulfilled by media science reports, they would still perform environmentally friendly behaviors as they are unlikely to

use it as a source of justification. In this way, the differential effects of these two distinct motivations could be investigated.

As we stated in the introduction of this dissertation, individuals may use sources of justification flexibly to be able to justify their desired behavior (Hsee, 1995; Kunda, 1987 - see also De Witt Huberts, Evers, & De Ridder, 2014). Previous research suggests that potentially everything could function as a justification, even trivial or irrational reasons (De Witt Huberts et al., 2014; Shafir et al., 1993). It is important though that the justifications sound plausible and valid (Shafir et al., 1993), therefore we believe there may be constraints on using justifications. In Chapter 3, we showed that there may be personal constraints to this, as individuals with a strong environmental self-identity do not use a justification for environmentally unfriendly behavior. Similarly, in the current chapter, we show that there may be situational constraints to using justifications: not every potential source indeed justifies environmentally unfriendly behaviors; it should be a valid source of external justification. Investigating in more detail the personal and situational constraints of justifying environmentally friendly behaviors appears a promising endeavor for future research.

## **Conclusion**

Our results have important practical implications for understanding how environmentally friendly behavior can be increased and encouraged. When media outlets paint a picture of omniscient science and unconditional and ongoing progress, individuals may use this as an external source of justification for environmentally unfriendly behavior. Instead, looking more critically at the power of science and the limits of progress could – somewhat ironically – encourage individuals to take matters in their own hands and make environmentally friendly choices.